Note: The information in this catalog PDF is subject to change without notice. Many departments make changes in their degree requirements and course descriptions between updates of the online catalog and PDF. For the most current information, check with the department offices.
Introduction

Mission

The University of Minnesota, founded in the belief that all people are enriched by understanding, is dedicated to the advancement of learning and the search for truth; to the sharing of this knowledge through education for a diverse community; and to the application of this knowledge to benefit the people of the state, the nation and the world.

The University’s mission, carried out on multiple campuses and throughout the state, is threefold:

Research and Discovery—Generate and preserve knowledge, understanding and creativity by conducting high-quality research, scholarship and artistic activity that benefit students, scholars and communities across the state, the nation and the world.

Teaching and Learning—Share that knowledge, understanding and creativity by providing a broad range of educational programs in a strong and diverse community of learners and teachers, and prepare graduate, professional and undergraduate students, as well as non-degree-seeking students interested in continuing education and lifelong learning, for active roles in a multiracial and multicultural world.

Outreach and Public Service—Extend, apply and exchange knowledge between the University and society by applying scholarly expertise to community problems, by helping organizations and individuals respond to their changing environments, and by making the knowledge and resources created and preserved at the University accessible to the citizens of the state, the nation and the world.

In all of its activities, the University strives to sustain an open exchange of ideas in an environment that embodies the values of academic freedom, responsibility, integrity and cooperation; that provides an atmosphere of mutual respect, free from racism, sexism and other forms of prejudice and intolerance; that assists individuals, institutions and communities in responding to a continuously changing world; that is conscious of and responsive to the needs of the many communities it is committed to serving; that creates and supports partnerships within the University, with other educational systems and institutions, and with communities to achieve common goals; and that inspires, sets high expectations for and empowers the individuals within its community.

Graduate School Location

The Graduate School’s main administrative offices are on the East Bank of the University of Minnesota’s Twin Cities campus in Johnston Hall, 101 Pleasant Street S.E., Minneapolis, MN 55455. See Campus Maps online at www.umn.edu/twincities/maps/index.html and www.d.umn.edu/maps/buildings.html. Johnston Hall is wheelchair accessible.

Publications

Graduate School Catalog—Prospective and current graduate students are responsible for all of the information contained in this catalog PDF that is pertinent to graduate study and to their specific fields. The first section, General Information, is the official source of information about Graduate School policies and procedures. The next section, Majors and Degrees, lists approximately 170 programs offered through the Graduate School.

The largest sections, Twin Cities Degree Programs and Faculty, and Courses, list contact names and addresses for the programs and their offices, graduate faculty who teach in each discipline, and present requirements and course descriptions for the various programs offering graduate degrees. At the beginning of the Courses section, the Course Numbers and Symbols page explains the numbering system, punctuation, department designators, and symbols used throughout the course descriptions. At the back is a complete listing of Course Designators.

This catalog PDF, produced by University Relations, is also available in HTML format at www.catalogs.umn.edu.

Updates to Catalog Information—Changes in Graduate School policies and procedures relating to admission, registration, financial assistance, and commencement are accessible online at www.grad.umn.edu.

Other Publications—The Class Schedule lists courses, class hours, locations, instructors, and basic costs and regulations. It is available online at http://onestop.umn.edu/index.html. Separate catalogs are available for the College of Continuing Education, the Duluth campus, and the professional colleges; see the catalog Web site at www.catalogs.umn.edu.
Policies

Catalog Use—The information in this catalog and other University catalogs, publications, or announcements is subject to change without notice. University offices can provide current information about possible changes.

This electronic publication is available in alternative formats on request. Contact the Office of Admissions, University of Minnesota, 240 Williamson Hall, 231 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-1111; admissions@umn.edu).

Equal Opportunity—The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

Inquiries regarding compliance may be directed to the Director, Office of Equal Opportunity and Affirmative Action, University of Minnesota, 419 Morrill Hall, 231 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-9547).

Disability Services—The University’s mission is to provide optimal educational opportunities for all students. The University recognizes that students with disabilities sometimes have unique needs that must be met in order for them to have access to campus programs and facilities. In general, University policy calls for accommodations to be made on an individualized and flexible basis. It is the responsibility of students to seek assistance at the University and make their needs known.

The first place to seek assistance is Disability Services. This office promotes program and physical access, which means ensuring the rights of students with disabilities and assisting the University in meeting its obligations under federal and state laws. Disability Services provides direct assistance such as information, referral, support, and academic accommodations for enrolled and prospective students, as well as consultation to faculty and staff to ensure access to their programs and facilities.

The office also assists students with disabilities in obtaining services from other University or community resources and serves as a liaison between the University and the Division of Rehabilitation Services. Campus accessibility maps also are available from Disability Services and general building accessibility information is also available at the online Department Directory, www.umn.edu/systemwide/directories/building.html. More detailed accessibility information for campus buildings is available by selecting the appropriate building from the menu at www1.umn.edu/twincities/maps.

For more information, contact Disability Services, University of Minnesota, 180 McNamara Alumni Center, 200 Oak Street S.E., Minneapolis, MN 55455 (612-626-1333 voice or TTY). For online access, go to http://ds.umn.edu.

Access to Student Educational Records—In accordance with Regents policy on access to student records, information about a student generally may not be released to a third party without the student’s permission. (Exceptions under the law include state and federal educational and financial aid institutions.)

The policy also permits students to review their educational records and to challenge the contents of those records.

Some student information—name, address, electronic (e-mail) address, telephone number, dates of enrollment and enrollment status (full time, part time, not enrolled, withdrawn and date of withdrawal), college and class, major, adviser, academic awards and honors received, and degrees earned—is considered public or directory information. Students may prevent the release of public information. To do so, they must request suppression from the records office on their campus.

Students have the right to review their educational records and to challenge the contents of those records. The Regents policy is available for review online at http://onestop.umn.edu/grades_and_transcripts/student_education_records_policy.html, at 200 Fraser Hall, Minneapolis, and at records offices on other campuses of the University. Questions may be directed to the One Stop Services Center, 200 Fraser Hall (612-624-1111; helpingu@umn.edu).

Immunization—Students born after 1956 who take more than one University course are required under Minnesota law to submit a Student Immunization Record Form.

The form, which is accessed through the official Graduate School online admission letter, should be downloaded, filled out, and returned to Boynton Health Service as soon as possible, but absolutely no later than 45 days after the beginning of the first term of enrollment, in order for students to continue registering for courses at the University. Complete instructions accompany the form.

Smoke-Free Campus Policy—Smoking is prohibited in all facilities of the University of Minnesota, Twin Cities campus except for designated private residence hall rooms.

E-Mail—E-mail is the University’s official means of communication with students. Students are responsible for all information sent via their University e-mail account. Students who forward their University e-mail account are still responsible for all information, including attachments, sent to the account.
The Campus and Community

On the Twin Cities campus, Graduate School students enjoy the vast academic and cultural opportunities of a major university and a unique metropolitan area.

Two Campuses in One—The Twin Cities campus, the largest and oldest in the University system, is technically two separate campuses: one just east of downtown Minneapolis on the Mississippi River, the other just west of the State Fairgrounds, a few miles from downtown Saint Paul.

The Mississippi River divides the Minneapolis campus into two banks connected by the double-decker Washington Avenue Bridge. The picturesque mall of the main East Bank is bordered by stately traditional buildings—including Johnston Hall, home of the Graduate School. Next door at the head of the mall is Northrop Memorial Auditorium and its plaza. At the opposite end of the mall, overlooking the Mississippi, Coffman Memorial Union offers a good place to relax between classes. Nearby are the health sciences complexes.

Just across the river is the West Bank. Newer and smaller, it boasts sleek brick buildings including the Elmer L. Anderson and Wilson Libraries, the Humphrey Institute of Public Affairs, Mondale Hall (the Law School), Ted Mann Concert Hall, the Carlson School of Management, and the Arts Quarter.

Three miles away and connected by a free express transit way, is the Saint Paul campus, where animal barns, croplands, flowers, and wooded areas evoke a small college atmosphere.

Urban Diversity—The Dinkytown, Stadium Village, Seven Corners, and Cedar-Riverside areas near the Minneapolis campus, and the St. Anthony Park neighborhood alongside the Saint Paul campus, all feature shops and restaurants tailored to students’ interests and budgets.

Minneapolis (the largest city in Minnesota) and Saint Paul (the state capital) are both flourishing centers of commerce, industry, and the arts, and where grandiose historic buildings complement bold new skyscrapers. Focal points of a progressive metropolitan area of more than 3 million people, the two downtowns offer many opportunities for entertainment, research, volunteer or part-time work, internships, and careers.

Arts and Entertainment—The Twin Cities are renowned for their innovative and varied cultural attractions, such as the Guthrie Theater, Ordway Music Theater, Orchestra Hall, Science Museum, and Omnitheater. Northrop Memorial Auditorium, the campus centerpiece, hosts performances by popular musical and dance artists and outstanding University bands and ensembles. Students can see or star in plays at the Rarig Center. Or they can enjoy the Walker Art Center and the Minneapolis Institute of Arts, the Minnesota and Como Zoos, the Mall of America, the Renaissance Festival and Valleyfair, and the Minneapolis Aquatennial and Saint Paul Winter Carnival. Overlooking the Mississippi River is the University’s Frederick R. Weisman Art Museum, with award-winning design by Frank Gehry.

Recreation and Sports—The University’s Recreational Sports program, one of the largest of its kind on any campus in the country, offers curling, cycling, racquetball, crew, ballroom dance, and 100 other teams, clubs, and fitness activities. Sports fans can attend Golden Gophers football at the new TCF Bank Stadium on campus, Minnesota Vikings football and Twins baseball at the Metrodome, Timberwolves basketball at the Target Center, and Wild hockey at the Xcel Energy Center. Many women’s and men’s intercollegiate athletic events also take place right on campus.

Outdoor enthusiasts can explore the Twin Cities’ 150 parks and 200 lakes, which are ideal for picnicking, hiking, biking, swimming, canoeing, sailing, fishing, rollerblading, ice skating, cross-country skiing, or simply sitting and thinking. The Boundary Waters Canoe Area Wilderness, one of the most unsullied wilderness treasures in the entire nation, is only a few hours drive north.

The warmth of spring, greenery of summer, and bright colors of autumn are followed by at least three months of winter snow, but even then, daytime temperatures generally average an invigorating 10 to 30 degrees above zero.

University Counseling and Consulting Services

University Counseling and Consulting Services (UCCS), 109 Eddy Hall on the East Bank and 199 Coffey Hall on the Saint Paul campus (612-624-3323 for both), offers counseling for academic, career, personal, or relationship concerns.

Besides counseling, UCCS features a variety of services. Its Career Development Program and Student Academic Success Services offer workshops, courses, and materials for career development or academic skills improvement. UCCS also offers a series of workshops for graduate students, as well as ongoing dissertation support groups. The Organizational Development Program offers consultation, assessment, team building, conflict mediation, training, and workshops. The Student Affairs Office of Measurement Services (OMS) scores exams, surveys, and research instruments and provides consultation to University faculty and staff. The Testing Center administers computerized national tests. For more information, see www.ums.umn.edu.
Libraries and Research Opportunities

The University of Minnesota Libraries include 14 library facilities on the Twin Cities campus, holding nearly 7 million volumes with current subscriptions to over 77,000 journals, making it the 15th largest of 113 North American research libraries. Five major library buildings provide anchors on both sides of the Mississippi River in Minneapolis and St. Paul: Wilson Library (humanities and social sciences), Walter Library (physical sciences and engineering), Bio-Medical Library, Magrath Library (natural, agricultural, environmental, and biological sciences), and Elmer L. Andersen Library (archives and special collections).

To support the many disciplines at an institution as comprehensive as the University of Minnesota, the University Libraries acquire, catalog, and maintain information in practically every field of knowledge, in every language, from every time period, and in every format. The online catalog, MNCAT Plus, provides a nearly complete listing of book and journal holdings and serves as a gateway to local, national, and global information sources including e-books, full-text periodicals, academic journal articles, and newspapers.

In addition to strong comprehensive research collections, subject librarians specialize in different research areas and are available for research assistance. The Libraries also offer a variety of free workshops on database literature searching and using the more complicated research materials and resources in the collections. Information about these and other services tailored especially to graduate students is available at www.lib.umn.edu/site/grads.phtml.

Research support is provided by the Offices of the Vice President for Research and the Vice Provost and Dean of Graduate Education, as well as by the public and private sectors. The Graduate School distributes a total of $6 million annually in competitive fellowship awards to students. Another $6 million annually is awarded competitively to faculty for research support and endowed professorship support. The University also ranks among the top research universities receiving federal research money.

Use of Human or Animal Subjects in Research

All research on the Twin Cities, Duluth, Morris, Crookston, and Rochester campuses that involves the use of human or animal subjects must be reviewed and approved before initiation by the Institutional Review Board: Human Subjects Committee (IRB) or the Institutional Animal Care and Use Committee (IACUC). This policy, approved by the University Senate and Board of Regents, applies to funded and nonfunded faculty, staff, and student research. All research, including Plan B projects, theses, and dissertations, that involves human or animal subjects must be approved by the appropriate committee to ensure that the rights and welfare of the subjects are protected. For more information, contact the Research Subjects Protection Office, University of Minnesota, MMC 820, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-5654; fax 612-626-6061).

University Research Centers

The University has numerous research centers and institutes. A partial list can be found at www.mbbnet.umn.edu/res.html.
Administration

University Regents

Clyde E. Allen Jr., Congressional District 7, Chair
Linda A. Cohen, At Large, Vice Chair
Anthony R. Baraga, Congressional District 8
Richard Beeson, Congressional District 4
Dallas Bohnsack, Congressional District 2
John Frobenius, Congressional District 6
Venora Hung, Congressional District 5
Steven D. Hunter, At Large
Dean Johnson, At Large
David M. Larson, Congressional District 3
Maureen Ramirez, At Large
Patricia S. Simmons, Congressional District 1

University Administrators

Robert H. Bruininks, President
E. Thomas Sullivan, Senior Vice President for Academic Affairs and Provost
Frank B. Cerra, Senior Vice President for Health Sciences and Dean of the Medical School
Robert J. Jones, Senior Vice President for System Academic Administration
Nancy “Rusty” Barceló, Vice President and Vice Provost for Equity and Diversity
Kathryn F. Brown, Vice President and Chief of Staff
Carol Carrier, Vice President for Human Resources
Steve Cawley, Vice President and Chief Information Officer
Karen L. Himle, Vice President for University Relations
R. Timothy Mulcahy, Vice President for Research
Charles Muscoplat, Vice President for Statewide Strategic Resource Development
Kathleen O’Brien, Vice President for University Services
Richard Pfutzenreuter, Vice President and Chief Financial Officer
Mark B. Rotenberg, General Counsel

Graduate School Administrators

R. Timothy Mulcahy, Interim Vice Provost and Dean of Graduate Education
Douglas Ernie, Ph.D., Associate Dean of Graduate Education
Shirley Nelson Garner, Ph.D., Associate Dean of Graduate Education
George D. Green, Ph.D., Associate Dean of Graduate Education
Timothy B Holst, Ph.D. Director of Graduate Programs, Duluth

The Graduate School administrative structure includes six policy and review councils, consisting of faculty and students, in the areas of biological sciences; education and psychology; health sciences; language, literature, and the arts; engineering, physical and mathematical sciences; and social sciences.

These councils, together with an Executive Committee, are responsible for making general policy for the Graduate School. The Executive Committee is composed of the vice provost and dean of graduate education; chairpersons of the policy and review councils, the Graduate Research Advisory Committee, the Biomedical Research Advisory Committee, and the Fellowship Committee; and representatives from the Duluth Graduate Council, Graduate School administration and staff, and the Council of Graduate Students.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Information</td>
<td></td>
</tr>
<tr>
<td>Tuition and Fees</td>
<td>8</td>
</tr>
<tr>
<td>Basic Admission Requirements</td>
<td>8</td>
</tr>
<tr>
<td>Application Procedure</td>
<td>8</td>
</tr>
<tr>
<td>Special Applicant Categories</td>
<td>9</td>
</tr>
<tr>
<td>Assistantships and Fellowships</td>
<td>10</td>
</tr>
<tr>
<td>For New Graduate Students</td>
<td>11</td>
</tr>
<tr>
<td>Other Financial Assistance</td>
<td>12</td>
</tr>
<tr>
<td>Office for Diversity in Graduate Education</td>
<td>13</td>
</tr>
<tr>
<td>Student Grievance Procedures</td>
<td>13</td>
</tr>
<tr>
<td>Housing</td>
<td>13</td>
</tr>
<tr>
<td>Orientation to the Twin Cities Campus</td>
<td>14</td>
</tr>
<tr>
<td>Council of Graduate Students</td>
<td>14</td>
</tr>
<tr>
<td>Preparing Future Faculty</td>
<td>14</td>
</tr>
<tr>
<td>Registration</td>
<td>14</td>
</tr>
<tr>
<td>Special Registration Categories</td>
<td>15</td>
</tr>
<tr>
<td>Registration Categories for Advanced Graduate Students</td>
<td>15</td>
</tr>
<tr>
<td>Readmission and Other Changes</td>
<td>15</td>
</tr>
<tr>
<td>Grading System</td>
<td>15</td>
</tr>
<tr>
<td>Satisfactory Progress Toward the Degree</td>
<td>16</td>
</tr>
<tr>
<td>Termination of Graduate Student Status</td>
<td>16</td>
</tr>
<tr>
<td>Postbaccalaureate Certificates</td>
<td>16</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>16</td>
</tr>
<tr>
<td>Professional Master’s Degree in Engineering</td>
<td>20</td>
</tr>
<tr>
<td>Master of Fine Arts</td>
<td>21</td>
</tr>
<tr>
<td>Specialist Certificate in Education</td>
<td>21</td>
</tr>
<tr>
<td>Doctor of Philosophy Degree</td>
<td>22</td>
</tr>
<tr>
<td>Doctor of Education</td>
<td>28</td>
</tr>
<tr>
<td>Doctor of Musical Arts</td>
<td>28</td>
</tr>
<tr>
<td>Doctor of Audiology</td>
<td>29</td>
</tr>
<tr>
<td>Doctor of Physical Therapy</td>
<td>29</td>
</tr>
<tr>
<td>Joint Degrees</td>
<td>29</td>
</tr>
<tr>
<td>Clearance for Graduation</td>
<td>29</td>
</tr>
<tr>
<td>Commencement Ceremony</td>
<td>29</td>
</tr>
</tbody>
</table>
Tuition and Fees

Tuition for the various categories of Graduate School registration and fees are listed in the Class Schedule online at http://onestop.umn.edu/finances/costs_and_tuition/tuition_and_fees.

Summer session tuition and fees are listed in the Summer Session Catalog online at www.cce.umn.edu/summer.

Residence—Because the University is a state institution, Minnesota residents pay lower tuition than nonresidents. For more information on eligibility requirements for resident status, contact the Resident Classification and Reciprocity Office, University of Minnesota, 240 Williamson Hall, 231 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-6330).

Reciprocity—For residents of North Dakota, South Dakota, Wisconsin, or Manitoba who qualify for reciprocity privileges, tuition rates are lower than for nonresidents and are, in some cases, comparable to resident rates. For more information, contact the Resident Classification and Reciprocity Office (see above) or visit http://onestop.umn.edu/finances/costs_and_tuition/tuition_and_fees/reciprocity/index.html.

Resident Tuition Benefit—For information on resident tuition for graduate assistants, fellows, and trainees, see Assistantships and Fellowships. For information on the benefit for underrepresented and educationally disadvantaged students, see Office for Diversity in Graduate Education in this section.

Basic Admission Requirements

Any student with a U.S. bachelor’s degree or a comparable foreign degree from a recognized college or university may apply to the Graduate School Office of Admissions. Applicants with the necessary background for their chosen major field, an excellent scholastic record from an approved college or university, and appropriate professional qualifications may be admitted for graduate work on recommendation of the graduate faculty in the proposed major field and approval of the vice provost and dean of graduate education. The Graduate School operational standard for admission is an undergraduate grade point average (GPA) of 3.00. Many programs prefer a higher GPA. Applicants should consult the program to which they are applying for more specific information about admission standards.

Graduate School Commitment to Diversity—The Graduate School embraces the University of Minnesota’s position that promoting and supporting diversity among the student body is central to the academic mission of the University. The Graduate School defines diversity to encompass many characteristics including economic disadvantage, special talents, evidence of leadership qualities, race or ethnicity, a strong work record, and disability. A diverse student body enriches graduate education by providing a multiplicity of views and perspectives that enhance research, teaching, and the development of new knowledge. A diverse mix of students promotes respect for, and opportunities to learn from, others with the broad range of backgrounds and experiences that constitute modern society. Higher education trains the next generation of leaders of academia and society in general, and such opportunities for leadership should be accessible to all members of society. The Graduate School and its constituent graduate programs are therefore committed to providing equal access to educational opportunities through recruitment, admission, and support programs that promote diversity, foster successful academic experiences, and cultivate the leaders of the next generation.

For more information on admission requirements and application procedures, contact the proposed major field at the address or phone number listed with each program in the Degree Program and Faculty section of this catalog.

Application Procedure

Applicants are required to apply online at www.grad.umn.edu/prospective_students/apply_online.html. Applicants are encouraged to apply for admission well in advance of the term in which they wish to enter the Graduate School (but no more than one year in advance of the proposed entry date). The Graduate School Application for Admission, complete with all required materials, must be submitted by the following deadlines.

Fall semester ....................... June 15
Spring semester ..................... October 15
Summer session ................... March 15

Deadlines that fall on a holiday or weekend will be extended through the next regular workday.

Many major fields have established deadlines earlier than those listed above and also require additional application and supporting materials. It is the applicant’s responsibility to obtain information about those deadlines and requirements from the director of graduate studies for the proposed major.

Note: More detailed and up-to-date information regarding the application fee, transcripts, and test data is included in the instructions accompanying the Graduate School Application for Admission.

Transcripts—Official transcripts of previous academic study must be submitted with the admissions application.

Experience at the University of Minnesota has been that often during the course of the program of study a student has need of a complete set of official credentials covering previous college and university training. Applicants are urged to request two sets of official credentials when preparing their admission
application—one to be submitted for permanent filing in the Graduate School and the other for personal use. **International Applicants**—All international applicants must submit complete credentials. Details on the types of transcripts required are given in the instructions for the Graduate School Application for Admission.

**Test Data**—One or more of the following tests may be required as part of the application process (in addition, students should consult the individual program requirements under Degree Programs and Faculty).

- **Graduate Record Examination (GRE)**—Most major fields request the GRE. It would be wise, therefore, for applicants to complete this test either in the senior year of undergraduate work or before filing an admission application.

  For information about the test, contact the Educational Testing Service, CN 6000, Princeton, NJ 08541; or [www.ets.org/gre](http://www.ets.org/gre). Official scores must be sent to the Graduate School Office from the testing service.

- **Graduate Management Admission Test (GMAT)**—See the accountancy, business administration, and business taxation program descriptions under Degree Programs and Faculty. For information on registering for the GMAT, write to the Graduate Management Admission Council (GMAC), 1600 Tysons Boulevard, Suite 1400, McLean, VA 22102 (866-505-6559 toll-free in the U.S. and Canada only; 703-245-4222; or [www.mba.com/mba/TaketheGMAT](http://www.mba.com/mba/TaketheGMAT)).

- **Test of English as a Foreign Language (TOEFL), International English Language Testing System (IELTS), and Michigan English Language Assessment Battery (MELAB)**—The TOEFL operational standard for admission to the Graduate School is a minimum total score of 79, plus minimum section scores of 21 on the writing section and 19 on the reading section on the Internet-based test, or a minimum score of 550 on the paper-based test. The IELTS operational standard is a minimum score of 6.5, and the MELAB operational standard is a minimum score of 80. Individual programs may require a higher score. One of these tests is required of all international applicants whose native language is not English, except those who will have completed 24 quarter or 16 semester credits (within the past 24 months) in residence as a full-time student at a recognized institution of higher learning in the United States before entering the University of Minnesota. These transfer students, however, may be asked to take locally administered English tests after arrival on campus.

  - [TOEFL](http://www.ets.org/toefl)
  - [www.ets.org/toefl](http://www.ets.org/toefl)
  - [IELTS](http://www.ielts.org)
  - [www.ielts.org](http://www.ielts.org)

- **Outside the U.S. and Canada:**
  - [www.lsa.umich.edu/eli/testing/melab](http://www.lsa.umich.edu/eli/testing/melab)
  - [www.lsa.umich.edu/eli/testing/melab](http://www.lsa.umich.edu/eli/testing/melab)

  - [MELAB Office, TCF Building University of Michigan 401 E. Liberty, Suite 350 Ann Arbor, MI 48104-2298 1-866-696-3522](http://www.lsa.umich.edu/eli/testing/melab)

  - [www.lsa.umich.edu/eli/testing/melab](http://www.lsa.umich.edu/eli/testing/melab)

- **Foreign Medical Graduate Examination in the Medical Sciences (FMGEMS)**—Applicants seeking admission to graduate study in clinical medical fields whose medical degrees or qualifications were conferred by medical schools outside the United States, Puerto Rico, or Canada must submit certification by the Educational Commission for Foreign Medical Graduates or evidence of a full and unrestricted license to practice medicine issued by a state or other territory under U.S. jurisdiction that is authorized to license physicians. For more information on certification and the FMGEMS, write to the Educational Commission for Foreign Medical Graduates, 3624 Market Street, Philadelphia, PA 19104 (215-386-5900; [www.ecfmg.org](http://www.ecfmg.org)).

  - [www.ecfmg.org](http://www.ecfmg.org)

**Additional Information**—The Graduate School and individual programs within it reserve the right to request additional information when they believe it is necessary.

### Special Applicant Categories

**University of Minnesota Undergraduates**—If admitted to the Graduate School, University of Minnesota undergraduate students who have no more than seven semester credits or two courses to complete for their bachelor’s degree (including both distribution and total credit requirements) may register in the Graduate School to begin a graduate program while simultaneously completing their baccalaureate work. A final bachelor’s transcript must be submitted before the second term of registration.

**Professional Development**—Applicants who wish to enroll in a field in the Graduate School but who are not interested in a graduate degree may apply for admission for “professional development coursework.” Applicants for professional development courses must complete the usual application materials and meet existing deadlines and admission standards. Because some major fields restrict admission to only those planning on pursuing an advanced degree, applicants are advised to consult with the director of graduate studies in their proposed major field before completing application materials.

**Academic Staff**—University of Minnesota staff holding academic appointments above the rank of instructor or research fellow are normally not permitted to complete a graduate degree at the University. Those who wish to register for courses and transfer them elsewhere may apply for admission for “professional development coursework.”
Assistantships and Fellowships

Resolution of the Council of Graduate Schools in the United States—Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an enrolled or prospective graduate student completes an agreement that both student and graduate school expect to honor.

When a student accepts an offer before April 15 and subsequently desires to withdraw, the student may submit a written resignation from the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student to that financial aid offer; she or he may not accept any other offer without first obtaining a written release from the institution to which the outstanding commitment was made.

Similarly, an offer made by an institution after April 15 is conditional on presentation by the student of a written release from any previously accepted offer. It is further agreed by the institutions and organizations subscribing to this resolution that a copy of the resolution should accompany every scholarship, fellowship, traineeship, and assistantship offer.

Graduate Assistantships

Graduate assistantships are academic appointments reserved for graduate and professional students. Appointments to teaching assistant, research assistant, or administrative fellow positions are offered through various departments. A teaching assistant helps teach students in a specified course or courses under the general supervision of the academic staff and may be assigned primary responsibility for an entire course. A research assistant carries out activities connected with research studies assigned by the supporting department or principal research investigator. An administrative fellow performs duties of a specialized nature connected with academic administration.

NOTE: To be eligible to hold one of these appointments, a student must have been admitted to the Graduate School or a professional school and be registered in the Graduate School or professional school each term of the appointment; this applies to appointments of any percentage or any number of hours. For more specific information, refer to the Graduate Assistant Employment Area in the Office of Human Resources (612-624-7070) or its Web site at www.umn.edu/ohr/gae.

Benefits

All graduate assistants holding appointments as teaching assistants, research assistants, and administrative fellows may become eligible for the following benefits:

Tuition Benefits—Upon reaching minimum qualification for eligibility (refer to the graduate assistant office Web site above), students receive a tuition benefit equal to twice the percentage of time worked. For example, a 40 percent appointment for the full payroll semester period includes an 80 percent tuition benefit, which applies only to tuition and the University fee. The maximum benefit is 100 percent and applies to a maximum of 14 credits each academic term. The tuition benefit does not cover course or student services fees.

Resident Rate Privilege—Upon reaching minimum qualification for eligibility (refer to the graduate assistant office Web site above), students receive a resident rate break, which is credited on the fee statement before the tuition benefit. This privilege applies concurrently to members of the immediate family (spouse or domestic partner, children, and parents).

Extended Resident Rate Privilege—When a graduate assistant has completed two qualifying terms of assistantship, the resident rate break continues for the number of terms the appointments were held, up to a maximum of four terms. This privilege applies also to the student’s immediate family. NOTE: For the student and family, this privilege does not extend beyond three years from the termination of the last or most recent qualifying appointment.

Each department sets its own financial aid application deadline. Unless otherwise noted, students should apply by January 15 for appointments for the ensuing academic year; applications received after January 15 are considered for available vacancies.

Graduate assistants are compensated according to a pay range established each year by the University’s central administration and approved by the Board of Regents. The current pay range for graduate
assists is available from the department or the University of Minnesota Job Center. Graduate students may not hold appointments for which there is no monetary compensation, nor are they allowed to hold appointments for which they receive only course credit or resident tuition rates.

More information may be obtained from either the head of the department offering the appointment or the Job Center, which maintains the graduate assistant office Web site and Grapevine, a newsletter for graduate assistants. More information about the assistantship program at the University may be obtained from the Job Center, University of Minnesota, 200 Donhowe Building (first floor for walk-in assistance), 319 15th Avenue S.E., Minneapolis, MN 55455 (612-624-7070; fax 612-625-9801; www.umn.edu/ohr/gae).

Graduate Assistant Health Care Plan—University-subsidized health insurance is available to most Graduate School or professional school students who hold an appointment as a teaching assistant, research assistant, or administrative fellow (some other fellows and trainees enrolled in the Graduate School are also eligible). For these students, the University pays 42.5 to 95 percent of the insurance premium during the academic year (fall through spring), the percentage depending on the level of appointment. To receive this coverage, eligible students must apply for it by the end of the second week of classes. To apply and for more information, contact the Graduate Assistant Insurance Office, N-323 Boynton Health Service, 410 Church Street S.E., Minneapolis, MN 55455 (612-625-6936; gradins@bhs.umn.edu; www.bhs.umn.edu).

Postsecondary Teaching and Learning Assistantships—Graduate students are eligible to apply for teaching assistantships in the Department of Postsecondary Teaching and Learning in mathematics, natural sciences, social sciences, ESL, and the humanities. The Department of Postsecondary Teaching and Learning offers first-year curriculum for entering students, with a particular emphasis on multiculturalism.

All graduate teaching assistantships for Postsecondary Teaching and Learning are posted for at least five days in the Job Center, University of Minnesota, 319 15th Avenue S.E., Minneapolis, MN 55455. Notices of vacancies in Postsecondary Teaching and Learning are routinely sent to related academic departments in other University colleges.

Graduate Fellowships

Graduate fellowships, awards based on academic merit, are available to new and currently enrolled graduate students. The Graduate School Fellowship Office, 314 Johnston Hall, administers several fellowship programs; a number of individual academic departments also administer field-specific fellowships. Entering students should contact their prospective graduate program. Currently enrolled students should consult the Fellowship Office and their graduate program office for current information on fellowship opportunities. The Fellowship Office also processes applications for several international competitions, such as Fulbright Grants for graduate study abroad. Contact the Graduate School Fellowship Office for additional information at 612-625-7579 or gs fellow@umn.edu; or visit www.grad.umn.edu/fellowships.

Resident Benefit for Graduate Fellows and Trainees—Graduate students who hold fellowships or traineeships are eligible for resident tuition rates, provided the award is administered by the University and the stipend is at least equal to a 25-percent-time graduate assistantship. This eligibility also extends to members of the immediate family (i.e., parent, spouse, child, or ward). For details and updates on this policy, contact the Graduate School Fellowship Office, 314 Johnston Hall (612-625-7579; www.grad.umn.edu/fellowships).

For New Graduate Students

Graduate School Fellowships—Intended for recruiting outstanding new students to the University’s graduate programs, these fellowships provide a stipend of approximately $21,500 for the academic year plus tuition for up to 14 credits per term and subsidized health insurance. Prospective students must be nominated by their chosen major field in late January through procedures announced during fall semester. Applicants should contact the director of graduate studies in their major field in advance.

Fellowships and Scholarships Administered Through Departments—Many academic departments have fellowships and awards from private endowment income, gifts, and other sources. Complete information is available on award amounts and purposes, deadlines, and the application process from individual departments. Students should inquire directly.

Fellowships Available For Underrepresented and Educationally Disadvantaged Students—Because eligibility varies depending on the fellowship, students should contact the appropriate program office to see if they are eligible. Information can also be obtained from the Office for Diversity in Graduate Education, 233 Appleby Hall (612-625-6858; gsoeo@umn.edu).

Diversity of Views and Experiences Fellowship (DOVE)—Students planning to enter the Graduate School for the first time in the fall semester are eligible for these one-year fellowships, which provide a stipend of approximately $22,500 plus tuition and health insurance (fees not included) for the academic year. Departmental support following the fellowship year is included. All applicants must be nominated by the graduate program they plan to enter. About 18 fellowships are awarded each year.

Other Available Fellowships—The availability of other fellowships for underrepresented and educationally disadvantaged students changes yearly. They include the Ford Foundation Pre-doctoral and Dissertation Fellowships for Minorities, the GEM Master’s Fellowship, the GEM Ph.D. Engineering
and Natural Science Fellowship, and others. Contact the Office for Diversity in Graduate Education, 233 Appleby Hall, for information. In addition, underrepresented and educationally disadvantaged students should check all regular sources of support described in this catalog.

Other Financial Assistance

Student Employment — The University’s Job Center (part of the Office of Human Resources) offers graduate students a wide range of nonacademic employment opportunities both on campus and throughout the Twin Cities area. All jobs are posted at the Job Center, 200 Donhowe Building, 319 15th Avenue S.E., Minneapolis, MN 55455 (612-625-2000; gaoinfo@umn.edu). Contact the Job Center for more information, including registration requirements for graduate student eligibility.

In addition to University (on-campus) employment, the Center offers programs for off-campus employment: the Job Location and Development (JLD) Program helps locate career-related opportunities with private and public employers in the Twin Cities; Community Service Programs helps arrange employment on and off campus with nonprofit organizations and agencies. Students who prefer more flexibility may apply for short-term, on-campus temporary positions through the Student Temporary Service (STS). STS also offers free microcomputer training and temporary job placement through the Microcomputer Training Program. Training is provided on Macintosh and IBM microcomputers. Once qualified, students are placed in temporary, on-campus microcomputer-related jobs at competitive wages.

Office of Student Finance (OSF) — To apply for financial aid, graduate students must complete the Free Application for Federal Student Aid (FAFSA), available from the financial aid office each year. Graduate students are considered for the following programs, according to their degree program, student status, and other qualifying criteria: Ford Federal Direct Subsidized and Unsubsidized Loans; Federal Perkins Loans; Student Educational Loan Fund (SELF); University Trust Fund Loan (UTFL); University of Minnesota scholarships and fellowships; regular student employment and Work-Study; Health and Human Services Health Care Professions Grants; Minnesota Medical Foundation Scholarship; Minnesota Tuition Offset for Health Professions; Peters Pharmacy Scholarship; University of Minnesota Medical School Scholarships; Health Professions Student Loan (HPSL); Loans for Disadvantaged Students (LDS) for health professions; Nursing Student Loan (NSL); Primary Care Loan (PCL) for medical students; and private loans.

International graduate students must contact International Student and Scholar Services for financial aid opportunities (see below).

Most awards are based on financial need and full-time enrollment status. Aid from the UTFL, Perkins, and Work-Study programs is awarded as applications become complete and until all funds have been spent. Students who submit their FAFSAs early to the federal processor receive first priority consideration for limited funds. Prospective students may apply before admission to the University.

For detailed information, students should obtain the most recent edition of the Scholarships and Financial Aid Handbook, a comprehensive guide to the financial aid process at the University of Minnesota. The handbook is accompanied by the FAFSA, which must be completed for aid consideration.

Students may write to the One Stop Student Services Center at either University of Minnesota, 210 Fraser Hall, 106 Pleasant Street S.E., Minneapolis, MN 55455, or University of Minnesota, 130 Coffey Hall, 1420 Eckles Avenue, Saint Paul, MN 55108; call 612-624-1111 or from July through September, 1-800-400-UofM (8636); fax 612-624-9584; helpingu@umn.edu; http://onestop.umn.edu/finances/financial_aid).

To receive disability accommodations when in Fraser Hall or information in an alternative format, call the disability services liaison for financial aid at 612-625-9578; TTY 612-626-0701.

International Students and Scholars — International Student and Scholar Services (ISSS) provides counseling, advising, and educational and career services to students and scholars from other countries. ISSS staff members offer counseling and advising services regarding visa requirements and other immigration issues; social, personal, and financial matters; international and intercultural educational opportunities; academic issues; and English language requirements.

International students new to the University of Minnesota must participate in ISSS’s International Student Orientation Program, which introduces students to academic, social, and practical matters relevant to their study in the United States. In addition, ISSS coordinates many cross-cultural training programs and events for students, faculty, staff, and the Twin Cities communities. All admitted international students and scholars are mailed materials pertaining to pre-arrival, arrival, and transition to the University system. Prospective student inquiries may be addressed to International Student and Scholar Services, 190 Hubert H. Humphrey Center, 301 19th Avenue South, Minneapolis, MN 55455 (612-626-7100) or visit the Web site at www.isss.umn.edu.

Army and Air Force ROTC — Graduate students may pursue a two-year Army or Air Force ROTC program. For information, see the University’s Undergraduate Catalog for the Twin Cities campus or call the Army ROTC (612-624-7300) or Air Force ROTC (612-624-2884).
Office for Diversity in Graduate Education

The Office for Diversity in Graduate Education (233 Appleby Hall, 612-625-6858, gseo@umn.edu) works closely with other University of Minnesota offices that are concerned with diversity and multiculturalism. The office
  • provides service to prospective and currently enrolled graduate students, faculty, funding representatives, and university colleagues;
  • provides information about the University of Minnesota and its commitment to enrolling a diverse student population;
  • supports a diverse student body in recruiting, funding, retention, and graduation with strategies for clarifying goals; selecting an appropriate graduate program; preparing the best possible graduate school application; and funding graduate work through assistantships and fellowships;
  • serves as the administrative unit for funding programs that support a diverse graduate student body;
  • promotes professional development and scholarship across disciplines and works toward creating the institutional environment necessary for facilitating the academic achievements of graduate and professional students; and
  • encourages undergraduate students to consider graduate study by participating in research and other academic projects outside of their regular coursework.

Student Grievance Procedures

Academic Complaints—The Graduate School follows the University’s policy on student academic complaints. Information about the policies related to student conduct and academic grievances are available online at www.umn.edu/regents/policies/humanresources/SexHarassment.html. For more information and additional resources contact the Student Conduct Resolution Center (612-624-7272; sos@umn.edu; www.sos.umn.edu).

Sexual Harassment—Policies pertaining to sexual harassment are contained in the Regents policy adopted December 11, 1998. The policy defines sexual harassment in the following manner.

   Sexual harassment means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature when: 1) submission to such conduct is made either explicitly or implicitly a term or condition of an individual’s employment or academic advancement in any University activity or program; 2) submission to or rejection of such conduct by an individual is used as the basis of employment or academic decisions affecting this individual in any University activity or program; or 3) such conduct has the purpose or effect of unreasonably interfering with an individual’s work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program.”

All-University policies and procedures pertaining to sexual harassment are available online at www.umn.edu/regents/policies/humanresources/SexHarassment.html.


Student Conduct Code—Matters concerning student conduct are addressed by the University’s Student Conduct Code rather than by Graduate School policies. The code applies both to academic and non-academic misconduct. Alleged violations involving graduate students in either instance are governed by the procedures outlined in the code itself. Allegations of non-academic misconduct by graduate students are dealt with directly by the University’s conduct code coordinator. See Section 5 of the Student Conduct Code (www.sja.umn.edu/conduct.html).

Because the Graduate School does not use a scholastic-standing committee or a disciplinary committee, responsibility for a full hearing concerning alleged academic misconduct by a graduate student most often lies with the department or program in which the student is majoring. When the alleged misconduct occurs in a course originating from a department or program outside of the student’s major, and the matter cannot be satisfactorily be resolved by the instructor, the allegation is forwarded to the conduct code coordinator for possible referral to a University disciplinary agency. For more information, contact the Office for Student Conduct and Academic Integrity (612-624-6073; www.umn.edu/oscai).

Housing

At the current time, the University guarantees a limited number of places in University Village and Centennial Hall for new and current graduate students who apply before May 1 for fall term. More graduate and professional students can be housed in residence halls/apartments during the spring term and will have an option of renewing for the following year. Students interested in living in a residence hall on campus or in off-campus housing in Minneapolis or Saint Paul should contact Housing and Residential Life, Comstock Hall-East, 210 Delaware Street S.E., Minneapolis, MN 55455 (612-624-2994; fax 612-624-6987; housing@umn.edu).

Listings of apartments, duplexes, houses, sleeping rooms, shared units, and sublets are maintained in the office as well as on the Web. Information on temporary housing, living costs, transportation, and day-care centers in the Twin Cities area is also available. For more information, visit the Housing and Residential Life Web site at www.housing.umn.edu.

For information on University family housing, contact Commonwealth Terrace Cooperative, 1250 Fifield Avenue, Saint Paul, MN 55108 (651-646-7526); or
Como Student Community, 1024 27th Avenue S.E., Minneapolis, MN 55414 (612-378-2434).

Orientation to the Twin Cities Campus

Designed for all incoming new graduate students in fall and spring semesters, Graduate Student Orientation (GSO) offers a wide variety of informational sessions and workshops to assist student transition into the University of Minnesota system. Sessions include “How to Navigate the U” and “The Nuts and Bolts of Graduate School” as well as basic resources such as “How to Get Your Student I.D.” All incoming graduate students (except those with foreign addresses) are mailed a brochure outlining the GSO schedule for that semester; F1 and J1 visa students receive information from International Student and Scholar Services (612-626-7100). For more information, contact Orientation and First-Year Programs (612-624-1979 or 800-234-1979; www.ofyp.umn.edu).

In addition to this University-wide orientation service, many graduate programs may offer orientation sessions specifically for their respective fields. For more information, students should contact the director of graduate studies in their major field.

Council of Graduate Students

The Council of Graduate Students (COGS) is the official governing body representing Graduate School students at the University. COGS provides opportunities for graduate students to participate actively in University and Graduate School administrative and policy decisions. Graduate students in each degree-granting program are entitled to elect one representative to serve on COGS. COGS also recruits student representatives for the Graduate School Policy and Review Councils, the University Senate, and many College of Liberal Arts and University-wide committees. In addition, COGS assists in providing ombuds services for graduate students and disseminates information, primarily through the Gradletter, the EXTRA! (graduate student listserv), and through general meetings held throughout the academic year. Information on University governance and grievance procedures is available from the COGS office.

Students may contact COGS at 405 Johnston Hall, 101 Pleasant Street S.E., Minneapolis, MN 55455 (612-626-1612; cogs@umn.edu; www.cogs.umn.edu).

Preparing Future Faculty

Preparing Future Faculty (PFF) welcomes graduate and postdoctoral participants from all disciplines. PFF helps participants acquire information about the teaching and learning process and the faculty role at a variety of institutions of higher education; gain a realistic perspective on the skills required for success as a faculty member; examine their fit with a teaching career in higher education; work with a faculty mentor in a teaching opportunity at a local college or university; demonstrate, document, and reflect on their teaching skills; and market themselves for faculty or other professional positions.

To receive a letter of recognition and a certificate of program participation from the Graduate School, participants must complete GRAD 8101—Teaching in Higher Education and GRAD 8102—Practicum for Future Faculty. Other credit courses on teaching and learning or the faculty role may be recognized by PFF as substitutes for GRAD 8101 or GRAD 8102.

PFF is a program of the Graduate School, administered through the Center for Teaching and Learning (CTL) in the Office of Human Resources. For more information, drop by the CTL in 315 Science Classroom Building (612-625-3811; pff@umn.edu; www.umn.edu/ohr/teachlearn/pff).

Registration

Registration Deadlines—All graduate students must register before the term-specific, University-wide registration deadline. For University calendar and registration deadline information and the University-wide policy governing cancel/adds, refer to http://onestop.umn.edu/onestop/calendar.html.

For information about the summer term, including registration deadlines, refer to the Summer Session Catalog or the Web site above. Exceptions to University-wide registration deadlines will be considered only by written request to the Graduate School; such requests are not routinely granted.

All graduate students must register before the first day of the term to avoid a late registration fee.

Registration Requirements—To maintain their active status, graduate students must register every fall and spring term. Those who do not register in the Graduate School every fall and spring are considered to have withdrawn and their Graduate School records are deactivated. Deactivated students may not register for courses, take examinations, submit degree program or Thesis Proposal Forms, file for graduation, or otherwise participate in the University community as Graduate School students. Those who wish to résumé graduate work must request readmission to the Graduate School and, if readmitted, must register in the Graduate School for the term of readmission to regain their active status. For more information about the Graduate School’s registration requirements, refer to www.grad.umn.edu/current_students/registration.

Graduate students holding appointments as teaching assistants, research assistants, or administrative fellows must be registered for credit each term of their appointment; this applies to appointments of any percentage or any number of hours. See Graduate Assistantships under Assistantships and Fellowships for more information.
Students receiving other types of financial aid from the University or other agencies, international students with certain types of visas, and students who wish to use various University services and facilities may have specific registration requirements; these students are responsible for obtaining information about such requirements from the appropriate offices.

**Special Registration Categories**

**GRAD 999**—GRAD 999 is a zero-credit, zero-tuition, non-graded registration option for Graduate School students who must register solely to meet the Graduate School’s registration requirement. GRAD 999 does not meet any other internal/external departmental or agency requirements. Other than requiring Graduate School students to hold active student status, the Graduate School does not impose any eligibility requirements on GRAD 999 registrations. However, individual graduate programs may establish their own eligibility criteria. Students considering registering for GRAD 999 should first check with their graduate program. For more information on GRAD 999, visit www.grad.umn.edu/current_students/registration/special-categories.html.

**Registration Categories for Advanced Graduate Students**—Advanced master’s students and advanced doctoral candidates (i.e., students who have completed all their program coursework and required thesis credits, but are still working full-time on the research or writing of their thesis, papers, capstone project, or dissertation) may be eligible for special registration categories that enable them to be certified as full-time students when registered for one credit.

“Full-time status with one credit registration” courses are available only to advanced master’s (8333) and doctoral (8444) students who have met eligibility criteria. Eligibility criteria are specific to advanced master’s and advanced doctoral applicants. Students must meet eligibility criteria and application deadlines to qualify.

For more information concerning eligibility requirements, deadlines, and application forms, contact the Graduate School, 316 Johnston Hall, the Graduate Assistantship Office, or visit www.grad.umn.edu/current_students/registration/special-categories.html.

**Readmission and Other Changes**

Most requests for readmission, change of major, track or degree objective, or change of campus within the Graduate School must be made by submitting the online Change of Status/Readmission Application found at www.grad.umn.edu/current_students/registration/readmission.html. This Web page also contains information for those who should not apply online for readmission or change of status. Payment of a $55 fee must be submitted with the application.

**Readmission**—To maintain their active status, graduate students must register every fall and spring term. Previously registered students who do not register in the Graduate School of the University of Minnesota every fall and spring term will be considered to have withdrawn and must apply for readmission in order to resume graduate work. More detailed information and specific examples are located at www.grad.umn.edu/current_students/registration.

**Change of Major, Track, or Degree Objective**—Students currently enrolled in the Graduate School who intend to change their major, track, or degree objective from that originally approved by the Graduate School should request a change of status. Students who have already been awarded a degree in the Graduate School must request a change of status if they wish to pursue another degree.

**Change of Campus**—Students currently enrolled in the Graduate School on one campus who wish to complete their studies on another campus should request a change of status. Graduate study is currently available on the Twin Cities campus and on the Duluth campus.

**Grading System**

The Graduate School uses two grading systems: A-B-C-D-F (with pluses and minuses) and S-N. Students have the option of choosing the system under which they will be graded, except in courses in which grading has been restricted to one system with approval of the Graduate School. Students choose their grading system at the time of initial registration. 5xxx and 8xxx courses with grades of A, B, C (including C-), and S may be applied to a Graduate School degree program; changes in grading option are not allowed after the second week of the term. Under some circumstances and with approval of the student’s major field, 4xxx, 6xxx, and 7xxx courses may also be applied to a Graduate School degree. At least two-thirds of the total number of course credits included on any Degree Program Form must be taken A-F. Individual major fields have the option of specifying more stringent requirements regarding the application of S-N courses to a degree program. All A-F registrations in the Graduate School, regardless of course level, will be calculated in the cumulative GPA.

**Incomplete Grades**—The symbol “I” may be assigned by an instructor to indicate “incomplete,” in accordance with provisions announced in class at the beginning of the semester, when in the instructor’s opinion there is a reasonable expectation that the student can successfully complete the work of the course. An “I” remains on the transcript until the instructor replaces it with a final A-F or S-N grade. Course instructors may, at their discretion, establish a time limit for the removal of incomplete grades. Each major field establishes for its graduate students the maximum number of credits of incompletes allowable at any given time.
Retaking Courses—The Graduate School discourages the retaking of courses to improve grades. If a course is retaken, appropriate tuition and fees will be assessed. All registrations and grades for the course remain on the student’s graduate transcript and are calculated into the cumulative GPA.

Grade Changes—To preserve the integrity of the graduate transcript as an accurate record of a student’s academic progress, the Graduate School does not approve requests to change final grades assigned to students in prior semesters.

Satisfactory Progress Toward the Degree

Graduate programs are required to provide their students with an annual review of their degree progress. In addition to fulfilling the Graduate School requirements, students should consult their major program’s graduate studies handbook for program-specific criteria for satisfactory progress toward their degree.

Termination of Graduate Student Status

When performance is unsatisfactory in terms of grades or normal progress toward the student’s degree objective, graduate student status may be terminated. All guidelines stated in this catalog are minimum requirements, and each program is free to set more specific terms by which progress is measured for purposes of continuation. Students are encouraged to check with the director of graduate studies in their major field for complete information about academic performance and degree progress standards and the procedures used to monitor these standards.

Students who do not register in the Graduate School every fall and spring term are considered to have withdrawn; their Graduate School records are deactivated (see Registration Requirements).

Postbaccalaureate Certificates

The Graduate School offers postbaccalaureate certificates (PBCs) that recognize graduate-level training beyond the award of the bachelor’s degree. Graduate School certificates may be coupled with a master’s or doctoral degree under special circumstances and with the approval of the graduate faculty in the degree-granting field. Refer to the list of Majors and Degrees for the fields in which PBCs are offered through the Graduate School. Graduate School PBCs require a minimum of 12 credits. Regular Graduate School application procedures and admission requirements apply.

As with master’s degrees offered via the Graduate School, PBC students must complete at least 60 percent of their certificate program coursework as registered University of Minnesota Graduate School students (See Transfer of Credits for the Master’s Degree for the potential source(s) of course credits that the Graduate School will consider for transfer). For information regarding specific Graduate School requirements for PBCs, including information on the time limit for completing a certificate, refer to the Graduate School Web site at www.grad.umn.edu/faculty-staff/governance/policies/postbac_administration.html; for specific certificate requirements, see Degree Programs and Faculty in this catalog.

Master’s Degree

The master’s degree is awarded in recognition of academic accomplishment as demonstrated by a coherent program of coursework, passing of the required examinations, and preparation of a thesis or project(s).

Plans for the Master’s Degree—The Graduate School offers the master’s degree under three different plans:

• Plan A, requiring a thesis; and
• Plan B, which substitutes additional coursework and special projects for the thesis; and
• Plan C, the Coursework Only master’s, which provides an alternative structure for degree completion, such as a culminating experience in the form of a capstone course and/or paper.

Minimum Graduate School requirements, including the 30-credit minimum, time limit for degree completion, double counting of credits, transfer coursework, and GPA apply to all plans. Individual major fields have the option of setting higher/more stringent requirements; students should be familiar with any special requirements in their major field. For plans offered in each major, see Degree Programs and Faculty in this catalog.

Registration Requirement for the Master’s Degree—Master’s degree students are required by the Graduate School to complete at least 60 percent of the coursework for their official degree programs (excluding thesis credits) as registered University of Minnesota Graduate School students; individual major fields may require a higher percentage. With approval of the adviser, director of graduate studies in the major (and director of graduate studies in the minor, if the courses are for a designated minor), and the Graduate School, transfer coursework may make up the remaining 40 percent (maximum) of the degree coursework (see Transfer of Credits for the Master’s Degree below).

Master’s Plan A students must enroll for a minimum of 10 thesis credits (8777) before receiving the degree.

Double Counting—Students may have a maximum of 8 credits in common between two master’s-level degrees.

Transfer of Credits for the Master’s Degree—Unless otherwise specified under a student’s major in Degree Programs and Faculty, the following rules apply to transfer of credits.
Master's degree students are required by the Graduate School to complete at least 60 percent of the coursework for their official degree programs (excluding thesis credits) as registered University of Minnesota Graduate School students. With approval of the adviser, director of graduate studies in the major (and director of graduate studies in the minor, if the courses are for a designated minor), and the Graduate School, the transfer of up to 40 percent of the degree program coursework from any combination of the following is permitted.

1. Graduate-level coursework completed at other accredited graduate institutions

2. Graduate-level coursework taken as a non-admitted U of M student—students may be able to register for graduate credit when not admitted to the Graduate School. Non-admitted students interested in taking graduate-level courses must work with the respective departments (generally the director of graduate studies or his/her designee) to gain admission to non-degree status. For information about registering for graduate credit as a non-admitted student, refer to the One Stop Web site at www.onestop.umn.edu/non-degree/registration/graduate/index.html.

3. Graduate-level coursework completed through other University of Minnesota units (e.g., College of Education and Human Development, Law School) in pursuit of graduate-level degrees;

4. Adult special, summer session, and College of Continuing Education coursework completed at the University of Minnesota before spring semester 2001. Any registrations in these categories during spring semester 2001 or later will not be accepted towards any Graduate School degree requirement.

In all cases, official transcripts of the work must be attached to the Degree Program Form, unless they have already been included in the student’s Graduate School file. Individual graduate programs have the option of specifying a lower percentage of coursework for transfer.

Work to be transferred must be graduate level (post-baccalaureate) and have been taught by faculty authorized to teach graduate courses. It is the student’s responsibility to provide appropriate course documentation (e.g., course syllabi, faculty status information) supporting proposed transfer credits to the program.

In the case of a transfer from a non-U.S. institution, the credits must have been earned in a program judged by the Graduate School to be comparable to a graduate degree program in a graduate school of a regionally accredited institution in the United States.

Regarding the transfer of coursework from either a U.S. or non-U.S. institution, if conditions are placed on a student’s admission to exclude certain coursework from transfer to a Graduate School degree program, that coursework may not be transferred regardless of the level of the coursework or the status of the school or college in which it was earned.

Credits are transferred by including the courses in the proposed degree program. Credits not accepted as part of a student’s degree program cannot be transferred. Courses taken before the awarding of a baccalaureate degree cannot be transferred.

Time Limit for Earning the Master’s Degree—
All requirements for the master’s degree must be completed and the degree awarded within seven years. The seven-year period begins with the earliest coursework included on the official Degree Program Form, including any transfer work. The graduate faculty in a specific program may set more stringent time requirements.

Students who are unable to complete the degree within the seven-year limit may petition the Graduate School for an extension of up to one additional year. Extensions beyond one year are considered only in the most extraordinary circumstances. To ensure timely consideration, petitions should be filed early in the term in which the time limit expires.

If a petition is approved, the student is notified of the expectations for progress and completion of the degree. If the petition is denied, the student is terminated from the graduate program.

Students who have been terminated under such circumstances may apply for readmission to the Graduate School; however, readmission under these circumstances is not assured. The faculty in the major field and the Graduate School set any readmission conditions on the student’s resumption of work toward the degree, such as registering for additional coursework, retaking written examinations, completing the degree within a specified time period, or other appropriate terms.

For more information about the master’s degree time limit and petitioning procedure, visit www.grad.umn.edu/current_students/forms/masters.html.

Official Degree Program Form—At the time of publication of this catalog PDF, Degree Program Forms were being filed in paper format. However, filing and tracking of Degree Program Forms will be changing to an electronic system. Updated information about the filing and tracking of these forms will be made available by the Graduate School, 316 Johnston Hall, and on the Graduate School’s Web site at www.grad.umn.edu.

The Graduate School expects master’s students to submit an official degree program by filing a Degree Program Form (available online at www.grad.umn.edu/current_students/forms/masters.html) by the time they have completed 10 credits, but no later than one term prior to completion of the degree; however, individual graduate programs may establish their own deadlines for submission of the degree program to the Graduate School. Graduate School approval of the degree program as submitted on the form is required prior to obtaining the master’s graduation packet, taking the master’s final examination, and/or degree clearance. Students are strongly encouraged to plan ahead to avoid unexpected delays.
The official Degree Program Form lists all coursework, completed and proposed, that the student will complete in fulfillment of degree requirements, including transfer work (see Transfer of Credits for the Master’s Degree). If a foreign language is required for the degree, it must also be specified on the Degree Program Form. The members of a student’s final examining committee (who are the thesis reviewers for Plan A) are appointed by the vice provost and dean of the Graduate School on recommendation of the faculty in the major field at the time the student’s official degree program is approved.

The minimum credit requirements for the program are specified under the Plan A and Plan B sections below. A Degree Program Form must be on file and approved by the Graduate School before reviewers report, examination, or graduation forms can be released to the student.

Changes in Approved Program—Once approved, the degree program must be fulfilled in every detail to meet graduation requirements. Changes to the degree program should be requested by completing a Graduate School Petition Form. The Petition Form is available from the Graduate School, 316 Johnston Hall, or online at www.grad.umn.edu/current_students/forms/masters.html.

Minimum Grade Requirements—The Graduate School requires a minimum GPA of 2.80 (on a 4.00 scale) for courses included on any official master’s Degree Program Form. Courses with grades of A, B, C (including C-), and S may be included in the official degree program, but grades of S are not calculated in the GPA. Students pursuing a Plan A master’s degree are required to register for thesis credits (8777); these registrations are not graded and therefore cannot be used to meet course credit requirements. At least two-thirds of the course credits included on any Degree Program Form must be taken A-F. Individual major fields have the option of setting higher grade requirements and specifying more stringent requirements regarding the application of S-N courses to a degree program; students should be familiar with any special requirements in their major field.

Language Requirement—See Degree Programs and Faculty to determine the language requirement, if any, for a specific major field. The Graduate School monitors the fulfillment of language study when a major field requires a language. Information on how to demonstrate proficiency, and on conditions under which proficiency is recorded on the official transcript, is available from the Graduate School, 316 Johnston Hall, or online at www.grad.umn.edu/current_students/forms/masters.html.

More Information—Students who have questions about the master’s degree after reading this entire section (including the following on Plan A and Plan B) may review online information at www.grad.umn.edu/current_students or contact the Graduate School by e-mail at gsmast@umn.edu.

NOTE: Many commonly used forms are available on the Graduate School Web site at www.grad.umn.edu/forms.

Plan A: Master’s Degree With Thesis

Minimum Credit Requirements—Students must complete an approved program of coursework consisting of a minimum of 14 credits in the major field and a minimum of 6 credits in one or more related fields outside the major. All credits included on the official Degree Program Form must be in graduate-level courses. Courses included on the official Degree Program Form cannot be used to meet both major and outside credit requirements. A 2.80 minimum GPA must be maintained for all courses in the degree program. Students must also register for a minimum of 10 master’s thesis credits (8777); these registrations are not graded and therefore cannot be used to meet course credit requirements.

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. Minors generally are declared when the Degree Program Form is filed; they must be declared prior to the final examination.

For majors in clinical branches, the minor or related fields must be in nonclinical fields that will serve as a basis for the proposed clinical specialization. This fundamental work should be taken early in the program. Familiarity with those phases of the nonclinical disciplines essential to proficiency in the major specialty is required.

Thesis Credits—Students must enroll for a minimum of 10 master’s thesis credits (8777) before receiving the degree. Students cannot include thesis credits in the total program credits when determining maximum transfer allowed (see Transfer of Credits for the Master’s Degree). In addition, they cannot transfer thesis credits from other graduate institutions, double-count thesis credits between two master’s degrees, or use thesis credits to meet the minimum major and related field coursework requirements for the degree.

Master’s Thesis

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 a master’s thesis.

Language of the Thesis—Theses must normally be written in English or in the language of instruction. If a thesis is to be written in a foreign language, including a language of instruction other than English, a letter should be attached to the degree program when it is submitted to the Graduate School. This letter should confirm that the recommended thesis reviewers (including the outside reviewer) are qualified to read, comprehend, and criticize a thesis in the foreign language.
Published Work Included as Part of the Thesis—The thesis may include materials that students have published while University of Minnesota graduate students, provided the research was carried out under the direction of the graduate faculty and approved by the adviser for incorporation into the thesis. Such publication is welcomed as the best demonstration of quality in a student’s research, and the Graduate School encourages the practice. The adviser should notify the Graduate School in writing of the intention to publish part of the thesis material, but the Graduate School’s approval is not required. In cases where the research is to be presented to the examining committee in the form of one or more articles that have been published, or are in a form suitable for publication, the student should contact the Graduate School (gsmast@umn.edu; 316 Johnston Hall) for information on accommodating such a presentation to the required thesis format.

Thesis Reviewers—The thesis is read by the entire examining committee, which is appointed by the vice provost and dean of graduate education on recommendation of the faculty in the major field at the time the student’s official degree program is approved. This examining committee consists of at least three members: two representatives from the major field and one from the minor or a related field. Committee members cannot represent more than one field simultaneously.

To permit faculty to allocate sufficient time to read the thesis and decide whether it is ready for defense, students must notify their adviser and other members of the final oral committee at least two weeks in advance that the thesis will be delivered on a particular date. All members of the examining committee must then have at least two weeks to read the thesis after it has been delivered. These are minimum standards; individual programs may establish other standards for their students.

The entire committee must be unanimous in certifying that the thesis is ready for defense, as indicated by their signatures on the Thesis Reviewers Report Form. Students request this form, part of the graduation packet, online at www.grad.umn.edu/current_students/masters/index.html, or in person at 316 Johnston Hall. The form will be released to the student only if she or he has a Degree Program Form approved by and on file with the Graduate School and has maintained active status (see Registration Requirements under Registration). When the signed Thesis Reviewers Report Form is returned to the Graduate School, 316 Johnston Hall, the student is provided with the Final Examination Report Form.

Final Examinations—Candidates for the master’s degree, Plan A, must pass a final oral examination; a final written examination may also be required at the discretion of the graduate faculty in the major field. If both a written and an oral examination are specified, the written examination must precede the oral examination. The final examinations cover the major field and the minor or related fields, and may include any work fundamental to these fields. The final oral for the master’s degree is conducted as a closed examination, attended by only the student and the examining committee.

Final examinations are coordinated by the chair of the student’s examining committee. All committee members must be present at the examination; the absence of any member results in an invalid examination. The results of the examinations are reported to the Graduate School on the Final Examination Report Form. A majority vote of the committee, all members present and voting, is required to pass the examination. A student who fails the examination may be terminated from the graduate program or may be allowed, on unanimous recommendation of the examining committee, to retake the examination, providing the reexamination is conducted by the original examining committee.

Changes in the Examining Committee—Substitutions on the examining committee may be necessitated by such circumstances as a faculty member’s temporary absence on leave from the University. The adviser or the director of graduate studies must request the Graduate School’s approval of such substitutions well in advance of the examination. Substitutions for an oral examination that are necessitated by emergency situations must also be approved in advance. In such cases, the adviser should consult with the Graduate School staff before the start of the examination.

Preparation and Submission of the Thesis—Two unbound copies of the thesis must be submitted to the Graduate School. The student’s adviser(s) must sign the thesis to confirm that it is complete and satisfactory in all respects and that all revisions required by the final examining committee have been made. Instructions for the preparation of the thesis, including format specifications and adviser’s signature requirements, should be obtained from the Graduate School, 316 Johnston Hall, or online at www.grad.umn.edu/current_students/forms/masters.html.

Plan B: Master’s Degree Without Thesis

Minimum Credit Requirements—Students must complete an approved program of coursework consisting of a minimum of 14 credits in the major field and a minimum of 6 credits in one or more related fields outside the major. The balance of credits to be completed to meet the 30-credit minimum requirement for the degree is chosen by agreement between the adviser and the student, subject to whatever restrictions the graduate faculty in the major field may place on that choice. Courses included in the student’s official degree program cannot be used to meet both major and outside credit requirements. All credits included in the official degree program must be earned in graduate-level courses. A 2.80 minimum GPA must be maintained for all courses included in the program.
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.

**Plan B Project(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 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.

**Final Examinations** — The Graduate School requires a final examination for Plan B candidates; this may be written, oral, or both, at the discretion of the graduate faculty in the major field. The final examinations cover the major field and the minor or related fields, and may include any work fundamental to these fields. Students should make the Plan B project(s) available to the examining committee for its review well in advance of the final examination. If a final oral examination is held, it is conducted as a closed examination, attended by only the student and the examining committee. All committee members must be present at the oral examination; the absence of any member results in an invalid examination.

A committee of at least three examiners is appointed by the vice provost and dean of graduate education upon recommendation of the faculty in the major field at the time the official degree program is approved. This committee consists of two representatives from the major field and one from the minor or a related field. Committee members cannot represent more than one filed simultaneously. The examination is coordinated by the chair of the student’s examining committee. The results of the examination are reported on the Final Examination Report Form, which the student must obtain from the Graduate School, 316 Johnston Hall, or by requesting a graduation packet online at [www.grad.umn.edu/current_students/forms/masters/index.html](http://www.grad.umn.edu/current_students/forms/masters/index.html) before the examination is held. This form is released only if the student has a Degree Program Form approved by and on file with the Graduate School and has maintained active status (see Registration Requirements under Registration). A majority vote of the committee, all members present and voting, is required to pass the examination. A student who fails the examination may be terminated from the program or may be allowed, on unanimous recommendation of the examining committee, a retake of the examination, providing the reexamination is conducted by the original examining committee.

**Changes in the Examining Committee** — Substitutions on the examining committee may be necessitated by such circumstances as a faculty member’s temporary absence on leave from the University. The adviser or the director of graduate studies must request the Graduate School’s approval of such substitutions well in advance of the examination. Substitutions for an oral examination that are necessitated by emergency situations must also be approved in advance. In such cases, the adviser should consult with the Graduate School staff before the start of the examination.

**More Information** — Students who have questions about the master’s degree may review online information at [www.grad.umn.edu/current_students/masters/index.html](http://www.grad.umn.edu/current_students/masters/index.html) or contact the Graduate School by e-mail at gsmast@umn.edu. **Note:** Commonly used forms are available on the Graduate School Web site at [www.grad.umn.edu/current_students/forms/masters/index.html](http://www.grad.umn.edu/current_students/forms/masters/index.html).

### Professional Master’s Degree in Engineering

A number of engineering departments offer programs, with emphasis on design methods, leading to a designated professional master’s degree in engineering. The design emphasis of the program is on applications rather than development of engineering methods or material behavior, and on application of knowledge and methods of the physical and social sciences as well as of engineering. The programs are primarily for students who have already earned a bachelor’s degree in a related engineering field. Students normally are expected to be recent graduates of a bachelor of science in engineering program accredited by the Engineers’ Council for Professional Development (ECPD). Full-time students should be able to complete the program in one calendar year. The professional master’s degree in engineering is considered a terminal degree. Students should also note that only under exceptional circumstances will the Graduate School and the participating programs permit students to transfer from this program to a master of science program.

**Fields in Which the Program is Offered** — Refer to the appropriate engineering department sections under Degree Programs and Faculty for information about the fields in which the professional master of engineering program is offered.

Regular Graduate School application procedures should be followed. Applicants should designate the master of engineering as their degree objective, to distinguish it from the master of science degree also available in the engineering fields.

**Two Options for the Professional Master’s Degree in Engineering** — The Graduate School offers the professional master’s degree in engineering with two options depending on the major field: a design project option and a coursework only option.

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**Financial Aid**


**GSMAST**

[www.gsmast.umn.edu](http://www.gsmast.umn.edu)

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**Graduate School**

[www.grad.umn.edu](http://www.grad.umn.edu)

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**University of Minnesota 2009-10 Graduate School Catalog**
Design Project Option
This option requires 14 credits in the major field, a minimum of 6 credits in one or more related fields outside the major, and a design project measured as a minimum of 10 (8777) credits. Students who wish to complete a designated minor must complete 6 or more credits in a single field. Courses included on the official Degree Program Form cannot be used to meet both major and outside credit requirements. The design project emphasizes problem solving based on engineering design criteria extant in industry. Performance of professional caliber able to withstand the scrutiny and critique of both senior industry design engineers and University engineering faculty is expected.

Preparation and Submission of the Design Project—Two unbound copies of the design project must be submitted to the Graduate School. The student’s adviser(s) must sign the project to confirm that it is complete and satisfactory in all respects and that all revisions required by the final examining committee have been made. Instructions for the preparation of the design project, including format specifications and adviser’s signature requirements, should be obtained from the Graduate School, 316 Johnston Hall, or online at www.grad.umn.edu/current_students/forms/masters.html.

Coursework Only Option
This option requires a minimum of 30 semester credits distributed to include 14 credits in the major field, a minimum of 6 credits in one or more related fields outside the major, and the remaining credits to be determined by the student and adviser subject to whatever guidelines the graduate faculty in the major field may place on such elective choices. Students who wish to complete a designated minor must complete 6 or more semester credits in a single field. Courses included on the official degree program cannot be used to meet both major and outside credit requirements. No projects or papers specific to this track are required. For information regarding degree completion requirements, which includes the submission of a Final Examination Report Form for both the design project and coursework only options, the student may contact the Graduate School by e-mail at gsmast@umn.edu.

Master of Fine Arts
Admission to master of fine arts programs is limited to students with the bachelor's degree or its equivalent from an accredited university or college and who demonstrate exceptional promise as creative artists in one or more of the subfields in their major area. For a list of the subfields and for specific program requirements, see Art, Creative Writing, Design, and Theatre Arts under Degree Programs and Faculty.

Specialist Certificate in Education
The Graduate School offers two-year specialist certificates in several education fields (see Educational Policy and Administration, Educational Psychology—Counseling/Personnel, Educational Psychology—School Psychological Services, and Educational Psychology—Special Education under Degree Programs and Faculty for descriptions). The specialist certificate requires a minimum of 60 credits.

Transfer of Credits—With approval of the adviser, director of graduate studies in the major, and the Graduate School, transfer of up to 50 percent of the degree program coursework from any combination of the following is permitted.
1. Graduate-level coursework completed at other accredited graduate institutions;
2. University of Minnesota coursework meeting specific registration criteria (see “Registering for Graduate Credit,” www.onestop.umn.edu/non-degree/registration/graduate/index.html for registration instructions);
3. Graduate-level coursework completed through other University of Minnesota units (e.g., College of Education, Law School) in pursuit of graduate-level degrees;
4. Adult special, summer session, and College of Continuing Education coursework at the University of Minnesota completed before spring semester 2001. Any registrations in these categories completed during spring semester 2001 or after will not be accepted toward any Graduate School degree requirement.

Individual graduate programs have the option of specifying a lower percentage of coursework allowed for transfer.

Work to be transferred must be graduate level (post-baccalaureate) and have been taught by faculty authorized to teach graduate courses. It is the student’s responsibility to provide appropriate course documentation (e.g., course syllabi, faculty status information) supporting proposed transfer credits to the program.

In the case of a transfer from a non-U.S. institution, credits must have been earned in a program judged by the Graduate School to be comparable to a graduate degree program in a graduate school of a regionally accredited institution in the United States. In transferring coursework from either U.S. or non-U.S. institutions, if conditions are placed on a student’s admission to exclude certain coursework from transfer to a Graduate School degree program, that excluded coursework may not be transferred—regardless of the level of the coursework or the status of the school or college from which it was earned.

Credits are transferred by including the courses in the proposed degree program. Credits not accepted as part of a student’s degree program cannot be transferred.
Courses taken before the awarding of a baccalaureate degree cannot be transferred.

**Degree Requirements**—Students pursuing the specialist certificate ordinarily complete the requirements for the master’s degree with a major in the field of the specialty as the first year of the program. All first-year students must meet regular admission, candidacy, and examination requirements for the master of arts degree and should specify as their degree objective the master’s degree on the application. A decision regarding continuation beyond the master’s degree in a specialist program depends on an evaluation of performance in meeting the master’s requirements.

**Time Limit for Earning the Specialist Certificate**—The specialist certificate can be completed in two years but must be completed and awarded within 12 years. The 12-year period begins with the earliest coursework included on the program form, including any transfer work. Graduate credits earned before the 12-year span are evaluated by the faculty in the area of specialization and may be recommended to the Graduate School for acceptance. Students who expect to exceed the 12-year limit may petition the Graduate School for an extension of time; contact the Graduate School, 316 Johnston or see [www.grad.umn.edu/current_students](http://www.grad.umn.edu/current_students) for more information.

**Final Examinations**—The Graduate School requires a final examination for specialist certificate candidates; this may be written, oral, or both, at the discretion of the graduate faculty in the major field. A committee of at least three examiners is appointed by the vice provost and dean of graduate education upon recommendation of the faculty in the major field at the time the official degree program is approved. This committee is comprised of three members from the student’s major field.

The examination is coordinated by the chair of the student’s examining committee. The results of the examination are reported on the Final Examination Report Form which the student must obtain before the examination is held from the Graduate School, 316 Johnston, or by requesting a graduation packet online at [www.grad.umn.edu/current_students/specialist/index.html](http://www.grad.umn.edu/current_students/specialist/index.html). The Final Examination Report Form will be released only if the student has a Degree Program Form approved by and on file with the Graduate School and has maintained active status (see Registration Requirements under Registration). A majority vote of the committee, all members present and voting, is required to pass the examination. A student who fails the examination may be terminated from the graduate program or may be allowed, on unanimous recommendation of the examining committee, one retake of the examination providing the reexamination is conducted by the original committee.

Except as noted in this section, the requirements and procedures for completing the specialist certificate are comparable to those described under Plan B: Master’s Degree Without Thesis.

**More Information**—Students who have questions about the specialist certificate after reading this entire section may review online information at [www.grad.umn.edu/current_students/forms/masters.html](http://www.grad.umn.edu/current_students/forms/masters.html).

### Doctor of Philosophy Degree

The doctor of philosophy degree (Ph.D.) is awarded chiefly in recognition of high attainment and ability in a special subject field as demonstrated by passing the required examinations covering both a candidate’s general and special subject fields, and by preparing and successfully defending a dissertation based on original research that makes a significant contribution to knowledge in the student’s field.

**Registration Requirement for the Doctoral Degree**—Doctoral students are generally required to register for major field and minor or supporting program coursework. Students should consult their graduate program to determine whether coursework completed while pursuing a University of Minnesota master’s degree may be used to meet their doctoral coursework requirement.

Doctoral students are required to enroll for a minimum of 24 thesis credits (8888) while writing the doctoral dissertation. Students may not register for thesis credits until the semester after they have passed their preliminary oral examination.

**Doctoral Pre-Thesis Credits (8666)**—These credits are available for doctoral students who have not yet passed their preliminary oral examination but need to be registered in the Graduate School to meet requirements of agencies or departments outside the Graduate School (e.g., loan agencies). Doctoral pre-thesis credits are not graded. **Note:** Registration for doctoral pre-thesis credits cannot be used to meet any Graduate School degree requirements other than to maintain active status (refer to Registration Requirements).

**Transfer of Credits for the Doctoral Degree**—Students may request from the Graduate School the transfer of the following types of course credits by including the courses in the proposed degree program. In all cases, official transcripts of the graded work must be attached to the Degree Program Form, unless they have already been included in the student’s Graduate School file. Transfer of graduate credit is not allowed for courses taken before the awarding of a baccalaureate degree.

**From other graduate institutions**—Graduate credits earned at other accredited graduate institutions may be applied to doctoral degrees if the coursework is graduate level and was taught by faculty authorized to teach graduate courses. The number of credits
accepted for transfer is determined by the graduate program faculty.

From other University of Minnesota graduate-level degrees—Graduate credits earned while admitted to pursue University of Minnesota graduate-level degrees (offered by a unit other than the Graduate School) may be applied to doctoral degrees. The number of graduate credits accepted for transfer is determined by the graduate program faculty.

In the case of a transfer from a non-U.S. institution, credits to be transferred must have been earned in a program judged by the Graduate School to be comparable to a graduate degree program of a regionally accredited institution in the United States.

In the case of a student’s transfer from either a U.S. or non-U.S. institution, if conditions are placed on a student’s admission to exclude certain coursework from transfer to a Graduate School degree program, that excluded coursework may not be transferred—regardless of the level of the coursework or the status of the school or college from which it was earned.

From other registration categories—A maximum of 12 semester credits of completed graduate-level coursework, in any combination of the specific registration categories listed below, may be considered for transfer.

Registrations for graduate credit by non-admitted students—Students may be able to register for graduate credit when not admitted to the Graduate School. Non-admitted students interested in taking graduate-level courses must work with the respective departments (generally the director of graduate studies or his/her designee) to gain admission to non-degree status. The registration procedure outlined in the current Class Schedule, “Registering for Graduate Credit,” must be followed for courses to be considered for transfer by the Graduate School. See http://onestop.umn.edu/non-degree/registration/graduate

Adult special, summer session, and College of Continuing Education (CCE) registrations prior to spring semester 2001—The Graduate School will accept only adult special, summer session, and CCE coursework taken at the University of Minnesota before spring semester 2001. Any registration in these categories taken during spring semester 2001 or later will not be accepted towards any Graduate School degree requirements.

Time Limit for Earning the Doctoral Degree—

All requirements for the doctoral degree must be completed and the degree awarded within five calendar years after passing the preliminary oral examination (see Preliminary Written and Oral Examinations).

Students who are unable to complete the degree within the five-year limit may petition the Graduate School for an extension of up to one additional year. Extensions beyond one year are considered only in the most extraordinary circumstances. To ensure timely consideration, petitions should be filed no later than early in the term in which the time limit expires.

If the petition is approved, the student is notified of the expectations for progress and completion of the degree. If the petition is denied, the student is terminated from doctoral candidacy and from the graduate program.

Students who have been terminated under such circumstances may apply for readmission to the Graduate School; readmission under these circumstances is not assured, however. The faculty in the major field and the Graduate School set any readmission conditions on the student’s resumption of work toward the degree, such as registering for additional coursework, retaking written examinations, filing a revised thesis proposal, completing the degree within a specified time period, or other appropriate terms.

For more information about the doctoral degree time limit and petitioning procedure, visit www.grad.umn.edu/current_students/forms/doctoral.html.

Official Program for the Degree—At the time of publication of this catalog PDF, Degree Program Forms were being filed in paper format. However, filing and tracking of Degree Program Forms will be changing to an electronic system. Updated information about the filing and tracking of these forms will be made available by the Graduate School, 316 Johnston Hall, and on the Graduate School’s Web site at www.grad.umn.edu.

The Graduate School expects doctoral students to file an official program for the degree during their second year of study using the Degree Program Form; however, individual graduate programs may establish their own deadlines for submission of the degree program to the Graduate School. Graduate School approval of the Degree Program Form is required well in advance of scheduling of the preliminary oral examination. Students are strongly encouraged to plan ahead to avoid unexpected delays.

The Degree Program Form should list all coursework, completed and proposed, that will be offered in fulfillment of degree requirements in the major field and in the minor field or supporting program, including any transfer work (see Transfer of Credits for the Doctoral Degree). If the student’s major field requires proficiency in one or more foreign languages, these should be specified as well. The members of a student’s preliminary oral examining committee are appointed by the vice provost and dean of graduate education on recommendation of the faculty in the major field at the time the student’s official degree program is approved.

A Degree Program Form approved by the Graduate School must be on file before the student is permitted to schedule the preliminary oral examination.

Changes in Approved Program—Once approved, the student’s degree program must be fulfilled in every detail to meet graduation requirements and before the final oral examination can be scheduled.
Program changes should be requested by completing a Graduate School Petition Form. The form is available from the Graduate School or online at www.grad.umn.edu/current_students/forms/doctoral.html.

**Minimum Grade Requirements**—The Graduate School does not define a minimum GPA for courses included on an official doctoral Degree Program Form, although individual programs are free to do so as part of their effort to monitor their students’ academic achievement and degree progress. Courses with grades of A, B, C (including C-), and S may be included in the official degree program, but grades of S are not calculated in the GPA. Students pursuing a doctoral degree must register for doctoral thesis credits (8888); these registrations are not graded and therefore cannot be used to meet course credit requirements. At least two-thirds of the total number of course credits included in any degree program must be taken A-F. Individual major fields have the option of specifying more stringent requirements concerning the application of S-N courses to a degree program.

**Major Field Credits**—The Graduate School does not specify a minimum number of credits in the major field for the doctoral degree. 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. Courses included in the official degree program cannot be used to meet both major and outside credit requirements.

**Minor Field or Supporting Program Work**—For the doctoral degree, a minimum of 12 credits must be completed in the minor field or supporting program. With a traditional minor, this work is in a single field related to the major; the minor field must be declared before the student passes the preliminary oral examination. If the student chooses a supporting program, it must be composed of a coherent pattern of courses outside the major, possibly embracing several disciplines. Both the minor and supporting program options may require students to take written preliminary examinations in the fields included, but students electing the supporting program option are not expected to have competency in each of the fields comparable to that of a person with a traditional minor.

For majors in clinical branches, the minor field or supporting program must be in nonclinical fields that will serve as a basis for the proposed clinical specialization. This fundamental work should be concentrated early in the program. Familiarity with those phases of the nonclinical disciplines essential to proficiency in the major specialty is required.

**Language Requirement**—See Degree Programs and Faculty to determine the language requirement, if any, for a specific major field. The Graduate School monitors the fulfillment of language study when a major field requires a language. Information on how to demonstrate proficiency, and on conditions under which proficiency is recorded on the official transcript, is available from the Graduate School, 316 Johnston Hall, or online at www.grad.umn.edu/current_students/forms/doctoral.html.

**Doctoral Candidacy**—Doctoral candidacy is established when a student passes the preliminary oral examination (including a “pass with reservations”).

**More Information**—Students who have questions about the doctoral degree, including information on examinations and the dissertation, may review online information at www.grad.umn.edu/current_students/doctoral/index.html or contact the Graduate School by e-mail at gsdoc@umn.edu.

**Note:** Commonly used forms are available on the Graduate School Web site at www.grad.umn.edu/current_students/forms/doctoral.html.

**Preliminary Written and Oral Examinations**

**Preliminary Written Examination**—All doctoral students are required to pass a written examination in the major field. This examination covers all work completed in the major field and may include any work fundamental to this field. The results of the examination are reported on the Preliminary Written Examination Report Form, signed by the student’s adviser and the director of graduate studies in the major field. The Preliminary Written Examination Report Form is available online at www.grad.umn.edu/current_students/forms/doctoral.html. It is the student’s responsibility to ensure that this form is received by the Graduate School, 316 Johnston Hall, before scheduling the preliminary oral examination.

**Preliminary Oral Examination**—Students take the preliminary oral examination after completing a substantial part of the coursework and passing the preliminary written examination, but before writing the dissertation.

**Preliminary Oral Examining Committee**—The examination is administered by the committee appointed by the vice provost and dean of graduate education on recommendation of the faculty in the major field at the time the student’s official doctoral degree program is approved. The examining committee includes a minimum of four members: three (including the student’s adviser) from the major field and one from the minor field or supporting program. Committee members cannot represent more than one field simultaneously.

All assigned members must be present at the preliminary oral examination; the absence of any member results in an invalid examination.

**Changes in the Preliminary Oral Examining Committee**—Substitutions on the examining committee may be necessitated by such circumstances as a faculty member’s temporary absence or leave from the University. The adviser or the director of graduate studies must request the Graduate School’s approval of such substitutions well in advance of the examination. Substitutions necessitated by emergency situations must also be approved in advance. In such
cases, the adviser should consult with the Graduate School staff before the start of the examination.

**Scheduling the Preliminary Oral Examination**

It is the responsibility of the student to schedule the preliminary oral with the examiners and with the Graduate School, 316 Johnston Hall, at least one week in advance. In certain health science fields, however, the faculty requires 30 days’ notice of the date of the preliminary oral. The Preliminary Oral Examination Scheduling Form is available online at [www.grad.umn.edu/current_students/forms/doctoral.html](http://www.grad.umn.edu/current_students/forms/doctoral.html).

Preliminary oral examinations should not be scheduled during the summer unless the members of the assigned committee can be assembled without substitution.

Before the oral examination can be scheduled, a degree program (and form) approved by the Graduate School must be on file, along with a Written Examination Report Form indicating that the student has passed the preliminary written examination. The Graduate School must also confirm that the student has maintained active status (see Registration Requirements under Registration).

If these documents are on file and the student has active status, the Graduate School issues the Preliminary Oral Examination Report Form and instructions for conducting the preliminary oral examination to the chair of the examining committee.

A copy of the student’s Degree Program Form is also sent to the chair of the examining committee; this may be useful to the committee in reviewing the student’s preparation and in confirming the completion of degree requirements, including coursework and any language requirements. The preliminary oral examination may be authorized in spite of deficiencies in these requirements, unless more stringent standards have been established by the major field. All requirements must be completed before the final oral examination may be scheduled.

**Preliminary Oral Examination Content and Outcome**

All doctoral students are required to pass a preliminary oral examination in the major field. The preliminary oral examination covers the major field, the minor field or supporting program, and any work fundamental to these areas, including possible plans for dissertation research. Unlike the doctoral final oral examination, the preliminary oral examination is conducted as a closed examination, attended by only the student and the examining committee.

Immediately before the preliminary oral examination, the committee chair stipulates the objectives of the examination and, in consultation with other members of the examining committee, determines how the examination is to be conducted. Immediately after the examination, the candidate is excused from the room and a written secret ballot is taken before discussing the examination. Following the discussion, a second and final vote is taken, and the participants sign (in the appropriate place on) the report form, which is to be returned to the Graduate School, 316 Johnston Hall, no later than the first workday after the examination.

The outcome of the examination, with all committee members present and voting, is recorded in one of three ways: pass, pass with reservations, or fail. The voting proportions necessary for these decisions are as follows: if the committee consists of four members, a favorable verdict for passing consists of either a unanimous vote or a vote of 3–1; if the committee consists of five members, a unanimous vote or a vote of 4–1 is needed; if the committee consists of six members, a unanimous vote or a vote of 5–1 or 4–2 is needed; and if there are seven members, a unanimous vote or a vote of 6–1 or 5–2 is needed. Candidates who do not earn committee votes in these proportions fail the examination. If, to achieve the minimum number of votes to reach a verdict of pass, any vote of pass with reservations is included, then the outcome will be recorded as a pass with reservations. A vote to pass the student with reservations still constitutes a passing vote.

**Pass With Reservations**—If the student passes the examination with reservations, the student is informed immediately, but the committee is permitted one week in which to convey its reservations to the student in writing, informing the student of the steps that must be taken to remove them. A copy of this letter must be sent to the Graduate School and should accompany the signed Oral Examination Report Form. When the student has satisfied the committee’s reservations, a second letter informing the student and the Graduate School that the reservations have been removed and that the student may proceed toward the degree is also required. Both letters should be written by the committee chair. The final oral examination may not be scheduled until the Graduate School has received a copy of the letter indicating that the reservations have been removed.

If the committee members disagree as to whether the reservations have been satisfactorily removed, the committee chair asks for another vote, the results of which are subject to the same voting proportions as the initial vote. If the student is unable to satisfy the committee’s reservations, his or her doctoral candidacy and graduate student status may be terminated.

**Failure of the Preliminary Oral Examination**

Students who fail the examination may be excluded from candidacy for the degree or may be allowed, on unanimous recommendation of the examining committee, to retake the examination, providing the reexamination is conducted by the original preliminary oral examining committee.

In no case may the reexamination take place before 10 weeks have passed. No more than one reexamination is allowed.

**Recess of a Preliminary Oral Examination**—If the preliminary oral examining committee recesses without having determined whether a student has passed the examination, the chair of the committee must send a letter to the vice provost and dean of graduate education explaining the reasons for the recess and noting the date on which the examining
committee will reconvene. If the recess will be longer than one week, the Preliminary Oral Examination Report Form must be returned to the Graduate School, 316 Johnston Hall, and the student must reschedule the examination with the Graduate School one week in advance. A new Preliminary Oral Examination Report Form will be mailed to the chair of the committee one week before the date on which the committee will reconvene. The reconvened committee must be composed of the same members as the original preliminary oral examining committee.

Cancellation of a Preliminary Oral Examination—If the preliminary oral examination cannot be held on the scheduled date, the Graduate School must be notified of the cancellation. The Preliminary Oral Examination Report Form must be returned to the Graduate School in 316 Johnston Hall. The student must reschedule the examination with the Graduate School one week in advance of the rescheduled exam date. A new Preliminary Oral Examination Report Form will be issued.

Ph.D. Dissertation

The dissertation must demonstrate the student’s originality and ability for independent investigation, and the results of the research must constitute a contribution to knowledge. The dissertation must exhibit the student’s mastery of the literature of the subject and familiarity with the sources. The subject matter must be presented with a satisfactory degree of literary skill.

Thesis Proposal—Students must file a Thesis Proposal Form with the Graduate School no later than the first semester after passing the preliminary oral examination. Individual graduate programs may have internal guidelines for submission of the thesis proposal. Graduate School approval of the Thesis Proposal Form is required prior to obtaining the graduation packet and scheduling the final doctoral oral examination. The form must include the proposed thesis title and a thesis proposal, about 250 words in length, describing the research to be undertaken and the methods to be employed in carrying it out.

The thesis reviewers and other members of the final oral examining committee are appointed by the vice provost and dean of graduate education upon recommendation of the faculty in the major field at the time the student’s thesis proposal is approved.

Changes in the Thesis Title or the Thesis Proposal—Changes in the wording of the thesis title may be made without special approval; however, changes cannot be made after the final thesis copy is submitted to the Graduate School. If substantive changes are made in the nature of the research itself, the student must submit a revised thesis proposal to the Graduate School immediately.

Language of the Dissertation—Dissertations must normally be written in English or in the language of instruction. If a dissertation is to be written in a foreign language, including a language of instruction other than English, a letter should be attached to the Thesis Proposal Form when it is submitted to the Graduate School. This letter should confirm that the recommended thesis reviewers (including the outside reviewer) are qualified to read, comprehend, and criticize a dissertation in the foreign language.

Published Work Included as Part of the Dissertation—The dissertation may include materials that students have published while University of Minnesota graduate students, provided the research was carried out under the direction of the graduate faculty and approved by the adviser for incorporation into the dissertation. Such publication is welcomed as the best demonstration of quality in a student’s research, and the Graduate School encourages the practice. The adviser should notify the Graduate School in writing of the intention to publish part of the dissertation material, but the Graduate School’s approval is not required.

In cases where the dissertation research is to be presented to the examining committee in the form of one or more articles that have been published, or are in a form suitable for publication, the student should contact the Graduate School, 316 Johnston Hall, for information on accommodating such a presentation to the required dissertation format.

Thesis Reviewers—All members of the final oral examining committee read the dissertation, although only those designated as thesis reviewers sign the report form certifying that the dissertation is ready for defense.

The designated thesis reviewers consist of the adviser, representing the major field, and at least two other members of the final oral examining committee, including at least one representative from the major field and one representative from the minor or supporting program. Part of this group of reviewers should come from outside of the graduate program’s thesis advisory committee, if the program uses such a committee. Reviewers cannot represent more than one field simultaneously.

Certification of the dissertation as ready for defense is a necessary step toward the final oral examination, but in no way diminishes the significance of that examination.

The Thesis Reviewers Report Form is obtained by the student from the Graduate School, 316 Johnston, or by requesting a graduation packet online at www.grad.umn.edu/current_students/forms/doctoral.html. The form will be released to the student only if he or she student has a Graduate School-approved Thesis Proposal Form on file and has maintained active status (see Registration Requirements under Registration).

Delivery of the Dissertation to Thesis Reviewers—At the time the candidate submits a draft of the dissertation to the thesis reviewers, copies must also be provided to all other members of the final oral examining committee. The dissertation abstract must be included with the dissertation when it is distributed to the committee.
To permit faculty to allocate sufficient time to read the dissertation and decide whether it is ready for defense, students must notify their adviser and other members of the final oral committee at least two weeks in advance that the dissertation will be delivered on a particular date. All members of the examining committee must then have at least two weeks to read the dissertation after it has been delivered.

When signing the Thesis Reviewers Report Form, reviewers have three options for certifying the dissertation: acceptable for defense as presented; acceptable for defense with minor revisions; or not acceptable for defense as presented/requires major revisions.

Reviewers must be unanimous in certifying that the dissertation is ready for defense, whether as presented or with minor revisions. If this is the case, and all other requirements have been met (see Final Oral Examination below), the Graduate School authorizes the final oral examination. In any instance where revisions are required, the committee must inform the student in writing of the revisions required, and all questions concerning such revisions must be resolved before the final copies of the dissertation are submitted and the degree is conferred. It is the adviser’s responsibility to ensure that revisions required by the reviewers are satisfactorily made (see Preparation and Submission of the Doctoral Dissertation).

Final Oral Examination

All doctoral students are required to successfully defend their theses in a final oral examination and graduate within five calendar years after passing the preliminary oral examination. To be eligible for the final oral examination, a student must have completed all work on the official doctoral degree program, including the language requirement, if any; must have passed both the written and oral preliminary examinations; must have an approved thesis proposal on file with the Graduate School; must have maintained active status; and must have satisfied the thesis credit requirement. In addition, the dissertation must have been certified by the readers as ready for defense.

Scheduling the Final Oral Exam With the Graduate School—The student must schedule the examination as soon as a date is set but no later than one week before the examination with both the committee and the Graduate School (see Clearance for Graduation). In certain health science fields, the faculty requires 30 days’ notice of the date of the final oral exam. The Final Oral Examination Scheduling Form is available online at www.grad.umn.edu/current_students/forms/dissertation.html.

When the examination is scheduled, the student’s Graduate School file is checked to determine if the student can be cleared to take the examination as stipulated above. If so, the report form for the final oral examination will be forwarded to the chair of the examining committee. If difficulties are apparent, Graduate School staff will contact the student immediately.

A minimum of 10 weeks must intervene between the preliminary oral and the final oral examinations. The final oral should not be scheduled during the summer unless the committee members can be assembled without substitution.

Final Oral Examining Committee—The committee must consist minimally of four members: three (including the student’s adviser) from the major field and one from the minor field or supporting program. At least one committee member from the minor field or supporting program should represent a graduate program (and budgetary unit, if possible) other than that of the student’s major. Committee members cannot represent more than one field simultaneously.

Although the student’s adviser serves as a member of the final oral examining committee, another member of the committee is designated as the chair and functions in this capacity at the final oral examination. The chair must be a senior member or affiliate senior member of the graduate faculty and may be from either the major field or the minor field or supporting program. The chair and other members of the final oral examining committee are appointed by the vice provost and dean of graduate education upon recommendation of the faculty in the major field at the time the student’s thesis proposal is approved.

All committee members must be present at the examination; the absence of any member results in an invalid examination.

Changes in the Final Oral Examining Committee—Substitutions on the examining committee may be necessitated by such circumstances as a faculty member’s temporary absence on leave from the University. The adviser or the director of graduate studies must request the Graduate School’s approval of such substitutions well in advance of the examination. Substitutions necessitated by emergency situations must also be approved in advance. In such cases, the committee chair should consult with Graduate School staff before the start of the examination.

Format of the Final Oral Examination—The final oral examination consists of a seminar in which the candidate presents the dissertation to the final oral examination committee and the invited scholarly community. The seminar may take place only after the dissertation has been judged ready for defense. The examination is limited to the candidate’s dissertation subject and relevant areas. It will not exceed three hours. A closed meeting between the candidate and the appointed examining committee immediately follows the dissertation presentation. Immediately after the examination, the candidate is excused from the room and a written, secret ballot is taken before discussing the examination. Following the discussion, a second and final vote is taken.
Reporting the Results of the Final Oral Examination—To be recommended for the award of the doctoral degree, candidates must receive a vote with no more than one dissenting member of the total examining committee. If the student has clearly passed or clearly failed the examination and all members have signed the Final Examination Report Form, the report form must be returned to the Graduate School no later than the first workday following the examination.

The adviser should be responsible for ensuring the inclusion of appropriate modifications and required revisions, if any, in the final dissertation. The Final Oral Examination Report Form should not be signed and submitted to the Graduate School until all revisions have been made. If the form will be held for more than one week, a letter or e-mail must be sent to the Graduate School stating that the form is being held pending required revisions.

Once the final report form has been returned to the Graduate School indicating that the student has either passed or failed the final oral examination, a hold is placed on the student’s records to prevent further registration in the Graduate School. If the adviser indicates that the student needs additional time to make minor revisions to the dissertation before it is submitted to the Graduate School, the student is permitted to register for one additional semester. Once the dissertation has been submitted, no further registration in the Graduate School is permitted unless the student has been admitted to professional development status or to another major field.

Recess of a Final Oral Examination—On rare occasions, the examining committee may conclude that the final oral examination should be recessed, to be reconvened at a later date. Guidelines for such circumstances are sent to the chair of each examining committee along with the Final Oral Examination Report Form.

The Graduate School need not be notified until after the fact of informal recesses of up to a week. In the case of a longer recess, the committee must inform the student in writing of the reasons for recessing the examination, including any deficiencies noted in the student’s dissertation or defense, and must indicate when they expect to reconvene and résumé the examination. A copy of this letter must be sent to the Graduate School, along with the unsigned Final Examination Report Form. When the student and the committee are ready to reconvene the examination, it should be scheduled in the normal way with the Graduate School. A new examination report form will be mailed to the chair of the committee one week before the date on which the committee will reconvene. The reconvened committee must be composed of the same members as the original final oral examining committee.

Preparation and Submission of the Doctoral Dissertation

The most current information on preparing and submitting the doctoral dissertation can be found at, www.grad.umn.edu/current_students/degree_completion/doctoral/ElectronicDissertationSubmission.html. The student’s adviser(s) must sign the signature page to confirm that it is complete and satisfactory in all respects and that all revisions required by the final examining committee have been made. Instructions for the preparation and submission of the dissertation, including format specifications and adviser’s signature requirements, can be obtained from the Graduate School, 316 Johnston Hall, or online at www.grad.umn.edu/current_students/forms/gst16.pdf.

Pursuit of a Second Ph.D. Degree

Students are not permitted to earn two Ph.D. degrees at the same time in two fields using the same program of study and dissertation. Although students are generally discouraged from doing so, special circumstances may warrant taking a second Ph.D. degree at a later date, but only when a completely separate program and dissertation are involved.

Doctor of Education

The University of Minnesota awards the doctor of education (Ed.D.), its highest professional degree in educational policy and administration and work and human resource education, in recognition of satisfactory academic preparation and demonstrated competence for professional activity in those fields. Standards and procedures for admission, and expectations for scholastic performance, are comparable to those for the Ph.D. A major part of the program must be conducted in full-time residence, including at least one continuous academic year at advanced stages of the program. Rules and procedures governing examinations, candidacy, time limits, appointment of committees, and the dissertation for the Ph.D. apply in general to the Ed.D.

For requirements, see Doctor of Philosophy Degree, or contact the Graduate School by e-mail at gsd@umn.edu. NOTE: Some commonly used forms are available on the Graduate School Web site at www.grad.umn.edu/current_students/forms/doctoral.html.

Doctor of Musical Arts

The program for the professional doctor of musical arts (D.M.A.) degree has a performance-teaching orientation. Standards and procedures for admission, and expectations for scholastic performance, are comparable to those for the Ph.D. Emphases offered, and details concerning major and minor requirements for the D.M.A., are included in the Music section under Degree Programs and Faculty. Rules and
The University offers the opportunity for study toward the professional doctor of physical therapy (D.P.T.) degree. This degree prepares graduates for physical therapy practice. The degree requires three years of year-round graduate study, including academic coursework, research activity, and clinical internships. Doctoral thesis credits do not apply and a dissertation is not required. D.P.T. graduates are eligible to apply for state registration or licensure according to the given state’s law. The program is accredited by the Commission on Physical Therapy Education (CAPTE).

Doctor of Audiology

The doctor of audiology degree (Au.D.) prepares clinical practitioners in the field of audiology with a primary interest in the disorders of hearing and balance, their diagnoses, and treatment. Program requirements include coursework, laboratory experiences, and clinical practicums and externships. Doctoral thesis credits do not apply and a dissertation is not required. Au.D. graduates qualify for clinical certification in audiology from the American Speech-Language-Hearing Association (ASHA), the primary professional organization for the field of speech, language, and hearing sciences. Graduates are also eligible for licensure in audiology from the Minnesota Department of Health and other states. For admission standards and program requirements, see Audiology under Degree Programs and Faculty.

Joint Degrees

The University offers the opportunity for study toward degrees in the following areas: M.D./Ph.D. program; M.D. and master of science (M.S.) in biomedical engineering; M.D. and master of health informatics (M.H.I.); master of social work (M.S.W.) and master of public policy (M.P.P.); M.S.W. and master of public health (M.P.H.); M.P.P. and M.S. in health services research, policy, and administration; J.D. and master of arts (M.A.) in mass communication; J.D. and M.P.P.; M.P.P. and Ph.D. in political science; M.P.P. and master of business administration (M.B.A.); M.S. in nursing and M.P.H.; doctor of veterinary medicine (D.V.M.) and M.S./Ph.D. in veterinary medicine; M.S.W. and master of urban and regional planning (M.U.R.P.); M.U.R.P. and master of landscape architecture (M.L.A.); M.U.R.P. and M.S. in civil engineering; J.D. and M.U.R.P.; master of science in industrial and systems engineering (M.S.I.Sy.E.) and M.S. in civil engineering; doctor of dental surgery (D.D.S.) and Ph.D. program; and a joint J.D./M.S./Ph.D. program in law, health, and life sciences. For more information, students should contact the individual program. See Degree Programs and Faculty for contact information.

Clearance for Graduation

Degrees are awarded on the last business day of each month. To qualify for graduation for a particular month, a student must submit the Application for Degree Form on or before the first business day of that month and must complete the examination and all other requirements (including necessary forms and fees) by the last business day of that month.

Commencement Ceremony

Two Graduate School commencement ceremonies are held each year—in late spring and in late fall. Graduates are encouraged, but not required, to attend. Commencement information, including deadlines and forms, can be found online at www.grad.umn.edu/current_students/degree_completion/index.html. To make sure their names appear in the program distributed at the commencement ceremony, students must submit the Commencement Attendance Form by the deadline specified. Degree completion procedures can be found online at www.grad.umn.edu/current_students/degree_completion/index.html.

All-University

(Twin Cities and Duluth Campuses)

Research Degrees (Ph.D., M.S.)

Majors Degrees Offered
Integrated Biosciences.............................................. M.S., Ph.D.
Toxicology............................................................. M.S., Ph.D.
Water Resources Science........................................ M.S., Ph.D.

All-University

(Twin Cities and Rochester Campuses)

Research Degrees (Ph.D., M.S.)

Majors Degrees Offered
Biomedical Informatics and Computational Biology................................. M.S., Ph.D.
Majors and Degrees

Twin Cities Campus

Research Degrees (Ph.D., M.A., M.S.)

<table>
<thead>
<tr>
<th>Majors</th>
<th>Degrees Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Engineering and Mechanics</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>American Studies</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Animal Sciences</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Anthropology</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Applied Economics</td>
<td>M.S., Ph.D.</td>
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<td>Applied Plant Sciences</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>Art History</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Asian Literature, Cultures, and Media</td>
<td>M.A., Ph.D.</td>
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<td>Astrophysics</td>
<td>M.A., Ph.D.</td>
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<td>Biochemistry, Molecular Biology, and Biophysics</td>
<td>M.S., Ph.D.</td>
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<td>Biomedical Engineering</td>
<td>M.S., Ph.D.</td>
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<td>Biophysical Sciences and Medical Physics</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>Bioproducts and Biosystems Science</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>Biotechnology and Management</td>
<td>M.S.B.B.S.E.M., Ph.D.</td>
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<td>Biostatistics</td>
<td>M.S., Ph.D.</td>
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<td>Business Administration</td>
<td>Ph.D.</td>
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<td>Cellular and Integrative Physiology</td>
<td>M.S., Ph.D.</td>
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<td>Chemical Engineering</td>
<td>M.S., Ph.D.</td>
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<td>Chemical Physics</td>
<td>M.S., Ph.D.</td>
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<td>Chemistry</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>Child Psychology</td>
<td>M.A., Ph.D.</td>
</tr>
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<td>Civil Engineering</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>Classical and Near Eastern Studies</td>
<td>M.A., Ph.D.</td>
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<td>Cognitive Science</td>
<td>Ph.D.</td>
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<td>Communication Studies</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Comparative and Molecular Biosciences</td>
<td>M.S., Ph.D.</td>
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<td>Comparative Literature</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Comparative Studies in Discourse and Society</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Computer Science</td>
<td>M.S., Ph.D.</td>
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<td>Conservation Biology</td>
<td>M.S., Ph.D.</td>
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<td>Control Science and Dynamical Systems</td>
<td>Ph.D.</td>
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<td>Design</td>
<td>M.A., M.S., Ph.D.</td>
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<td>Ecology, Evolution, and Behavior</td>
<td>M.A., Ph.D.</td>
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<td>Economics</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Education, Curriculum, and Instruction</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Educational Policy and Administration</td>
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</tr>
<tr>
<td>Educational Psychology</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>M.S.E.E., Ph.D.</td>
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<tr>
<td>English</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Entomology</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>Environmental Health</td>
<td>M.S., Ph.D.</td>
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<td>Epidemiology</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>Family Social Science</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Feminist Studies</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Food Science</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>French</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Geography</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Geology</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Geophysics</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Germanic Studies</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Health Informatics</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Health Services Research, Policy, and Administration</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Hispanic and Luso-Brazilian Literatures and Linguistics</td>
<td>Ph.D.</td>
</tr>
<tr>
<td>History</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>History of Science, Technology, and Medicine</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Human Resources and Industrial Relations</td>
<td>Ph.D.</td>
</tr>
<tr>
<td>Industrial and Systems Engineering</td>
<td>M.S.I.Sy.E., Ph.D.</td>
</tr>
<tr>
<td>Kinesiology</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Linguistics</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Mass Communication</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Materials Science and Engineering</td>
<td>M.S., M.E., Ph.D.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>M.S., M.E., Ph.D.</td>
</tr>
<tr>
<td>Medicinal Chemistry</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Microbiology, Immunology, and Cancer Biology</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Molecular, Cellular, Developmental Biology and Genetics</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Music</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Natural History, Science and Engineering</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Nursing</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Nutrition</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Oral Biology</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Otolaryngology</td>
<td>M.S., M.S.Otol., Ph.D.Otol.</td>
</tr>
<tr>
<td>Pharmaceutics</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>Pharmacology</td>
<td>M.S., Ph.D.</td>
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<tr>
<td>Philosophy</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Physics</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Plant Biomedical Sciences</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Plant Pathology</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Political Science</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Psychology</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Rehabilitation Science</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Rhetoric and Scientific and Technical Communication</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Scientific Computation</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Social, Administrative, and Clinical Pharmacy</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Social Work</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Sociology</td>
<td>M.A., Ph.D.</td>
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<tr>
<td>Soil Science</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Speech-Language-Hearing Sciences</td>
<td>Ph.D.</td>
</tr>
<tr>
<td>Statistics</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Theatre Arts</td>
<td>M.A., Ph.D.</td>
</tr>
<tr>
<td>Veterinary Medicine</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Work and Human Resource Education</td>
<td>M.A., Ph.D.</td>
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</table>
### Research Degrees (Master’s Only)

<table>
<thead>
<tr>
<th>Majors</th>
<th>Degrees Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>M.S.</td>
</tr>
<tr>
<td>Bioethics</td>
<td>M.A.</td>
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<tr>
<td>Clinical Laboratory Science</td>
<td>M.S.</td>
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<tr>
<td>Clinical Research</td>
<td>M.S.</td>
</tr>
<tr>
<td>Geological Engineering</td>
<td>M.S.</td>
</tr>
<tr>
<td>Hispanic and Lusophone Literatures, Cultures, and Linguistics</td>
<td>M.A.</td>
</tr>
<tr>
<td>Landscape Architecture</td>
<td>M.S.</td>
</tr>
<tr>
<td>Microbial Engineering</td>
<td>M.S.</td>
</tr>
<tr>
<td>Sport Management</td>
<td>M.A.</td>
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<tr>
<td>Stem Cell Biology</td>
<td>M.S.</td>
</tr>
</tbody>
</table>

### Professional Degrees

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Accountancy</td>
<td>M.Acc.</td>
</tr>
<tr>
<td>Aerospace Engineering</td>
<td>M.Aero.E.</td>
</tr>
<tr>
<td>Architecture</td>
<td>M.Arch.</td>
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<tr>
<td>Art</td>
<td>M.F.A.</td>
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<tr>
<td>Audiology</td>
<td>Au.D.</td>
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<tr>
<td>Biological Science</td>
<td>M.B.S.</td>
</tr>
<tr>
<td>Business Taxation</td>
<td>M.B.T.</td>
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<tr>
<td>Chemical Engineering</td>
<td>M.Ch.E.</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>M.C.E.</td>
</tr>
<tr>
<td>Computer Science</td>
<td>M.C.S.</td>
</tr>
<tr>
<td>Creative Writing</td>
<td>M.F.A.</td>
</tr>
<tr>
<td>Dentistry</td>
<td>M.S.</td>
</tr>
<tr>
<td>Design</td>
<td>M.F.A.</td>
</tr>
<tr>
<td>Educational Policy and Administration</td>
<td>Ed.D.</td>
</tr>
<tr>
<td>English as a Second Language</td>
<td>M.A.</td>
</tr>
<tr>
<td>Experimental Surgery</td>
<td>M.S.Exp.Surg.</td>
</tr>
<tr>
<td>Financial Mathematics</td>
<td>M.F.M.</td>
</tr>
<tr>
<td>Geographic Information Science</td>
<td>M.G.I.S.</td>
</tr>
<tr>
<td>Geological Engineering</td>
<td>M.Geo.E.</td>
</tr>
<tr>
<td>Geology</td>
<td>M.S.</td>
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<tr>
<td>Health Informatics</td>
<td>M.H.I.</td>
</tr>
<tr>
<td>Health Journalism and Communication</td>
<td>M.A.</td>
</tr>
<tr>
<td>Human Resources and Industrial Relations</td>
<td>M.A.</td>
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<tr>
<td>Infrastructure Systems Engineering</td>
<td>M.S.I.S.E.</td>
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<tr>
<td>Landscape Architecture</td>
<td>M.L.A.</td>
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<tr>
<td>Liberal Studies</td>
<td>M.L.S.</td>
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<tr>
<td>Management of Technology</td>
<td>M.S.MOT.</td>
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<tr>
<td>Materials Science and Engineering</td>
<td>M.Mat.S.E.</td>
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<tr>
<td>Molecular, Cellular, Developmental</td>
<td>M.S.</td>
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<tr>
<td>Music</td>
<td>M.M., D.M.A.</td>
</tr>
<tr>
<td>Occupational Therapy</td>
<td>M.S.</td>
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<tr>
<td>Physical Therapy</td>
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<td>Public Affairs</td>
<td>M.P.A.</td>
</tr>
<tr>
<td>Public Policy</td>
<td>M.R.P.</td>
</tr>
<tr>
<td>Science, Technology, and Environmental Policy</td>
<td>M.S.</td>
</tr>
<tr>
<td>Scientific and Technical Communication</td>
<td>M.S.</td>
</tr>
<tr>
<td>Security Technologies</td>
<td>M.S.S.T.</td>
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<tr>
<td>Social Work</td>
<td>M.S.W.</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>M.S.S.E.</td>
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<tr>
<td>Speech-Language-Hearing Sciences</td>
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<tr>
<td>Strategic Communication</td>
<td>M.A.</td>
</tr>
<tr>
<td>Theatre Arts</td>
<td>M.F.A.</td>
</tr>
<tr>
<td>Urban and Regional Planning</td>
<td>M.U.R.P.</td>
</tr>
<tr>
<td>Work and Human Resource Education</td>
<td>Ed.D.</td>
</tr>
</tbody>
</table>

### Certificate of Specialist in Education

- Counseling and Student Personnel Psychology
- Educational Policy and Administration
- School Psychology
- Special Education
- Special Education Administration

### Minor Only

- Bioinformatics
- Complementary Therapies and Healing Practices
- Development Studies and Social Change
- Education Sciences
- Family Policy
- Gerontology
- Human Factors/Ergonomics
- Human Genetics
- Human Rights
- International Education
- Interpersonal Relationships Research
- Italian Studies
- Law
- Literacy and Rhetorical Studies
- Medieval Studies
- Microbial Ecology
- Museum Studies
- Nanoparticle Science and Engineering
- Political Psychology
- Population Studies
- Prevention Science
- Program Evaluation
- Public Art
- Public Health
- Quaternary Paleoecology
- Religious Studies
- Risk Analysis for Introduced Species and Genotypes
- Social and Philosphic Studies of Education
- Studies in Africa and the African Diaspora
- Studies of Science and Technology
- Sustainable Agriculture Systems

### Postbaccalaureate Certificates

- Applied Developmental Psychology
- Complementary Therapies and Healing Practices
- Early Childhood Policy
- French Studies
- Housing Studies
- Nonprofit Management
- Policy Issues on Work and Pay
- Stream Restoration Science and Engineering
- Technical Communication
- Transportation Studies

### Post-Master’s Certificate

- Nursing
### Duluth Campus

#### Research Degrees (Master’s Only)

<table>
<thead>
<tr>
<th>Majors</th>
<th>Degrees Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied and Computational Mathematics</td>
<td>M.S.</td>
</tr>
<tr>
<td>Chemistry</td>
<td>M.S.</td>
</tr>
<tr>
<td>Computer Science</td>
<td>M.S.</td>
</tr>
<tr>
<td>Criminology</td>
<td>M.A.</td>
</tr>
<tr>
<td>Electrical and Computer Engineering</td>
<td>M.S.E.C.E.</td>
</tr>
<tr>
<td>Engineering Management</td>
<td>M.S.E.M.</td>
</tr>
<tr>
<td>English</td>
<td>M.A.</td>
</tr>
<tr>
<td>Geological Sciences</td>
<td>M.S.</td>
</tr>
<tr>
<td>Physics</td>
<td>M.S.</td>
</tr>
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#### Professional Degrees

<table>
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</tr>
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<td>M.F.A.</td>
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<tr>
<td>Business Administration</td>
<td>M.B.A.</td>
</tr>
<tr>
<td>Communication Sciences and Disorders</td>
<td>M.A.</td>
</tr>
<tr>
<td>Education--Teaching and Learning</td>
<td>Ed.D.</td>
</tr>
<tr>
<td>Engineering Management</td>
<td>M.S.E.M.</td>
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<td>Teaching and Learning</td>
<td>Ed.D.</td>
</tr>
</tbody>
</table>

#### Minor Only

Linguistics
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Information</td>
<td>34</td>
</tr>
<tr>
<td>Financial Aid</td>
<td>34</td>
</tr>
<tr>
<td>Program Statements</td>
<td>34</td>
</tr>
<tr>
<td>Key to All-University Program Abbreviations</td>
<td>34</td>
</tr>
<tr>
<td>Duluth and Twin Cities Campus Degree Programs</td>
<td>35</td>
</tr>
<tr>
<td>Integrated Biosciences M.S. and Ph.D.</td>
<td>35</td>
</tr>
<tr>
<td>Toxicology M.S. and Ph.D.</td>
<td>36</td>
</tr>
<tr>
<td>Water Resources Science M.S. and Ph.D.</td>
<td>37</td>
</tr>
<tr>
<td>Rochester and Twin Cities Campus Degree Program</td>
<td>39</td>
</tr>
<tr>
<td>Biomedical Informatics and Computational Biology M.S. and Ph.D.</td>
<td>39</td>
</tr>
</tbody>
</table>
All-University Programs and Faculty

General Information
The Graduate School offers several programs jointly between two campuses of the University of Minnesota. All-University master of science and doctor of philosophy programs in integrated biosciences, toxicology, and water resources science are offered jointly between the Twin Cities and Duluth campuses. An All-University masters of science and doctor of philosophy program in biomedical informatics and computation biology is offered jointly between the Twin Cities and Rochester campuses. All programs are under the jurisdiction of the Graduate School dean and have comparable admission, candidacy, and degree requirements. General Graduate School regulations, including those for minimum degree requirements, apply to programs offered on all campuses (see General Information at the beginning of this catalog).

Financial Aid
Information about assistantships, fellowships, and other financial assistance available to graduate students can be found in the General Information section at the beginning of this catalog. Assistantships (teaching and research) are normally granted through the individual departments. Students can obtain information by writing to the director of graduate studies for their particular program. Some residence counseling positions may be available on the Duluth campus. For information, write to the Housing Office, 149 Lake Superior Hall, University of Minnesota Duluth, MN 55812.

Program Statements
Brief descriptions of the various degree programs are listed on the following pages. Course offerings are listed in this catalog, the University of Minnesota Duluth Catalog, and online at www.catalogs.umn.edu/courses.html. General information concerning graduate work on the Duluth campus may be obtained from the Graduate School Office–Duluth, University of Minnesota Duluth, 431 Darland Administration Building, 1049 University Drive, Duluth, MN 55812. Information is also available at www.d.umn.edu/grad.

General information concerning the Rochester campus may be obtained from University of Minnesota Rochester (UMR) Student Services, 111 South Broadway, Rochester, MN 55904 (507-280-2831 or 1-800-947-0117; stuserv@umn.edu). Information is also available at www.r.umn.edu.

Key to All-University Program Abbreviations

Faculty
Graduate faculty are listed at the beginning of each degree program. After the faculty name, the home department will be listed (unless the department is the same as the program name), followed by the graduate faculty status in the program. Professors emeriti are identified by “(emeritus).”

Membership Categories
Senior Member (SM)—Authorization to advise students at all levels, including the doctorate; to serve as a thesis reviewer and as an examiner on student examining committees, including service as chair of doctoral committees; to teach courses for graduate credit; and to participate in governance. In fields that also offer a professional doctorate, some senior member appointments may be restricted to the supervision of students seeking the professional degree.

Affiliate Senior Member (ASM)—Authorization to assume the same responsibilities as senior member, but not to participate in governance. Affiliate Member (AM)—Authorization to assume the same responsibilities as member, but not to participate in governance.

Examiner Status (E)—Authorization to serve as a thesis reviewer and as an examiner on student examining committees at all levels, but not as chair, and to teach courses for graduate credit. Examining status does not include membership on the graduate faculty and does not confer governance privileges.

Tests
The following test abbreviations appear throughout graduate program listings.

TOEFL—Test of English as a Foreign Language
USMLE—United States Medical Licensing Examination

Affiliate Member/Advising (AM2)—Authorization to serve as a thesis reviewer and examining committee member for doctoral students, but not as chair.

Member/Advising (M2)—Authorization to advise students at the master’s level; to serve as a thesis reviewer at the master’s level and as an examiner on student examining committees at the master’s and postbaccalaureate certificate levels; to teach courses for graduate credit; and to participate in governance. At the discretion of the appointing program, may also include authorization to co-advice doctoral students with a senior member or affiliate senior member of the graduate faculty, and to serve as a thesis reviewer and examining committee member for doctoral students, but not as chair.

Member (M)—Authorization to serve as a thesis reviewer at the master’s level and as an examiner on student examining committees at the master’s and postbaccalaureate certificate levels; to teach courses for graduate credit; and to participate in governance. At the discretion of the appointing program, may also include authorization to serve as a thesis reviewer and examining committee member for doctoral students, but not as chair.

Affiliate Member/Advising (AM2)—Authorization to assume the same responsibilities as member/advising, but not to participate in governance.

Examiner Status (E)—Authorization to serve as a thesis reviewer and as an examiner on student examining committees at all levels, but not as chair, and to teach courses for graduate credit. Examining status does not include membership on the graduate faculty and does not confer governance privileges.

Tests
The following test abbreviations appear throughout graduate program listings.

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Duluth and Twin Cities Campus Degree Programs

Integrated Biosciences M.S. and Ph.D.

Contact Information—Integrated Biosciences Graduate Program, University of Minnesota, 162 Medical School Duluth, 1035 University Drive, Duluth, MN 55812 (218-726-6898; fax: 218-726-8152; ibr@d.umn.edu; www.d.umn.edu/ibs).

For latest graduate faculty listings, see www.grad.umn.edu/faculty.rosters/faculty.html.

Professor

Mustafa N. al’Absi, Behavioral Sciences, SM
Matthew T. Andrews, Biology, M2
Gregory J. Beilman, Surgery, Twin Cities, SM
Yosef Cohen, Fisheries, Wildlife, and Conservation Biology, Twin Cities, M2
Timothy P. Craig, Biology, M2
Lester R. Drewes, Biochemistry and Molecular Biology, SM
Barbara A. Elliott, Family Medicine and Community Health, SM
Goran B. Hellekant, Physiology and Pharmacology, M2
Lois J. Heller, Physiology and Pharmacology, M2
Randall E. Hicks, SM
Alan B. Hooper, Biochemistry, Molecular Biology and Biophysics, Twin Cities, M2
John J. Pastor, Biology, SM
Joseph R. Prohaska, Biochemistry and Molecular Biology, SM
Jean F. Regal, Biochemistry and Molecular Biology, SM
George J. Trachte, Pharmacology, M2
Kendall B. Wallace, Biochemistry and Molecular Biology, M2

Adjunct Professor

Janet R. Keough, Biology, AM2
Carl Richards, Biology, M2

Associate Professor

Gerald T. Ankley, Fisheries, Wildlife, and Conservation Biology, Twin Cities, SM
Edgar Arriaga, Chemistry, Twin Cities, SM
Benjamin L. Clarke, Medical Microbiology and Immunology, M2
Haim Einat, Pharmacy, SM
Julie R. Etterson, Plant Biology, SM
Janet L. Fitzakerley, Pharmacology, M2
Jon M. Holy, Anatomy and Cell Biology, SM
Allen Mensinger, Biology, SM
Ayman M. Noreddin, Pharmacy, SM

Adjunct Associate Professor

M. K. Froberg, Pathology and Laboratory Medicine, M2

Assistant Professor

Grant W. Anderson, Pharmacy, SM
Lucia P. Barker, Medical Microbiology and Immunology, M2

Bjoern Bauer, Pharmacy, M2
Steven M. Berry, Chemistry and Biochemistry, SM
Clay J. Carter, SM
Stephanie J. Guildford, Biology, M2
Marshall E. Hampton, Biology, M2
Anne Hinderliter, Chemistry and Biochemistry, M2
Tim L. Kroft, Biology, SM
Venkatram R. Mreddy, Chemistry and Biochemistry, M2
Glenn R. Nordehn, Family Medicine, M2
Teresa Rose-Hellekant Physiology and Pharmacology, M2
Jon N. Rumbley, Chemistry and Biochemistry, SM
Gregory Rutkowski, Chemical Engineering, M2
Patricia M. Scott, Biochemistry and Molecular Biology, M2

Adjunct Assistant Professor

Joseph L. Johnson, Chemistry and Biochemistry, SM

Senior Research Associate

Richard P. Axler, Natural Resources Research Institute, SM
Subhach C. Basak, Natural Resources Research Institute, M2
Donn K. Branstrator, Natural Resources Research Institute, M2
Brian H. Hill, Natural Resources Research Institute, ASM
George E. Host, Natural Resources Research Institute, SM
Thomas R. Hrabik, Natural Resources Research Institute, SM
Lucinda B. Johnson, Natural Resources Research Institute, SM
John R. Kelly, Natural Resources Research Institute, ASM
David R. Mount, Natural Resources Research Institute, ASM
Gerald J. Niemi, Natural Resources Research Institute, SM

Research Associate

Valerie J. Brady, Natural Resources Research Institute, M2
Sigmund J. Degix Jr., Natural Resources Research Institute, AM2
Rodney D. Johnson, Natural Resources Research Institute, AM2
Ron Moen, Natural Resources Research Institute, M2
Euan D. Reavey, Natural Resources Research Institute, M2
Patrick K. Schoff, Natural Resources Research Institute, M2

Along with the program-specific requirements listed below, please read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The all-University integrated biosciences graduate program offers study toward the master of science (M.S.) degree under Plan A (coursework and original thesis) and 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.

M.S. and Ph.D. Prerequisites for Admission—Undergraduate admission standards for the M.S. and Ph.D. graduate program in integrated biosciences include a bachelor’s degree or equivalent from an accredited college or university in the biological or physical sciences or a related field. Background in a wide variety of subdisciplines is appropriate preparation for the Integrated Biosciences Graduate program. Examples include, but are not limited to: biochemistry, botany, cell biology, developmental biology, ecology, evolution, genetics, immunology, limnology, microbiology, molecular biology, neuroscience, physiology, and zoology.

Applicants with a GPA of 3.00 or better and 60th percentile placement in the GRE general test are preferred. Applicants for whom English is not a native language should submit TOEFL, MELAB, or IELTS scores whose standards are those of the U of M Graduate School (www.grad.umn.edu/prospective_students/application_information/TOEFL.html).

No single deficiency automatically disqualifies an application from being considered. Applicants deficient in some requirements may be admitted with the provision that specific courses are completed within the first year of the program. Coursework used to make up deficiencies may not be applied toward fulfillment of the graduate degree.

M.S. and Ph.D. Special Application Requirements—The GRE test is required. Applicants with a GPA of 3.00 or better and 60th percentile placement in the GRE general test are preferred. Applicants for whom English is not a native language should submit TOEFL, MELAB, or IELTS scores whose standards are those of the U of M Graduate School (www.grad.umn.edu/prospective_students/application_information/TOEFL.html).

M.S. and Ph.D. Degree Requirements

The following comprises the core curriculum for all IBS students pursuing either a M.S. or Ph.D. degree: IBS 8011 (Integrated Biological Systems), IBS 8012 (Integrated Evolutionary Processes), IBS 8099 (The Biological Practitioner), STAT 5411 (Analysis of Variance), IBS 8020 (IBS Colloquia—two semesters), and IBS 8030 (IBS Research Club—four semesters).

Language Requirements—None
M.S. Plan A Degree Requirements

Prerequisites for Admission—Additional 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.

Curriculum—Students must complete at least 12 course credits in the major; a minimum of 6 credits of electives in another graduate program or programs (for a minor or related field) or in the IBS emphasis other than that which comprises the major program; and at least 10 thesis credits. Students must designate one of the areas of emphasis in the second semester of their first year.

Language Requirements—None.

Final Exam—Students must present a department seminar and pass a final oral exam.

Ph.D. Degree Requirements

Prerequisites for Admission—Additional 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.

Curriculum—Students must complete at least 14 course credits in the major; a minimum of 6 credits of electives in another graduate program or programs (for a minor or related field) or in the IBS emphasis other than that which comprises the major program; and at least 10 thesis credits. Students must designate one of the areas of emphasis in their second semester.

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—It is anticipated that 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, followed by a closed examination with the student’s examining committee.

Toxicology M.S. and Ph.D.

Contact Information—Toxicology Graduate Program, Medical School Duluth, 162 SMed, 1035 University Drive, Duluth, MN 55812 (218-726-6354; fax: 218-726-8014; toxgrad@d.umn.edu; www.d.umn.edu/medweb/toxicology).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Yusuf J. Abul-Hajj, Medicinal Chemistry, Pharmacognasy, Twin Cities, SM
David R. Brown, Veterinary Biosciences, Twin Cities, SM
Robert M. Carlson, Chemistry and Biochemistry, SM
Lester R. Drewes, Biochemistry and Molecular Biology, SM
Vincent F. Garry Jr., Laboratory Medicine/Pathology, Twin Cities, SM
Patrick E. Hannah, Medicinal Chemistry, Pharmacognasy, Twin Cities, SM

Michael J. Murphy, Veterinary Population Medicine, Twin Cities, SM
Joseph R. Prohaska, Biochemistry and Molecular Biology, SM
Jean F. Regal, Biochemistry and Molecular Biology, SM
W. Thomas Shier, Medicinal Chemistry, Pharmacognasy, Twin Cities, SM
Lawrence P. Wackett, Biotechnology Institute, Twin Cities, SM
Kendall B. Wallace, Biochemistry and Molecular Biology, SM

Adjunct Professor

Anthony Kiopres, Veterinary Population Medicine, Twin Cities, SM

Associate Professor

Gerald T. Ankley, Fisheries, Wildlife, and Conservation Biology, Twin Cities, AM2
Yinduo Ji, Veterinary and Biomedical Sciences, Twin Cities, SM
Ayman M. Noreddin, Pharmacy, SM
Mark S. Rutherford, Veterinary and Biomedical Sciences, Twin Cities, SM
Ashok K. Singh, Veterinary Population Medicine, Twin Cities, SM

Assistant Professor

Robert T. Cormier, Biochemistry and Molecular Biology, SM

Adjunct Assistant Professor

Hillary M. Carpenter, Environmental Health Sciences, Twin Cities, AM2
John W. Nichols, Pharmacology, AM2
Geary W. Olsen, Environmental Health Sciences, Twin Cities, AM2
Robert Roy, Environmental Health Sciences, Twin Cities, AM2

Senior Research Associate

Subhash C. Basak, Natural Resources Research Institute, AM2
Gerald J. Niemi, Natural Resources Research Institute, SM

Along with the program-specific requirements listed below, please read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 cancerogenesis behavioral toxicology and the toxicity of noxious agents to various organ systems (e.g., nervous, heart, liver, kidneys).

Prerequisites for Admission—Applicants must have a bachelor’s degree or its foreign equivalent from a recognized college or university. At least a full year each of biology, organic chemistry, and physics as well as mathematics through calculus are expected.

Special Application Requirements—GRE General Test scores are required; international students must also submit TOEFL scores.

M.S. Degree Requirements

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.

Language Requirements—None.

Final Exam—The final exam is oral.

Ph.D. Degree Requirements

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.

Minor Requirements for Students Majoring in Other Fields—A minor is available at the doctoral level and requires 12 credits—8 credits of core courses and 4 credits of advanced toxicology courses.

Water Resources Science M.S. and Ph.D.

Contact Information—Water Resources Science Graduate Program, 205 RLB, 2205 E. 5th Street, Duluth, MN 55812 (218-726-7435; fax: 218-726-6979; wrs@umn.edu; www.wrs.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

E. Calvin Alexander Jr., Earth Science, Geology and Geophysics, Twin Cities, SM
Dorothy H. Anderson, Forest Resources, Twin Cities, SM
Roger E. Arndt, Civil Engineering, Twin Cities, SM
John M. Baker, Soil, Water, and Climate, Twin Cities, SM
Marvin E. Bauer, Forest Resources, Twin Cities, SM
David D. Biesboer, Plant Biology, Twin Cities, SM
Stephan A. Bortone, Biology, SM
Patrick L. Brezonik, Civil Engineering, Twin Cities, SM
Kenneth N. Brooks, Forest Resources, Twin Cities, SM
Erik T. Brown, Geological Sciences, SM
H. H. Cheng, Soil, Water, and Climate, Twin Cities, SM
Charles J. Clanton, Bioproducts and Biosystems Engineering, Twin Cities, SM
Steve M. Colman, Geological Sciences, SM
James B. Cotner, Ecology, Evolution and Behavior, Twin Cities, SM
Leonard C. Ferrington, Entomology, Twin Cities, SM
Eft Fountoulia, Civil Engineering, Twin Cities, SM
Susan M. Galatowitsch, Horticultural Science, Twin Cities, SM
Philip J. Gersmehl, Geography, Twin Cities, SM
Florence K. Gleason, Plant Biology, Twin Cities, SM
John S. Gulliver, Civil Engineering, Twin Cities, SM
Satish C. Gupta, Soil, Water, and Climate, Twin Cities, SM
Robert E. Hecky, Biology, SM
Randall E. Hicks, Biology, SM
Miki Hondzo, Civil Engineering, Twin Cities, SM
Emi Ito, Earth Science, Geology and Geophysics, Twin Cities, SM
Thomas C. Johnson, Geological Sciences, SM
Nicholas R. Jordan, Agronomy and Plant Genetics, Twin Cities, SM
Mary H. Meyer, Horticulture, Twin Cities, SM
John F. Moncrief, Soil, Water, and Climate, Twin Cities, SM
Howard D. Mooers, Geological Sciences, SM
D. J. Mulca, Soil, Water, and Climate, Twin Cities, SM
Ed Nater, Soil, Water, and Climate, Twin Cities, SM
Raymond M. Newman, Fisheries, Wildlife, and Conservation Biology, Twin Cities, SM
Chris Paola, Earth Science, Geology and Geophysics, Twin Cities, SM
John J. Pastor, Biology, SM
Jim A. Perry, Fisheries, Wildlife, and Conservation Biology, Twin Cities, SM
Hans-Ofel Pfannkuch, Earth Science, Geology and Geophysics, Twin Cities, SM
David G. Pilt, Landscape Architecture, Twin Cities, SM
Alan S. Polasky, Ecology, Evolution and Behavior, Twin Cities, SM
Carl J. Rosen, Soil, Water, and Climate, Twin Cities, SM
Michael J. Sadowsky, Soil, Water, and Climate, Twin Cities, SM
Ingrid E. Schneider, Forest Resources, Twin Cities, SM
Mark W. Seeley, Soil, Water, and Climate, Twin Cities, SM
Peter W. Sorenson, Fisheries, Wildlife, and Conservation Biology, Twin Cities, SM
Fotis Sotiropoulos, Civil Engineering, Twin Cities, SM
Susan G. Stafford, Forest Resources, Twin Cities, SM
Heinz G. Stefan, Civil Engineering, Twin Cities, SM
Robert W. Sterner, Ecology, Evolution, and Behavior, Twin Cities, SM
Deborah L. Swackhammer, Environmental Health Sciences, Twin Cities, SM
Michael Sydor, Physics, SM
Harvey Thorleifson, Earth Science, Geology and Geophysics, Twin Cities, SM
Vaughan R. Voller, Civil Engineering, Twin Cities SM
Bruce N. Wilson, Bioproducts and Biosystems Engineering, Twin Cities, SM

Adjunct Professor

Janet R. Keough, Biology, AM2
Carl Richards, Biology, SM
Carlisle F. Runge, Forest Resources, Twin Cities, SM
Bruce Vondracek, Fisheries, Wildlife, and Conservation Biology, Twin Cities, SM

Associate Professor

William Arnold, Civil Engineering, Twin Cities, SM
Ted W. Arnold, Fisheries, Wildlife, and Conservation Biology, Twin Cities, SM
Randal J. Barnes, Civil Engineering, Twin Cities, SM
Christina Gallup, Geological Sciences, SM
Timothy J. Griffis, Soil, Water, and Climate, Twin Cities, SM
Sarah E. Hobbie, Ecology, Evolution, and Behavior, Twin Cities, SM
Frances R. Homans, Applied Economics, Twin Cities, SM
Raymond N. Hozalski, Civil Engineering, Twin Cities, SM
Katherine Klink, Geography, Twin Cities, SM
Timothy M. LaPara, Civil Engineering, Twin Cities, SM
Kristopher McNeill, Chemistry, Twin Cities, SM
Elizabeth C. Minor, Chemistry and Biochemistry, SM
Laura R. Musacchio, Landscape Architecture, Twin Cities, SM
Kristen C. Nelson, Forest Resources, Twin Cities, SM
John L. Nieber, Bioproducts and Biosystems Engineering, Twin Cities, SM
All-University Degree Programs and Faculty

Paige J. Novak, Civil Engineering, Twin Cities, SM
Gary R. Sands, Bioproducts and Biosystems Engineering, Twin Cities, SM
Matt Simck, Environmental Health Sciences, Twin Cities, SM
Steven P. Sternberg, Chemical Engineering, SM
Jeffrey S. Strock, Soil, Water, and Climate, Twin Cities, M2
John B. Swenson, Geological Sciences, SM
Steven J. Taff, Applied Economics, Twin Cities, SM
Josef P. Werne, Chemistry and Biochemistry, SM
Tongxin Zhu, Geography, M2

Adjunct Associate Professor
David Fulton, Fisheries, Wildlife, and Conservation Biology, Twin Cities, SM
Naomi Zeitouni, Applied Economics, Twin Cities, SM

Assistant Professor
Jay A. Austin, Large Lakes Observatory, M2
Dennis R. Becker, Forest Resources, Twin Cities, M2
Jacques Finlay, Ecology, Evolution, and Behavior, Twin Cities, M2
Jeffrey A. Gralnick, Biotechnology Institute, Twin Cities, SM
Karen B. Gran, Geological Sciences, M2
Stephanie J. Guildford, Biology, SM
Kimberly Hill, Civil Engineering, Twin Cities, SM
Qiujiong Huang, Applied Economics, Twin Cities, M2
Sergei Katsev, Physics, M2
Joe Knight, Forest Resources, Twin Cities, M2
Katsumi Matsumoto, Earth Science, Geology and Geophysics, Twin Cities, M2
Lee Penn, Chemistry, Twin Cities, SM
Fernando Porte-Agel, Civil Engineering, Twin Cities, SM
Anthony C. Runkel, Earth Science, Geology and Geophysics, Twin Cities, AM2
Martin O. Saar, Earth Science, Geology and Geophysics, Twin Cities, M2
Sangwon Suh, Bioproducts and Biosystems Engineering, Twin Cities, SM
Brandt M. Toner, Soil, Water, and Climate, Twin Cities, M2

Adjunct Assistant Professor
James Almendinger, Fisheries, Wildlife, and Conservation Biology, Twin Cities, AM2
Paul D. Capel, Civil Engineering, Twin Cities, AM3
Karlyn Eckman, Forest Resources, Twin Cities, M2
Mark Edlund, Earth Science, Geology and Geophysics, Twin Cities, AM3
Mindy L. Erickson, Bioproducts and Biosystems Engineering, Twin Cities, AM2
Carrie E. Jennings, Geology and Geophysics, Twin Cities, AM2
Joe Magner, Fisheries, Wildlife, and Conservation Biology, Twin Cities, AM2
Tyson Ochsner, Soil, Water, and Climate, Twin Cities, AM3
Pamela Rice, Soil, Water, and Climate, Twin Cities, AM2
Edward B. Swain, Fisheries, Wildlife, and Conservation Biology, Twin Cities, AM2

Senior Research Associate
Richard P. Axler, Natural Resources Research Institute, SM
Paul R. Bloom, Soil, Water, and Climate, Twin Cities, SM
Donn K. Brauntrator, Natural Resources Research Institute, SM
Brian H. Hill, Natural Resources Research Institute, ASM
George E. Host, Natural Resources Research Institute, SM
Thomas R. Hrabik, Natural Resources Research Institute, SM
Lucinda B. Johnson, Natural Resources Research Institute, SM

Research Associate
Valerie J. Brady, Natural Resources Research Institute, M2
Daniel R. Engstrom, Earth Science, Geology and Geophysics, Twin Cities, ASM
Lorin K. Hatch, Fisheries, Wildlife, and Conservation Biology, Twin Cities, AM2
Euan D. Reavis, Natural Resources Research Institute, M2

Senior Fellow
Larry Baker, Water Resources Center, SM

Along with the program-specific requirements listed below, please read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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.

The program involves faculty from the following departments on the Twin Cities campus: Applied Economics; Bioproducts and Biosystems Engineering; Civil Engineering; Ecology, Evolution, and Behavior; Entomology; Environmental and Occupational Health; Fisheries, Wildlife, and Conservation Biology; Forest Resources; Geography; Horticultural Science; Geology and Geophysics; 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, Geography, Geological Sciences, Physics, and Political Science, as well as the Large Lakes Observatory and the Natural Resources Research Institute in Duluth.

Prerequisites for Admission—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. Further preparation may be expected from students wishing to specialize in certain areas of the program. Students who do not have a master’s degree in a related subject are admitted to the M.S. program first, even if their long-term goal is a Ph.D. degree. Availability of funding and willingness of a member of the graduate faculty to serve as an advisor 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 Web site. 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. These letters also may be used in applying for financial aid.

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; only rarely, under extenuating circumstances, will students be considered for admission without GRE scores. Students may be admitted any semester but are strongly encouraged to begin fall semester and to submit their application by January 1 in the year they expect to begin their studies.

Courses—Refer to Water Resources Science (WRS) in the course section of this catalog for courses pertaining to the program. Check the program Web site at http://wrs.umn.edu for additional course information.
Use of 4xxx Courses—Use of 4xxx courses is permitted for degree requirements based on approval by the advisor and the director of graduate studies.

M.S. Degree Requirements

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 supporting courses (at least 6 credits) outside of aquatic science also are required. Training in responsible conduct of research and ethics is also required. Approved core and area of emphasis courses are listed on the program Web site at http://wrs.umn.edu.

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 courses to meet the Graduate School minimum credit requirements.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires 9 credits, including WRS 5101 (3 credits) or in Duluth POL 4201 (4 credits) and two of the other core courses described under M.S. degree requirements.

Ph.D. Degree Requirements

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 minor or supporting program.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Doctoral students must complete 12 credits, including WRS 5101 (3 credits) or in Duluth POL 4201 (4 credits), a core courses described under the M.S. degree requirements, and two electives from one of the areas of emphasis.

Rochester and Twin Cities Campus Degree Program

Biomedical Informatics and Computational Biology M.S. and Ph.D.

Contact Information—Biomedical Informatics and Computational Biology, University of Minnesota Rochester, 300 University Square, 111 South Broadway, Rochester, MN 55904 (507-281-7791; bicbgrad@umn.edu)

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

Professor

Massoud Amin, Electrical and Computer Engineering, SM
Ann Bode, Cellular and Molecular Biology, Hormel Institute, SM
Daniel Boley, Computer Science and Engineering, SM
John Carlis, Computer Science and Engineering, SM
Connie W. Delaney, School of Nursing, SM
Zigang Dong, Cellular and Molecular Biology, Hormel Institute, SM
Lynda Ellis Medicine and Pathology, SM
Jiali Gao, Chemistry, SM
Vipin Kumar, Computer Science and Engineering, SM
Mitchell Luskin, Mathematics, SM
Claudia Neuhauser, University of Minnesota Rochester, SM
Hans Othmer, Mathematics, SM
Wei Pan, School of Public Health, SM
Stuart Speedie, Laboratory Medicine and Pathology, SM
Ahmed Tewfik, Electrical and Computer Engineering
Larry Wackett, Biochemistry, Molecular Biology, and Biophysics, SM

Adjunct Professor

Karla Ballman, Biostatistics, Mayo Clinic, SM
Zeljko Bajzer, Biochemistry, Mayo Clinic, SM
Christopher Chute, Medical Informatics, Mayo Clinic, SM

Stephen Ekker, Biochemistry and Molecular Biology, Mayo Clinic, SM
Peter Li, Biomedical Informatics, Mayo Clinic, SM
Yuan-Ping Pang, Pharmacology, Mayo Clinic, SM

Associate Professor

Yang Da, Animal Science, SM
Fumiaki Katagiri, Plant Biology, SM
Arkady Khodursky, Biochemistry, Molecular Biology, and Biophysics, SM
Cavan Reilly, School of Public Health, SM
Darrin York, Chemistry, SM

Adjunct Associate Professor

Armando Manduca, Biophysics, Mayo Clinic, SM

Assistant Professor

Elizabeth Amin, College of Pharmacy, SM
Rui Kuang, Computer Science and Engineering, SM
Mohamed Mokbel, Computer Science and Engineering, SM
Chad Myers, Computer Science and Engineering, SM
Marc Riedel, Electrical and Computer Engineering, SM
William Schuler, Computer Science and Engineering, SM

Adjunct Assistant Professor

John W Eberhard, IBM, SM
Jean-Pierre Kocher, Biomedical Informatics, Mayo Clinic, SM
George Paulik, IBM, SM
Carlos Sosa, IBM, SM
George Vasmatzis, Laboratory Medicine, Mayo Clinic, SM

Other

Drew Flaada, IBM, M2
Mike Good, IBM, M2
Paul Mattson, IBM, M2

Along with the program-specific requirements listed below, please read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The graduate program in biomedical informatics and computational biology 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 an academic career have the opportunity to participate in development programs that focus on aspects of teaching and learning.

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. We expect incoming graduate students to have taken the following courses at the undergraduate level prior to entering the program: calculus (one year), introductory computer science course and basic programming skills (one semester), chemistry (one year), general biology (one semester). In addition, we expect students to have background in two of the three areas: 1) multivariable calculus, differential equations, linear algebra; 2) algorithms and data structure, discrete mathematics; 3) statistics or biostatistics, probability theory. Students with a stronger training in the life/health sciences may replace one of the three areas by one of the following two areas: 1) biochemistry, genetics, and cell biology; or 2) health sciences (pharmacology, physiology, or related areas). The expected competencies of incoming students may be demonstrated by coursework completed at the undergraduate level or by informal competency examinations. Some deficiencies may be made up during the first year of study through coursework or individualized study.

Special Application Requirements—Three letters of recommendation and scores from the General Test of the GRE are required. Applicants are considered for admission only for the fall semester.

Courses—Refer to Biomedical Informatics and Computational Biology (BICB) in the course section of this catalog for courses pertaining to the program and to the BICB program web site for a list of courses that may be used to fulfill program requirements.

Use of 4xxx Courses—Inclusion of 4xxx courses on degree program forms is subject to adviser and director of graduate studies approval. There is a limit of one 4xxx course.

M.S. Degree Requirements
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 a career that requires a limited research experience or 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. 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. The requirements include 20 course credits for Plan A and 30 course credits for Plan B.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—Programs are arranged on an individual basis. A minimum of 9 credits must be completed in Core Area 1 and one of the Core Areas 2–5.

Ph.D. Degree Requirements
Ph.D. students take preliminary written exams at the end of the second year of study that consists 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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Programs are arranged on an individual basis. A minimum of 12 credits must be completed in Core Area 1 and two of the Core Areas 2–5.
<table>
<thead>
<tr>
<th>Department/Program</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astrophysics</td>
<td>54</td>
</tr>
<tr>
<td>Art</td>
<td>52</td>
</tr>
<tr>
<td>Art History</td>
<td>52</td>
</tr>
<tr>
<td>Asian Literatures, Cultures, and Media</td>
<td>53</td>
</tr>
<tr>
<td>Astronomy</td>
<td>50</td>
</tr>
<tr>
<td>Audiology</td>
<td>55</td>
</tr>
<tr>
<td>Biochemistry, Molecular Biology, and Biophysics</td>
<td>55</td>
</tr>
<tr>
<td>Bioethics</td>
<td>56</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>58</td>
</tr>
<tr>
<td>Biological Science</td>
<td>58</td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>59</td>
</tr>
<tr>
<td>Biophysical Sciences and Medical Physics</td>
<td>60</td>
</tr>
<tr>
<td>Bioproducts and Biosystems Science</td>
<td>61</td>
</tr>
<tr>
<td>Building and Management</td>
<td>61</td>
</tr>
<tr>
<td>Biostatistics</td>
<td>62</td>
</tr>
<tr>
<td>Biosystems and Agricultural Engineering</td>
<td>63</td>
</tr>
<tr>
<td>Business Administration</td>
<td>63</td>
</tr>
<tr>
<td>Business Taxation</td>
<td>65</td>
</tr>
<tr>
<td>Cell and Development Biology</td>
<td>66</td>
</tr>
<tr>
<td>Cell and Integrative Physiology</td>
<td>66</td>
</tr>
<tr>
<td>Chemical Engineering and Materials Science and Engineering</td>
<td>67</td>
</tr>
<tr>
<td>Chemical Physics</td>
<td>68</td>
</tr>
<tr>
<td>Chemistry</td>
<td>69</td>
</tr>
<tr>
<td>Child Psychology</td>
<td>70</td>
</tr>
<tr>
<td>Chinese Studies</td>
<td>71</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>71</td>
</tr>
<tr>
<td>Classical and Near Eastern Studies</td>
<td>72</td>
</tr>
<tr>
<td>Classics</td>
<td>74</td>
</tr>
<tr>
<td>Clinical Laboratory Science</td>
<td>74</td>
</tr>
<tr>
<td>Clinical Research</td>
<td>75</td>
</tr>
<tr>
<td>Cognitive Science</td>
<td>76</td>
</tr>
<tr>
<td>Communication Disorders</td>
<td>77</td>
</tr>
<tr>
<td>Communication Studies</td>
<td>77</td>
</tr>
<tr>
<td>Comparative and Molecular Biosciences</td>
<td>78</td>
</tr>
<tr>
<td>Comparative Literature</td>
<td>79</td>
</tr>
<tr>
<td>Computing Studies in Discourse and Society</td>
<td>80</td>
</tr>
<tr>
<td>Complementary Therapies and Healing Practices</td>
<td>81</td>
</tr>
<tr>
<td>Composition, Literacy, and Rhetorical Studies</td>
<td>82</td>
</tr>
<tr>
<td>Computer Science</td>
<td>82</td>
</tr>
<tr>
<td>Conservation Biology</td>
<td>84</td>
</tr>
<tr>
<td>Control Science and Dynamical Systems</td>
<td>85</td>
</tr>
<tr>
<td>Counseling and Student Personnel</td>
<td>86</td>
</tr>
<tr>
<td>Counseling and Student Personnel</td>
<td>86</td>
</tr>
<tr>
<td>Psychology</td>
<td>86</td>
</tr>
<tr>
<td>Creative Writing</td>
<td>86</td>
</tr>
<tr>
<td>Culture and Teaching</td>
<td>86</td>
</tr>
<tr>
<td>Dentistry</td>
<td>86</td>
</tr>
<tr>
<td>Design</td>
<td>88</td>
</tr>
<tr>
<td>Design, Housing, and Apparel</td>
<td>89</td>
</tr>
<tr>
<td>Development Studies and Social Change</td>
<td>89</td>
</tr>
<tr>
<td>Early Childhood Policy</td>
<td>89</td>
</tr>
<tr>
<td>East Asian Studies</td>
<td>90</td>
</tr>
<tr>
<td>Ecology, Evolution, and Behavior</td>
<td>90</td>
</tr>
<tr>
<td>Economics</td>
<td>91</td>
</tr>
<tr>
<td>Education—Work and Human Resource</td>
<td>92</td>
</tr>
<tr>
<td>Education, Curriculum, and Instruction</td>
<td>92</td>
</tr>
<tr>
<td>Education and Outreach Studies</td>
<td>93</td>
</tr>
<tr>
<td>Educational Policy and Administration</td>
<td>94</td>
</tr>
<tr>
<td>Educational Psychology</td>
<td>95</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>98</td>
</tr>
<tr>
<td>Elementary Education</td>
<td>100</td>
</tr>
<tr>
<td>English</td>
<td>100</td>
</tr>
<tr>
<td>English as a Second Language</td>
<td>101</td>
</tr>
<tr>
<td>Entomology</td>
<td>101</td>
</tr>
<tr>
<td>Environmental Health</td>
<td>102</td>
</tr>
<tr>
<td>Epidemiology</td>
<td>103</td>
</tr>
<tr>
<td>Ergonomics</td>
<td>104</td>
</tr>
<tr>
<td>Experimental Surgery</td>
<td>104</td>
</tr>
<tr>
<td>Family Policy</td>
<td>104</td>
</tr>
<tr>
<td>Family Social Science</td>
<td>105</td>
</tr>
<tr>
<td>Family, Youth, and Community</td>
<td>106</td>
</tr>
<tr>
<td>Feminist Studies</td>
<td>106</td>
</tr>
<tr>
<td>Financial Mathematics</td>
<td>107</td>
</tr>
<tr>
<td>Fisheries</td>
<td>108</td>
</tr>
<tr>
<td>Food Science</td>
<td>108</td>
</tr>
<tr>
<td>Forestry</td>
<td>108</td>
</tr>
<tr>
<td>French</td>
<td>109</td>
</tr>
<tr>
<td>French Studies</td>
<td>109</td>
</tr>
<tr>
<td>Genetics</td>
<td>110</td>
</tr>
<tr>
<td>Geographic Information Science</td>
<td>110</td>
</tr>
<tr>
<td>Geography</td>
<td>111</td>
</tr>
<tr>
<td>Geological Engineering</td>
<td>112</td>
</tr>
<tr>
<td>Geology</td>
<td>113</td>
</tr>
<tr>
<td>Geophysics</td>
<td>114</td>
</tr>
<tr>
<td>Germanic Studies</td>
<td>115</td>
</tr>
<tr>
<td>Gerontology</td>
<td>117</td>
</tr>
<tr>
<td>Greek</td>
<td>117</td>
</tr>
<tr>
<td>Health Informatics</td>
<td>117</td>
</tr>
<tr>
<td>Health Journalism and Communication</td>
<td>118</td>
</tr>
<tr>
<td>Health Services Research, Policy, and Administration</td>
<td>119</td>
</tr>
<tr>
<td>Hispanic and Luso-Brazilian Literature and Linguistics</td>
<td>120</td>
</tr>
<tr>
<td>Hispanic and Lusophone Literatures, Cultures, and Linguistics</td>
<td>121</td>
</tr>
<tr>
<td>Hispanic Linguistics</td>
<td>122</td>
</tr>
<tr>
<td>Hispanic Literatures</td>
<td>122</td>
</tr>
<tr>
<td>History</td>
<td>122</td>
</tr>
<tr>
<td>History of Medicine and Biological Sciences</td>
<td>123</td>
</tr>
<tr>
<td>History of Science and Technology</td>
<td>123</td>
</tr>
<tr>
<td>History of Science, Technology, and Medicine</td>
<td>123</td>
</tr>
<tr>
<td>Housing Studies</td>
<td>124</td>
</tr>
<tr>
<td>Human Factors/Ergonomics</td>
<td>124</td>
</tr>
<tr>
<td>Human Genetics</td>
<td>125</td>
</tr>
<tr>
<td>Human Resources and Industrial Relations</td>
<td>125</td>
</tr>
<tr>
<td>Immunology</td>
<td>127</td>
</tr>
<tr>
<td>Industrial and Systems Engineering</td>
<td>127</td>
</tr>
<tr>
<td>Industrial Relations</td>
<td>127</td>
</tr>
<tr>
<td>Infrastructure Systems Engineering</td>
<td>128</td>
</tr>
<tr>
<td>Integrative Biology and Physiology</td>
<td>128</td>
</tr>
<tr>
<td>Intercultural Education</td>
<td>128</td>
</tr>
<tr>
<td>Interpersonal Relationships Research</td>
<td>129</td>
</tr>
<tr>
<td>Italian Studies</td>
<td>129</td>
</tr>
<tr>
<td>Japanese</td>
<td>129</td>
</tr>
<tr>
<td>Journalism</td>
<td>129</td>
</tr>
<tr>
<td>Kinesiology</td>
<td>130</td>
</tr>
<tr>
<td>Landscape Architecture</td>
<td>131</td>
</tr>
<tr>
<td>Latin</td>
<td>132</td>
</tr>
<tr>
<td>Law</td>
<td>132</td>
</tr>
<tr>
<td>Learning Technologies</td>
<td>133</td>
</tr>
<tr>
<td>Liberal Studies</td>
<td>133</td>
</tr>
<tr>
<td>Linguistics</td>
<td>133</td>
</tr>
<tr>
<td>Literacy and Rhetorical Studies</td>
<td>134</td>
</tr>
<tr>
<td>Literacy Education</td>
<td>135</td>
</tr>
<tr>
<td>Luso-Brazilian Literature</td>
<td>135</td>
</tr>
<tr>
<td>Lusophone Literatures and Cultures</td>
<td>135</td>
</tr>
<tr>
<td>Management of Technology</td>
<td>135</td>
</tr>
<tr>
<td>Manufacturing and Systems Engineering</td>
<td>136</td>
</tr>
<tr>
<td>Mass Communication</td>
<td>136</td>
</tr>
<tr>
<td>Materials Science and Engineering</td>
<td>137</td>
</tr>
<tr>
<td>Mathematics</td>
<td>137</td>
</tr>
<tr>
<td>Mathematics Education</td>
<td>138</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>138</td>
</tr>
<tr>
<td>Mechanics</td>
<td>139</td>
</tr>
<tr>
<td>Medical Physics</td>
<td>139</td>
</tr>
<tr>
<td>Medicinal Chemistry</td>
<td>139</td>
</tr>
<tr>
<td>Medieval Studies</td>
<td>139</td>
</tr>
<tr>
<td>Microbial Engineering</td>
<td>140</td>
</tr>
<tr>
<td>Microbiology, Immunology, and Cancer Biology</td>
<td>141</td>
</tr>
<tr>
<td>Molecular, Cellular, Developmental Biology and Genetics</td>
<td>143</td>
</tr>
<tr>
<td>Molecular Veterinary Biosciences</td>
<td>144</td>
</tr>
<tr>
<td>Museum Studies</td>
<td>144</td>
</tr>
<tr>
<td>Music</td>
<td>144</td>
</tr>
<tr>
<td>Nanoparticle Science and Engineering</td>
<td>146</td>
</tr>
<tr>
<td>Natural Resources Science and Management</td>
<td>147</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>147</td>
</tr>
<tr>
<td>Nonprofit Management</td>
<td>149</td>
</tr>
<tr>
<td>Nursing</td>
<td>150</td>
</tr>
<tr>
<td>Nutrition</td>
<td>151</td>
</tr>
<tr>
<td>Occupational Therapy</td>
<td>153</td>
</tr>
<tr>
<td>Oral Biology</td>
<td>153</td>
</tr>
<tr>
<td>Otalary and Scientific and Technical Communication</td>
<td>155</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>156</td>
</tr>
<tr>
<td>Philosophy</td>
<td>157</td>
</tr>
<tr>
<td>Physical Therapy</td>
<td>158</td>
</tr>
<tr>
<td>Physics</td>
<td>159</td>
</tr>
<tr>
<td>Plant Sciences</td>
<td>160</td>
</tr>
<tr>
<td>Plant Pathology</td>
<td>161</td>
</tr>
<tr>
<td>Policy Issues on Work and Pay</td>
<td>162</td>
</tr>
<tr>
<td>Political Psychology</td>
<td>163</td>
</tr>
<tr>
<td>Political Science</td>
<td>163</td>
</tr>
<tr>
<td>Population Studies</td>
<td>164</td>
</tr>
<tr>
<td>Prevention Science</td>
<td>165</td>
</tr>
<tr>
<td>Program Evaluation</td>
<td>165</td>
</tr>
<tr>
<td>Psychology</td>
<td>166</td>
</tr>
<tr>
<td>Public Affairs</td>
<td>167</td>
</tr>
<tr>
<td>Public Health</td>
<td>168</td>
</tr>
<tr>
<td>Public Policy</td>
<td>168</td>
</tr>
<tr>
<td>Quaternary Paleoeocogy</td>
<td>169</td>
</tr>
<tr>
<td>Rehabilitation Science</td>
<td>170</td>
</tr>
<tr>
<td>Religious Studies</td>
<td>170</td>
</tr>
<tr>
<td>Rhetoric and Scientific and Technical Communication</td>
<td>171</td>
</tr>
<tr>
<td>Risk Analysis for Introduced Species and Genotypes</td>
<td>172</td>
</tr>
<tr>
<td>Science, Technology, and Environmental Policy</td>
<td>173</td>
</tr>
<tr>
<td>Scientific and Technical Communication</td>
<td>173</td>
</tr>
<tr>
<td>Scientific Computation</td>
<td>174</td>
</tr>
<tr>
<td>Security Technologies</td>
<td>175</td>
</tr>
<tr>
<td>Social, Administrative, and Clinical Pharmacy</td>
<td>176</td>
</tr>
<tr>
<td>Social and Philosophical Studies of Education</td>
<td>177</td>
</tr>
<tr>
<td>Social Work</td>
<td>178</td>
</tr>
<tr>
<td>Sociology</td>
<td>179</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>180</td>
</tr>
<tr>
<td>Soil Science</td>
<td>180</td>
</tr>
<tr>
<td>Speech-Language-Hearing Sciences</td>
<td>181</td>
</tr>
<tr>
<td>Sport Management</td>
<td>182</td>
</tr>
<tr>
<td>Statistics</td>
<td>183</td>
</tr>
<tr>
<td>Stem Cell Biology</td>
<td>184</td>
</tr>
<tr>
<td>Strategic Communication</td>
<td>185</td>
</tr>
<tr>
<td>Stream Restoration Science and Engineering</td>
<td>185</td>
</tr>
<tr>
<td>Studies in Africa and the African Diaspora</td>
<td>186</td>
</tr>
<tr>
<td>Studies of Science and Technology</td>
<td>187</td>
</tr>
<tr>
<td>Surgery</td>
<td>187</td>
</tr>
<tr>
<td>Sustainable Agriculture Systems</td>
<td>188</td>
</tr>
<tr>
<td>Technical Communication</td>
<td>188</td>
</tr>
<tr>
<td>Theatre Arts</td>
<td>189</td>
</tr>
<tr>
<td>Transportation Studies</td>
<td>190</td>
</tr>
<tr>
<td>Urban and Regional Planning</td>
<td>191</td>
</tr>
<tr>
<td>Veterinary Medicine</td>
<td>192</td>
</tr>
<tr>
<td>Work and Human Resource Education</td>
<td>193</td>
</tr>
<tr>
<td>Related Fields</td>
<td>195</td>
</tr>
<tr>
<td>Family Practice and Community Health</td>
<td>195</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>195</td>
</tr>
<tr>
<td>Pediatric Sciences</td>
<td>195</td>
</tr>
<tr>
<td>Psychiatry (ASPY and CAPY)</td>
<td>195</td>
</tr>
<tr>
<td>Russian</td>
<td>195</td>
</tr>
<tr>
<td>Therapeutic Radiology</td>
<td>195</td>
</tr>
</tbody>
</table>
Key to Abbreviations

Faculty
Graduate faculty are listed at the beginning of each degree program. After the faculty name, the home department will be listed (unless the department is the same as the program name), followed by the graduate faculty status in the program. Professors emeriti are identified by “(emeritus).”

Membership Categories
Senior Member (SM)—Authorization to advise students at all levels, including the doctorate; to serve as a thesis reviewer and as an examiner on student examining committees, including service as chair of doctoral committees; to teach courses for graduate credit; and to participate in governance. In fields that also offer a professional doctorate, some senior member appointments may be restricted to the supervision of students seeking the professional degree.

Affiliate Senior Member (ASM)—Authorization to assume the same responsibilities as senior member, but not to participate in governance. In fields that also offer a professional doctorate, some affiliate senior member appointments may be restricted to the supervision of students seeking the professional degree.

Member/Advising (M2)—Authorization to advise students at the master’s level; to serve as a thesis reviewer at the master’s level and as an examiner on student examining committees at the master’s and postbaccalaureate certificate levels; to teach courses for graduate credit; and to participate in governance. At the discretion of the appointing program, may also include authorization to co-advise doctoral students with a senior member or affiliate senior member of the graduate faculty, and to serve as a thesis reviewer and examining committee member for doctoral students, but not as chair.

Affiliate Member/Advising (AM2)—Authorization to assume the same responsibilities as member/advising, but not to participate in governance.

Member (M)—Authorization to serve as a thesis reviewer at the master’s level and as an examiner on student examining committees at the master’s and postbaccalaureate certificate levels; to teach courses for graduate credit; and to participate in governance. At the discretion of the appointing program, may also include authorization to serve as a thesis reviewer and examining committee member for doctoral students, but not as chair.

Affiliate Member (AM)—Authorization to assume the same responsibilities as member, but not to participate in governance.

Examiner Status (E)—Authorization to serve as an examiner on student examining committees at all levels, but not as chair, and to teach courses for graduate credit. Examining status does not include membership on the graduate faculty and does not confer governance privileges.

Tests
The following test abbreviations appear throughout graduate program listings.

ECFMG—Educational Commission for Foreign Medical Graduates
GMAT—Graduate Management Admission Test
GRE—Graduate Record Examination
IELTS—International English Language Testing System
MELAB—Michigan English Language Assessment Battery
SPEAK—Michigan English Language Assessment Battery
TOEFL—Test of English as a Foreign Language
TSE—Test of Spoken English
USMLE—United States Medical Licensing Examination

For more information about these individual tests, see page 7 in the General Information section.

Accountancy

Contact Information—Master of Accountancy, Department of Accounting, University of Minnesota, 3-108 Carlson School of Management, Minneapolis, MN 55455 (612-624-7511; fax 612-626-7795; macct@umn.edu; www.carlsonschool.umn.edu/macc).

For latest faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Frank B. Gigler, M2
Edward L. Joyce, M2
Chandra S. Kanodia, M2
Judy A. Rayburn, M2

Associate Professor
Gordon L. Duke, M2
Pervin K. Shroff, M2

Senior Lecturer
Frank J. Beil, M
Gary W. Carter, AM2
Paul G. Gutterman, M2

Larry Kallio, M2
Mark Sellner
Terry L. Tranter, AM2

Along with the program specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The M.Acc. program offers students a one-year program with a broad selection of graduate courses in accounting, taxation, finance, operations management, and information systems, including master of business taxation (MBT) and MBA courses. 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 endless pursuit of the mission for the M.Acc. program. For the students, such efforts ensure relevant, practical, and challenging courses that enhance their professional development.

Prerequisites for Admission—Application to the M.Acc. program requires a baccalaureate degree with at least an additional 24 semester hours (36 quarter hours) in accounting, including coverage of, but not necessarily separate courses in, financial accounting, intermediate accounting, auditing, taxation, and management accounting; and completed at least an additional 24 semester hours (36 quarter hours) in business-related or accounting courses.
Professor—Chair, Graduate and Mechanics Aerospace Engineering and Mechanics

Special Application Requirements—Results of the GMAT are required. Three letters of recommendation from persons qualified to evaluate most recent work and potential for graduate study. Either in-person or telephone interview with program director depending on applicant’s location. Applicants are considered for admission for fall and spring semesters.

Courses—Refer to Accounting (ACCT), Tax (MBT), Operation Management Science (OMS), Finance (FINA), and Information and Decision Sciences (IDSC) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

M.Acc. Degree Requirements

The M.Acc. program requires 30 credits, including 12 required credits with courses in advanced accounting topics; 8–10 credits in accounting and tax electives; 8–10 credits in general business electives such as operation accounting and tax electives; 8–10 credits in advanced accounting topics; 8–10 credits in accounting and tax electives, and decision sciences, and master of business administration.

Language Requirements—None.

Aerospace Engineering and Mechanics

Contact Information—Chair, Graduate Admissions Committee, 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; aem-dgs@aem.umn.edu; www.aem.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Roger E. A. Arndt, Civil Engineering, SM
Gary J. Balas, SM
Graham V. Candler, SM
Roger L. Fosdick, SM
William L. Garrard, SM
Richard D. James, SM
Daniel D. Joseph, SM
Perry H. Leo, SM
Ellen K. Longmire, SM
Mitchell B. Luskin, Mathematics, SM
Ivan Marusic, ASM
Thomas W. Shield, SM
Ellad Tadmor, SM
Yiyuan J. Zhao, SM

Associate Professor

Demoz Gebre-Egziabher, SM
Yohannes Kebetta, AM
Krishnan Mahesh, SM

Assistant Professor

Ryan S. Elliott, SM
Bernard Mettler, SM
Thomas D. Schwartzentruber, SM
Jian Sheng, SM

Teaching Specialist

Jeffrey Hammar, M2

Other

Francesco Borrelli, AM
Dale F. Enns, ASM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The department offers an M.S. and a Ph.D. degree in aerospace engineering and mechanics, as well as a professionally-oriented master of aerospace engineering. 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.

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.

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.

Courses—Refer to Aerospace Engineering and Mechanics (AEM) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Programs can contain no more than two courses at 4xxx.

M.Aero.E. Coursework Only and Design Project Degree Requirements

The M.Aero.E. program emphasizes the application of fluid mechanics, aerospace systems, and solid mechanics in aerospace engineering. The program must include at least 12 credits of 5xxx or 8xxx courses. In addition to the minimum credit requirement, the student must demonstrate an understanding of aerodynamics and aerospace vehicle mechanics, either from previous study or from additional coursework in the graduate program.

Language Requirements—None.

Final Exam—The final exam is oral.

M.S. Degree Requirements

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. Plan A requires 30 graduate credits, a minimum of 20 course credits and 10 thesis credits. No seminar credits can be used to satisfy the 20-course credit requirement. Plan B requires 30 credits including the 3-credit Plan B project course. Of the remaining 27 credits, a minimum of 24 credits of coursework is required and no seminar credits can be used to satisfy this requirement. If seminar credits are used to meet the 30 credit requirement, they must be in one-credit modules.

For both Plan A and Plan B, the program must include at least one sequence of 8xxx courses in aerospace engineering and no more than 8 credits of 4xxx courses. Also, the student must demonstrate an understanding of aerodynamics and aerospace vehicle mechanics, either from prior study or from additional coursework beyond the 30-credit minimum.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—At least one sequence of two 8xxx courses in aerospace engineering is required.

Ph.D. Degree Requirements

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 thesis research. The program must contain a minimum of 42 credits of approved courses and four semesters of colloquium attendance. Of the 42 credits, a minimum of 36 credits must be in approved coursework, not including seminar credits. If seminar credits are used to meet the 42 credit minimum requirement they must be in one-credit modules. The program also must include at least four 8xxx courses in aerospace engineering (at least four 8xxx courses in mechanics for the Ph.D. in mechanics) and can contain no more than two 4xxx courses. 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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—At least 12 credits in aerospace engineering are required, including at least one sequence of two 8xxx courses.

Agriculture and Applied Economics
See Applied Economics.

Agricultural Engineering
See Bioproducts and Biosystems Science Engineering and Management.

American Studies
Contact Information—Department of American Studies, University of Minnesota, 104 Scott Hall, 72 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4190; www.cla.umn.edu/american).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Richard D. Leppert, Cultural Studies and Comparative Literature, SM
Elaine Tyler May, SM
Steven Ruggles, History, SM
Eric Sheppard, Geography, SM

Professor
Patricia C. Albers, American Indian Studies, SM
Ronald R. Aminzade, Sociology, SM

W. John Archer, Cultural Studies and Comparative Literature, SM
David O. Born, Preventive Sciences, SM
Timothy Andres Brennan, Cultural Studies and Comparative Literature, ASM
Rose M. Brewer, African American and African Studies, SM
Maria Damon, English, SM
Gail Dubrow, Graduate School, ASM
Penny A. Edgeall, Sociology, SM
Donna R. Gabaccia, History, SM
Philip J. Gersmehl, Geography, SM
Edward M. Griffin, English, SM
Karen N. Hoyle, Library Collection, and Preservation (Children’s Literature Research Collections), AM
Mary Jo Kane, Kinesiology, SM
Sally J. Kenney, Public Affairs, SM
Sally G. Kohlsstedt, Geology and Geophysics (Science/Technology, History of) SM
Regina Kunzel, Gender Women, and Sexuality Studies, ASM
Alex J. Lubet, Music, SM
Judith A. Martin, Geography-Urban and Regional Planning, SM
Lary L. May, SM
Ellen Messer-Davidow, English, SM
Richa Nagar, Gender, Women, and Sexuality Studies, ASM
John D. Nichols, American Indian Studies, SM
David W. Noble, SM
Riv-Ellen Prell, SM
Paula Rabinowitz, English, SM
Harvey B. Sarles, Cultural Studies and Comparative Literature, SM
David E. Wilkins, American Indian Studies, SM
John S. Wright, English, African American and African Studies, SM
Jack D. Zipes, German, Scandinavian, and Dutch, SM

Associate Professor
Lisa Albrecht, School of Social Work, SM
Bruce P. Braun, Geography, SM
Robert “Robin” Brown, Cultural Studies and Comparative Literature, SM
Brenda J. Child, SM
Susan Craddock, Gender, Women, and Sexuality Studies, ASM
Jeffrey R. Crump, Design, Housing, and Regional Planning, SM
Jigna Desai, Gender, Women, and Sexuality Studies, ASM
Roderick Ferguson, SM
Kirsten Fischer, History, SM
Vinay Gidwani, Geography, ASM
Ronald Greene, Communication Studies, ASM
Douglas Hartmann, Sociology, SM
Tricia Keaton, SM
Erika Lee, History, SM
Josephine D. Lee, English, SM
Richard Lee, Psychology, SM
Patrick McNamara, History, ASM
Louis G. Mendoza, Chicano Studies, SM
Roger P. Miller, Geography, SM
Kevin P. Murphy, History, ASM
Lisa A. Norling, History, SM
Jean M. O’Brien-Kehoe, History, SM
Joanna O’Connell, Spanish and Portuguese, SM
Laurie Ouellette, Communication Studies, ASM
Daniel J. Philippou, English, SM
Jennifer L. Pierce, ASM
Gilbert B. Rodman, Communication Studies, ASM
Jani Scandura, English, ASM
Robert B. Silberman, Art History, SM
Katherine M. Solomonson, Architecture, SM
Brian G. Southwell, Journalism and Mass Communications, ASM
Dara Ziporah Strollovitch, Political Science, ASM
Eden Torres, Gender, Women, and Sexuality Studies, SM
David Treuer, English, ASM
Barbara Welke, History, SM
Michelle M. Wright, English, ASM
Jacquelyn N. Zita, Gender, Women, and Sexuality Studies, SM

Assistant Professor
M. Bianet Castellanos, M2
David A. Y. O. Chang, History, M2
Tracey Ann Deutsch, History, M2
Kale Fajardo, M2
Karen Zouwen Ho, M2
Keith A. Mayes, African American and African Studies, M2
Hoon Song, Anthropology, M2
Omise’eke Natasha Tinsley, English, M2
David Valentine, Anthropology, M2

Senior Fellow
Harry C. Boyte, Public Affairs, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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.

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, but no students are admitted for a terminal M.A. Students entering the Ph.D. program must hold at least a bachelor’s degree level 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 Web site http://americanstudies.umn.edu/grad/admission .html for application procedures and additional information.
Courses—Refer to American Studies (AMST) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—One 4xxx course in American studies, English, history, American Indian studies, or another appropriate program, may be included as one of the seminars to meet course requirements in American studies. As long as a member of the graduate faculty teaches the course, students can register for additional 4xxx courses by contracting to take the course as an AMST 8xxx directed study with appropriate additional coursework.

M.A. Degree Requirements
The master’s degree is not designed as a terminal degree and students are not admitted to it. 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 Web at http://americanstudies.umn.edu/pdf/GradHandbook3-08.pdf.

Language Requirements—Reading knowledge of one foreign language is required.

Minor Requirements for Students Majoring in Other Fields—For a master’s minor, students are expected to choose courses consistent with or complementary to their major. Students should complete either AMST 8201 or 8202 and two more courses in American studies.

Ph.D. Degree Requirements
Ph.D. students must complete the following course distributions: four core American studies courses (Introductory Seminars AMST 8201 and AMST 8202; AMST 8401—Praecinctum in American Studies; and Dissertation Seminar, AMST 8801); 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.

Language Requirements—Reading knowledge of one foreign language is required.

Minor Requirements for Students Majoring in Other Fields—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.

Ancient and Medieval Art and Archaeology
See Classical and Near Eastern Studies.

Animal Sciences

Contact Information—Department of Animal Science, University of Minnesota, 305 Haecker Hall, 1364 Eckles Avenue, Saint Paul, MN 55108 (612-624-3491; fax 612-625-5789; ansc@umn.edu; www.ansci.umn.edu/gradprogram/index.html).

For latest faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
David R. Brown, Veterinary and Biomedical Sciences, SM
Hugh Chester-Jones, SM
Brian A. Crooker, SM
William R. Dayton, SM
Alfredo DiCostanzo, SM
Mohamed E. El-Halawani, SM
Douglas N. Foster, SM
Leslie B. Hansen, SM
Marcia R. Hathaway, SM
Dennis G. Johnson, SM
Lee J. Johnston, SM
Mathur S. Kannan, Veterinary and Biomedical Sciences, SM
James G. Linn, SM
Sally L. Noll, SM
Scott M. O’Grady, SM
F. Abel Ponce de Leon, SM
Jeffrey K. Reneau, SM
Anthony J. Seykora, SM
Gerald C. Shurson, SM
Marshall D. Stern, SM
Jonathan E. Wheaton, SM
Michael E. White, SM

Adjunct Professor
Oladele S. Gazal, Department of Biological Sciences, Saint Cloud State University, M
Hans-Joachim G. Jung, Agronomy and Plant Genetics, SM

Associate Professor
Sam K. Baidoo, SM
Yang Da, SM
John Deen, Veterinary Clinical Sciences, SM
Marcia Endres, SM
Scott C. Fahrenkrug, SM
Laura J. Mauro, SM
Srinand Sreevatsan, Veterinary Clinical Sciences, SM

Assistant Professor
Yuzhi Li, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Students 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.

Prerequisites for Admission—A bachelor’s degree in agriculture or a biological field with training in biology, chemistry, physics, and mathematics is required.

Special Application Requirements—Three letters of recommendation evaluating the applicant’s potential, and a statement of career goals are required. The preferred GPA generally required for admission is 3.00 for the M.S. and 3.20 for the Ph.D. GRE scores are required. Applicants are admitted every semester.

Courses—Refer to Animal Science (ANSC) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Certain 4xxx courses may be included on the program form with prior approval by the student adviser and the director of graduate studies.

M.S. Degree Requirements
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. An official program of study, listing coursework to be completed and a thesis title, is submitted to a Graduate Faculty Program Committee and the director of the animal sciences graduate program for review and then forwarded to the Graduate School for approval.

Plan B requires a minimum of 30 credits. These 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, a project(s) is to be conducted.
Ph.D. Degree Requirements
The Ph.D. degree is granted chiefly in recognition of the candidate’s achievements and knowledge in a specific field. Although there is no minimum number of credits required, students typically complete 40-50 credits to develop competency in their field of interest. 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.

Language Requirements—None.

Minor Requirements for Students
Majoring in Other Fields—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.

Ph.D. Degree Requirements
The Ph.D. degree is granted chiefly in recognition of the candidate’s achievements and knowledge in a specific field. Although there is no minimum number of credits required, students typically complete 40-50 credits to develop competency in their field of interest. 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.

Language Requirements—None.

Minor Requirements for Students
Majoring in Other Fields—Requirements are designed to fit the student’s needs. 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.

Anthropology
Contact Information—Department of Anthropology, University of Minnesota 395 Hubert H. Humphrey Center 301 19th Avenue South, Minneapolis, MN 55455 (612-625-3400; fax 612-625-3095; anth@umn.edu; http://anthropology.umn.edu).

For latest faculty information, visit http://anthropology.umn.edu/faculty-profiles/faculty-profiles.html.

Professor
Patricia Albers, American Indian Studies, ASM
William Beeman, SM
Guy E. Gibbon, SM
Stephen F. Gudeman, SM
John M. Ingham, SM
David M. Lipset, SM
Riv-Ellen Prell, American Studies, ASM
Gloria G. Raheja, SM
Peter S. Wells, SM
Joseph J. Westermeyer, Psychiatry, AM2

Associate Professor
Karen Ho, SM
Stuart McLean, SM
Jean M. Langford, SM
Martha Tappen, SM
Karen-Sue Taussig, SM
Gilbert B. Tostevin, SM
Thomas Wolfe, History, ASM

Assistant Professor
Katherine Hayes, SM
Kieran McNulty, SM
Gilliane Monier, SM
Susan C. Mulholland, ASM
Hoon Song, SM
David Valentine, SM
Michael Wilson, SM

Lecturer
Scott F. Anfinson, ASM
John A. Soderberg, AM
Michelle M. Terrell, AM

Fellow
Sonja E. Pattern, Family Medicine and Community Health, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The Department of Anthropology offers graduate education in sociocultural anthropology, linguistic anthropology, anthropological archaeology, and biological anthropology. Major areas of faculty research and graduate student training in sociocultural anthropology include colonial and post-colonial studies, cultures of capitalism, cultural studies of science, economic anthropology, ethnographies of the state, gender/sexuality, globalization, medical anthropology, personality and culture, and urban anthropology, among other specialties. Regional specialization includes Europe, Latin America, the Pacific, the Middle East, North America, Russia, and South Asia.

The program in linguistic anthropology offers training and research opportunities in language, culture, and power; theory in sociolinguistics and the semantics of interaction; paralinguistic and nonlinguistic semiotics; and the anthropology of language styles. Regional specializations include the Middle East and the urban United States.

The program in biological anthropology offers training and research opportunities in paleoanthropology and behavioral biology. The paleoanthropology specialty combines biological anthropologists and Paleolithic archaeologists in the reconstruction of hominin evolution and behavior through the application of evolutionary theory to the analysis of skeletal morphology, faunal remains, site taphonomy, and lithic technology. The biological biology specialty combines the department’s biological anthropologists as well as primatologists in the Jane Goodall Institute’s Center for Primate Studies in the study of non-human primates, human foragers, evolutionary ecology, and evolutionary theory. Regional specialization includes Africa, Southwest Asia, Central Asia, and Europe.

The program in anthropological archaeology offers training and research opportunities in the use of sociocultural theories and interpretive strategies in the reconstruction of historic and prehistoric pasts, the application of faunal and lithic analysis to questions in paleoecology and evolutionary theory, and cultural heritage studies (CRM) through the M.A. program in cultural heritage management. Regional specialization includes Europe, Southwest Asia, Central Asia, and North America.

Ph.D. Degree Requirements
The Ph.D. degree is granted chiefly in recognition of the candidate’s achievements and knowledge in a specific field. Although there is no minimum number of credits required, students typically complete 40-50 credits to develop competency in their field of interest. 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.

Language Requirements—None.

Minor Requirements for Students
Majoring in Other Fields—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.

Ph.D. Degree Requirements
The Ph.D. degree is granted chiefly in recognition of the candidate’s achievements and knowledge in a specific field. Although there is no minimum number of credits required, students typically complete 40-50 credits to develop competency in their field of interest. 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.

Language Requirements—None.

Minor Requirements for Students
Majoring in Other Fields—Requirements are designed to fit the student’s needs. 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.

Anthropology
Contact Information—Department of Anthropology, University of Minnesota 395 Hubert H. Humphrey Center 301 19th Avenue South, Minneapolis, MN 55455 (612-625-3400; fax 612-625-3095; anth@umn.edu; http://anthropology.umn.edu).

For latest faculty information, visit http://anthropology.umn.edu/faculty-profiles/faculty-profiles.html.

Professor
Patricia Albers, American Indian Studies, ASM
William Beeman, SM
Guy E. Gibbon, SM
Stephen F. Gudeman, SM
John M. Ingham, SM
David M. Lipset, SM
Riv-Ellen Prell, American Studies, ASM
Gloria G. Raheja, SM
Peter S. Wells, SM
Joseph J. Westermeyer, Psychiatry, AM2

Associate Professor
Karen Ho, SM
Stuart McLean, SM
Jean M. Langford, SM
Martha Tappen, SM
Karen-Sue Taussig, SM
Gilbert B. Tostevin, SM
Thomas Wolfe, History, ASM

Assistant Professor
Katherine Hayes, SM
Kieran McNulty, SM
Gilliane Monier, SM
Susan C. Mulholland, ASM
Hoon Song, SM
David Valentine, SM
Michael Wilson, SM

Lecturer
Scott F. Anfinson, ASM
John A. Soderberg, AM
Michelle M. Terrell, AM

Fellow
Sonja E. Pattern, Family Medicine and Community Health, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The Department of Anthropology offers graduate education in sociocultural anthropology, linguistic anthropology, anthropological archaeology, and biological anthropology. Major areas of faculty research and graduate student training in sociocultural anthropology include colonial and post-colonial studies, cultures of capitalism, cultural studies of science, economic anthropology, ethnographies of the state, gender/sexuality, globalization, medical anthropology, personality and culture, and urban anthropology, among other specialties. Regional specialization includes Europe, Latin America, the Pacific, the Middle East, North America, Russia, and South Asia.

The program in linguistic anthropology offers training and research opportunities in language, culture, and power; theory in sociolinguistics and the semantics of interaction; paralinguistic and nonlinguistic semiotics; and the anthropology of language styles. Regional specializations include the Middle East and the urban United States.

The program in biological anthropology offers training and research opportunities in paleoanthropology and behavioral biology. The paleoanthropology specialty combines biological anthropologists and Paleolithic archaeologists in the reconstruction of hominin evolution and behavior through the application of evolutionary theory to the analysis of skeletal morphology, faunal remains, site taphonomy, and lithic technology. The biological biology specialty combines the department’s biological anthropologists as well as primatologists in the Jane Goodall Institute’s Center for Primate Studies in the study of non-human primates, human foragers, evolutionary ecology, and evolutionary theory. Regional specialization includes Africa, Southwest Asia, Central Asia, and Europe.

The program in anthropological archaeology offers training and research opportunities in the use of sociocultural theories and interpretive strategies in the reconstruction of historic and prehistoric pasts, the application of faunal and lithic analysis to questions in paleoecology and evolutionary theory, and cultural heritage studies (CRM) through the M.A. program in cultural heritage management. Regional specialization includes Europe, Southwest Asia, Central Asia, and North America.

See the Graduate Student Handbook and faculty profiles in the graduate section of the department’s Web site for more detail about these programs and specialties (www.anthropology.umn.edu).

Prerequisite for Admission—A B.A. degree or equivalent is required for admission.

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, except for the master’s only programs; the deadline for all materials is December 1.

Courses—Refer to Anthropology (ANTH) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—4xxx anthropology courses may be included on the Degree Program Form if they are taught by members of the graduate faculty.

M.A. Degree Requirements
For Plan A and Plan B, 30 semester credits, with at least 14 in anthropology and 6 in a minor or related field. Students should consult the Graduate Student Handbook for special requirements for sociocultural anthropology, linguistic anthropology, archaeology, and biological anthropology.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students
Majoring in Other Fields—The minor program is individually designed by the student and the director of graduate studies.
Minimally, students must take 6 credits in anthropology (5xxx courses or above).

**Ph.D. Degree Requirements**
Requirements include 36 credits of coursework; 24 in anthropology and 12 in a minor or supporting program. Students should consult the [Graduate Student Handbook](http://grad.umn.edu/handbook) for special requirements for sociocultural anthropology, linguistic anthropology, archaeology, and biological anthropology.

**Language Requirements**—Requirements depend upon student’s special area of research.

**Minor Requirements for Students Majoring in Other Fields**—The minor program in anthropology is individually designed by the student and the director of graduate studies. A minimum of 12 credits in anthropology (5xxx courses or above) must be completed for the minor.

### Applied Developmental Psychology

**Postbaccalaureate Certificate**

**Contact Information**—Applied Developmental Psychology Certification Program, Institute of Child Development, 51 East River Road, Minneapolis, MN 55455 (612-624-2576; fax 612-624-6373; borde021@umn.edu, [http://education.umn.edu/fields/Appdev.htm](http://www.umn.edu/)).

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.umn.edu/).

**Professor**
Herbert L. Pick Jr., M
Anne D. Pick, (emeritus), M
Richard Weinberg, M

**Curriculum**—The certificate in applied developmental psychology allows graduate students who major or minor in child psychology 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.

**Admission**—Admission is open to graduate students enrolled in a doctoral program at the University. Students in child psychology must consult with the training director(s) and complete a department application form before officially registering for the first seminar. Students not in child psychology must have successfully completed a four-year undergraduate degree with a preferred 3.00 GPA and equivalent of 12 quarter or 9 semester course credits in psychology, and one statistics course. Admission is based primarily on the applicant’s academic record, GRE scores, and research experience.

**Certificate Requirements**—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.

**Associate Professor**
Jay S. Coggins, SM
Elizabeth E. Davis, SM
Jeremiah E. Fruin, SM
Maria J. Hanratty, SM
Frances R. Homans, SM
Terrance M. Hurley, SM
Laura T. Kalambokidis, SM
Deborah Levison, SM
Gerard McCullough, SM
Joseph A. Ritter, SM
Pamela J. Smith, SM
Rodney B. Smith, SM
Steven J. Taft, SM
Judy Temple, SM
Robert J. Town, SM

**Assistant Professor**
Jean M. Abraham, M2
Caroline Carlin, M2
Guoqiong Huang, M2
Pinar Karaca Mandic, M2
Colleen Flaherty Manchester, M2
Elton Mykerezi, M2
Claire Lee, M2
Clara Lee, M2
Chengyan Yue, M2

**Research Associate**
Naomi Zeitouni, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—Graduate study 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

**Applied Economics**

**Contact Information**—Applied Economics Graduate Program, University of Minnesota, 231 Classroom-Office Building, 1994 Buford Avenue, Saint Paul, MN 55108 (612-625-3777, [apecdgs@umn.edu](mailto:apecdgs@umn.edu), [www.apecgrad.umn.edu/](http://www.apecgrad.umn.edu/))

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.umn.edu/).
economics; labor economics; policy analysis; production and marketing economics; resource and environmental economics; and trade and development economics.

**Prerequisites for Admission**—A GPA of 3.00 in an undergraduate program and in graduate level work is preferred. Applicants without a master’s degree are, except in a few special cases, considered only for admission to the M.S. program. The following coursework is considered the minimum preparation for admission to the M.S. program: intermediate-level microeconomic and macroeconomic theory, statistics, calculus, and linear algebra. Applicants to the Ph.D. program should also have completed courses in microeconomic and macroeconomic theory at the master’s level. Students lacking background in economics or quantitative methods may be required to complete deficiencies before being accepted into the program.

**Special Application Requirements**—GRE scores are required for all students, domestic and foreign. Applicants should provide evidence of superior scholarship, professional experience, and general aptitude for graduate study. Students are admitted any semester but should keep in mind that most assistantships are allocated by the end of February for the following fall semester. Applicants seeking fellowships should submit all application materials by December 15.

**Use of 4xxx Courses**—Use of 4xxx courses toward degree requirements is not permitted.

**M.S. Degree Requirements**
The M.S. prepares students for employment opportunities in the public and private sector and for further graduate study. M.S. students are required to complete graduate level courses in microeconomic theory, macroeconomic theory, and econometrics or statistics, or to have completed equivalent courses prior to entry into the program. Students are also required to participate in a 1 credit M.S. seminar. Both Plan A and B require at least 30 credits, of which at least 14 credits must be in the major field and at least 6 credits must be in a related field or minor. 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. A preferred minimum GPA of 3.00 in program courses is preferred for graduation.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**—M.S. students must complete at least 9 credits of 5xxx or 8xxx courses in applied economics. Courses for the minor are approved by the director of graduate studies in the applied economics graduate program. All courses in the minor must be taken A-F and completed with a GPA of 3.00 or higher.

**Ph.D. Degree Requirements**
The Ph.D. degree program in applied economics prepares students for research, teaching, and extension positions, and for research and administrative posts in public and private sector organizations. 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; health economics; labor economics; policy analysis; production and marketing economics; trade and development economics; and resource and environment economics.

Applicants for the Ph.D. degree should have completed an M.S. degree in economics, applied economics, agricultural economics, or a related field. Prior training should include micro- and macro-economic theory at the master’s level, calculus 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.

All students must complete a set of core courses in micro and macro theory, econometrics, and welfare economics totaling 23 credits. They must also complete two additional “methods” courses and the Ph.D. seminar.

All Ph.D. students must include a “supporting field” or a “minor” program of 12 to 18 credits.

Courses in economic theory, applied econometrics, welfare economics, and applied economic methods are to be completed on the A-F grade basis. At least two-thirds of the credits included on any Ph.D. degree program must be taken under the A-F grading system, and it is preferred that students maintain a 3.00 GPA in the program.

Written preliminary examinations for the Ph.D. degree include the minor or major examination in microeconomic theory (offered by the Department of Economics) and field examinations in two of the seven Ph.D. fields (offered by the Applied Economics Graduate Program). The 8xxx courses in the Applied Economics Graduate Program prepare students for field exams. An approved minor (e.g., economics or health policy) can be substituted for one field exam in the department.

After passing the written preliminary examinations, the student must take a preliminary oral examination. This exam can be on coursework, a thesis prospectus, or some combination. It is administered by a committee of four people, including three from the Applied Economics Graduate Program and one other graduate faculty member not from the program. At the conclusion of the thesis research, a final oral examination is taken. The final oral exam consists of a public seminar (in which the candidate presents the thesis) and a closed meeting between the candidate and the appointed examining committee.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—Ph.D. students must complete at least 15 credits of 5xxx or 8xxx courses in applied economics. Courses for the minor are approved by the director of graduate studies in the Applied Economics Graduate Program. All courses in the minor must be taken A-F and completed with a GPA of 3.00 or higher.

**Applied Plant Sciences**

**Contact Information**—Director of Graduate Studies, University of Minnesota, 411 Borlaug Hall, 1991 Upper Buford Circle, Saint Paul, MN 55108 (612-625-4742; fax 612-625-1268; apsc@umn.edu; www.appliedplantsciences.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Regents Professor**
Ronald L. Phillips, SM

**Professor**
James A. Anderson, SM
Roger L. Becker, SM
Rex N. Bernardo, SM
Jerry D. Cohen, SM
Beverly R. Durgan, SM
Nancy J. Ehike, SM
John E. Erwin, SM
Vincent A. Fritz, SM
Susan M. Galatowitsch, SM
Gary M. Gardner, SM
Jeffrey L. Gunsolus, SM
Emily E. Hoover, SM
Robert J. Jones, SM
Nicholas R. Jordan, SM
John A. Lamb, Soil, Water, and Climate, SM
James J. Luby, SM
Albert H. Markhart III, SM
Mary H. Meyer, SM
Thomas E. Michaels, SM
James H. Orf, SM
Paul M. Porter, SM
Carl J. Rosen, Soil, Water, and Climate, SM
within their area of expertise. The program and gain in-depth knowledge and familiarity with all the disciplines within and scholarship. Students gain a broad necessary to conduct high quality research and quantitative and qualitative research skills to problem solving in their discipline in and plant breeding/molecular genetics.

Applied Plant Sciences

—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 in their discipline 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 a broad familiarity with all 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; and Landscape Architecture; and related departments. Students choose from among four specialization tracks—agronomy/agroecology, applied plant sciences, horticulture, or plant breeding/plant molecular genetics.

Agroecology/Agronomy Specialization—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.

Applied Plant Sciences Specialization—Students create an integrated, individualized program combining a breadth of courses from several disciplines or areas including plant biology at the organismal level, genetics and plant breeding, cropping systems and communities, and courses relating to the production of agronomic and/or horticultural commodities.

Horticulture Specialization—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 ecologic tools to answer research questions.

Plant Breeding/Plant Molecular Genetics Specialization—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.

Prerequisites for 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 statement of career interests, goals, and objectives. Students may apply at any time; however, submission of all application materials by December 1 is strongly encouraged to ensure priority consideration for fellowships and teaching and research assistantships awarded for the next academic year. Students can be admitted any term.

Courses—Refer to Agronomy and Plant Genetics (AGRO), Applied Plant Sciences (APSC), Horticultural Science (HORT) and Sustainable Agricultural Systems (SAGR) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on the Degree Program Form is subject to adviser and director of graduate studies approval.

M.S. Degree Requirements

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.
Ph.D. Degree Requirements
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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A Ph.D. minor requires 12 credits from among 4xxx, 5xxx, and 8xxx courses in the areas of specialization, with only one 4xxx course allowed.

Architecture
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 612-624-5743; http://arch.cdes.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Renee Cheng, AIA, M2
Thomas Fisher, M2
Lance A. LaVine, M2
Julia Robinson, M2
Ignacio San Martin, M2
Leon G. Satkowski, M2
Leslie Van Duzer, M2

Adjunct Professor
Robert Mack, FAIA, AM2
Dale M. Mulfinger, FAIA, AM2
Duane Thorbeck, FAIA, AM2

Associate Professor
Lee B. Anderson, M
Arthur H. Chen, M
William F. Conway, AIA, M
Gunter Dittmar, M
Mary M. Guzowski, M2
Cynthia Jara, M2
Andrzej Piotrowski, M2
Katherine M. Solomonson, M2
J. Stephen Weeks, AIA, M2

Adjunct Associate Professor
James Lutz, AIA, AM
Thomas A. Meyer, FAIA, AM2
Ralph K. Nelson, AIA, AM2
Todd J. Rhoades, AIA, AM2
Lee E. Tollefson, FAIA, AM2

Assistant Professor
Ritu Bhatt, M2
Blaine Brownell, M2
JoInh Comazzi, M2
Gregory Donofrio, M2
Benjamin Ibarar-Sevilla, M2
Ozayr Saloojee, M2
Mark Swackhammer, M2

Assistant Professor
Joihn Comazzi, M2

Adjunct Assistant Professor
Loren Abraham, AIA, AM
William Anthony Blanski, AIA, AM
Dave Dimond, AIA, LEED-AP, AM
Nina Ebbighassem, AIA, AM
Mic Johnson, AIA, AM
Martha McCuade, AIA, AM
Nancy A. Miller, M2
Mark Tambornino, AM
Jennifer A. Yoos, AIA, AM

Adjunct Instructor
Lucas Alm, AIA, AM
Christian Dean, AIA, M
Kristen S. Paulsen, AM
Douglas Pierce, AIA, LEED AP, AM2
Marcelo Valdes, AIA, AM

Research Associate
Louise Goldberg, AM
Kathleen Harder, AM
Research Fellow
Jonee K. Brigham, AIA, LEED-AP, M2
Virajita Singh, M2
Richard B. Strong, M2
William Weber, M2

Director
John Carmody, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 department offers one NAAB accredited professional degree, the master of architecture, and two non-professional research degrees, the M.S. in architecture—with a sustainable design track and the M.S. in architecture with concentration in heritage conservation and preservation.

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: 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 and in heritage preservation and conservation. The nonprofessional M.S. 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 dual degree program that combines the M.Arch. professional degree program and the M.S. in architecture with a sustainable design track.

Prerequisites for Admission to the M.Arch—Students entering the three-year M.Arch. program have varied educational backgrounds that add to a diverse student body. There are several different paths into and through the M.Arch. program. Students who have a B.A. or B.S. degree with a major in architecture or environmental design, generally enter the three-year M.Arch. program.

Students who have earned a bachelor degree in a field other than architecture and little or no background in architecture apply for the 3+ Option, enrolling in a summer semester to establish the foundation needed to succeed in the professional program. The majority of candidates have earned an undergraduate degree with a major in architecture or in a preprofessional architecture program at an NAAB accredited school of architecture. All M.Arch candidates complete the master of Architecture as either a Plan C with a master’s design project or a Plan A thesis in their final studio in the spring semester. Information about each of these paths and the requirements for admission appears on the following page.
The 3+ Option—This option is designed for students with a broad range of academic backgrounds in undergraduate fields other than architecture. Students who are admitted to the 3+ program receive graduate level preparation through a rigorous summer semester of studies in drawing, architectural history-theory, technologies, and design studio. The ensuing fall semester, 3+ students merge with all other M.Arch. three-year program candidates for the remaining complement of design studios and courses.

**Advanced Standing/Post-Professional**—The standard M.Arch professional degree program is three years in length. However, candidates may request admission with advanced standing, and if admitted, may complete the degree in two years; these are exceptional students with a B.S. with a major in architecture degree from accredited NAAB schools. Applications from students who already hold a five-year B.Arch. professional degree, often international students, may be admitted as post-professional degree students. The director of graduate studies tailors advanced and post-professional students’ programs to comply with NAAB requirements upon graduation. Post-professional students must be in residence a minimum of three semesters and complete 33 credits.

**Prerequisites for Admission to the M.S. in Architecture**—Master of science in architecture sustainable design track applicants should have an undergraduate degree with a major in architecture, environmental or building sciences, engineering, or a related field. Applicants seeking a concentration in heritage preservation should have an undergraduate degree with a major in architecture, landscape architecture, art history, urban studies, geography, archaeology, or a related field. Application requirements include a statement of purpose, a writing sample related to the field, a portfolio of related works or design projects, transcripts of all coursework, and three faculty recommendations. The GRE is required. The two- to three-page statement must outline a probable research agenda, topics or themes that the applicant wishes to pursue, including information about the applicant’s preparation for the field and career goals. The statement and portfolio are submitted directly to the School of Architecture by January 15.

**Special Application Requirements**—Admission to the M.Arch. program is highly competitive. In addition to meeting Graduate School application requirements, all students applying to the M.Arch program, whether Plan A or Plan C option, must submit all of the following: a portfolio that demonstrates design talent, transcripts of all coursework, three faculty recommendations, responses in English to two of three school of architecture questions posted on the electronic application. GRE scores are only required if selecting the Plan A Thesis option. The portfolio should be no larger than 8.5” x 11”. International students must submit scores from the TOEFL or the MELAB. For all applicants, the department may waive requirements for required courses when they are equivalent to those offered by the department.

For an online application or for more information about Graduate School admissions, see the General Information section of this catalog, or visit the Graduate School Web site at www.grad.umn.edu/prospective_students/Application Information/index.html.

**Accreditation and Licensing**—Preparation for the profession of architecture requires both formal education and practical experience followed by a professional examination and registration. In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes two types of degrees: the bachelor of architecture and the master of architecture. A program may be granted a six-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards. Master’s degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree. The master of architecture degree program at the School of Architecture, University of Minnesota College of Design is fully accredited by the NAAB.

**Courses**—Refer to Architecture (ARCH) in the Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—4xxx courses cannot be included on Degree Program Forms without the permission of the adviser and director of graduate studies.

**M.Arch. Degree Requirements**

The professional M.Arch. curriculum requires completion of 78 course credits and a 12-credit design studio Plan A Thesis. M.Arch. students can expect to complete the program in six semesters (three years), including the thesis studio design. 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.

**Language Requirements**—None.

**Final Exam**—An individual design proposal and submission of the written research are required for both the Plan A or Plan C M.Arch professional degree.

**M.S. Degree Requirements**

Students are admitted to the M.S. in architecture–sustainable design track or the concentration in heritage preservation under either Plan A or Plan B. The M.S. in architecture–sustainable design track requires a total of 34 credits, typically completed over one-and-a-half years. Coursework includes the following: four sustainable design courses (12 cr); two electives in architecture (6 cr); and either a 10-credit Plan A thesis or Plan B masters project(s). The M.S. in architecture–heritage conservation and preservation concentration requires a total of 33 credits, typically completed over one-and-a-half years. Coursework includes the following: three foundation courses (12 cr); two electives in architecture (6 cr); two electives outside of architecture (6 cr); and either a Plan A thesis (10 cr) or Plan B project(s) (9 cr).

**M.S./M.Arch. Dual Degree Requirements**

Students earn both the master of architecture (M.Arch.) and a master of science in architecture–sustainable design track (M.S.-S.D.) by careful coordination of coursework. Typically, students achieve both professional degrees in three-and-a-half to four years by overlapping up to 24 credits of specified courses, depending on the preprofessional academic preparation. Students elect the Plan A or Plan C option for the M.Arch. and have the option of Plan A or B for the M.S.-
S.D. part of the dual degree. Consult with the director of graduate studies for details. Refer to the School of Architecture M.S. in architecture—sustainable design track Web site (http://arch.cdes.umn.edu/graduate/MS/MS_SD/index.html) for more specific dual degree requirements.

Language Requirements—None.

Final Exam—An oral presentation, a visual presentation of the thesis, and the submission of the written thesis document are required for the M.S. Plan A. The Plan B or Plan A M.S.-S.D. requires an oral examination.

Art

Contact Information—Department of Art, University of Minnesota, E201 Regis Center for Art, 405 21st Avenue South, Minneapolis, MN 55455 (612-625-8096; fax 612-625-7881; artdept@umn.edu; www.art.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
M. Diane Katsiaficas, M2
Clarence E. Morgan, M2
Mark Pharis, M2
Wayne E. Potratz, M2
Thomas A. Rose, M2

Associate Professor
Jan Estep, M2
David Feinberg, M2
Lynn A. Gray, M2
Gary L. Hallman, M2
James V. Henkel, M2
Jerald A. Krepps, M2
Alexis Kuhr, M2
Thomas J. Lane, M2
Lynn T. Lukkas, M2
Joyce Lyon, M2
Tetsuya Yamada, M2

Assistant Professor
Christine A. Baemler, M2
Jenny Schmid, M2
Andrea Stanislav, M2
Diane Willow, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The master of fine arts program places major emphasis on creative studio work of high quality. It promotes not only the conceptual and technical education of the professional artist in the context of the studio environment, 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 time and interactivity. 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.

Prerequisites for Admission—An undergraduate degree is required.

Special Application Requirements—Admission to the M.F.A. program is highly competitive. In addition to meeting Graduate School application requirements, students applying to the program must demonstrate a high degree of capability and commitment in a visual portfolio and must submit all of the following to the director of graduate studies: a one page statement of artistic and academic intent must reach the department’s Web site www.art.umn.edu. Completed Graduate School applications (including official transcripts) must reach the Graduate School by January 5. The visual portfolio, letters of recommendation, the supplementary application form, transcripts of all coursework, and three letters of recommendation. Admission is in fall semester only. Ceramics, painting, and sculpture applicants must submit from 10 to 20 images of work completed in their chosen medium. Printmaking applicants must submit a minimum of four original prints in addition to the digital portfolio. Time and interactivity applicants must submit a portfolio in the medium appropriate to the work being submitted for review. Photography applicants may submit 10 to 20 slides or a minimum of ten finished prints. Instructions for submitting the portfolio may be found at the department’s Web site www.art.umn.edu. Completed Graduate School applications (including official transcripts) must reach the Graduate School by January 5. The visual portfolio, letters of recommendation, the supplementary application and the statement of artistic and academic intent must reach the director of graduate studies in the Department of Art also by January 5. Incomplete files will not be reviewed.

Courses—Refer to Art (ARTS) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses in the related field (other than art history) on the Degree Program Form is subject to the adviser and director of graduate studies approval.

M.F.A. Degree Requirements
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 visual research. The program recommends that coursework be completed prior to the final year of creative thesis registration. Candidates must plan programs with their advisers to include the graduate seminars ARTS 8400 (taken in the first term) and ARTS 8410 (taken in the second year) and up to 18 credits of creative thesis coursework. The related field requirement of 9 credits includes three courses in the history of art (or two courses in the history of art and one course from another academic department pertinent to the student’s program). Candidates must be reviewed annually for progress through the program. At the end of the thesis year, candidates demonstrate their visual research accomplishments through a solo, creative thesis exhibition on campus, a supporting paper, and a final oral exam.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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.

Art Education

See Education, Curriculum and Instruction.

Art History

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; arthist.umn.edu; www.arthist.umn.edu.

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
W. John Archer, ASM
Catherine B. Asher, SM
Frederick M. Asher, SM
*Frederick A. Cooper, SM
Gail Lee Dubrow, ASM
Sheila J. McNally, SM
Steven F. Ostrow, SM
*Robert J. Poor, SM
Leon G. Satkowski, ASM
Gabriel P. Weisberg, SM

Associate Professor
Jane M. Blocker, SM
Michael Gaudio, SM
Robert B. Silberman, SM
Katherine M. Solomonson, ASM
*John W. Steyaert, SM

Assistant Professor
Angélica Afanador-Pujol, SM
Ritu Bhatt, AM
Jennifer Marshall, SM
Other

Lyndel I. King, Weisman Art Museum, AM
Diane Mullin, Weisman Art Museum, AM

* Not accepting new students.

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Areas of specialization:
American art and architecture; Baroque art and architecture; early modern art; East Asian art and Bronze Age archaeology; Greek and Roman art and archaeology; Islamic art and architecture; late Gothic and northern Renaissance art; modern art and theory, including film and photography studies as well as 19th- through 21st-century art; Latin American art and architecture, and South Asian art and architecture.

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. For the Ph.D. program, an M.A. degree in art history or in a field closely related to the chosen area of specialization is required, as well as coursework or other experience indicating substantial background in art historical methods and knowledge.

Special Application Requirements—For the M.A. program, results from the GRE General Test, at least one substantial research paper 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.

For the Ph.D. program, results from the GRE General Test, an M.A. thesis or a minimum of two substantial M.A. papers in art history, and three letters of recommendation from persons well acquainted with the applicant’s research and writing skills are required. In addition, Ph.D. applicants must provide a statement describing previous experience and academic training as related to the projected course of study and academic goals. Ph.D. candidates are urged to contact the director of graduate studies before applying.

Applications for the Ph.D. program (if not previously enrolled in the department) and M.A. program are reviewed in December for admission in the fall. For both of these, the application form, statement of purpose, official transcripts, and official GRE scores must reach the Graduate School by late November (contact the Department of Art History for the precise date). Three letters of recommendation and research paper(s) must reach the department by the same deadline. Internal Ph.D. applicants should contact the department for details and deadlines. All applications for financial aid are due on the same date as the applications for admission.

College of Liberal Arts Office of Information Technology Visual Resources Center—The CLA-OIT Visual Resources Center (VRC) is located in 460 Heller Hall. The VRC works with the many departments and centers within CLA to digitize their materials and make them available via an online database (www.dcl.umn.edu). The center also manages art history’s approximately 250,000 slides, 100,000 photo archives, and 400 films, with content ranging from the prehistoric to the contemporary, in architecture, sculpture, painting, and other media, from all areas of the world.

Courses—Refer to Art History (ARTH) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx art history courses on the Degree Program Form is subject to adviser and director of graduate studies approval. Students from other majors may include such courses subject to their own program’s approval.

M.A. Plan B Degree Requirements
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 art historical in content and drawn from courses in at least three of the following areas: American, ancient, early modern, East Asian, Islamic, medieval, modern and contemporary, Latin American, 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 focusing on Asian/Islamic art must take at least one course in Western art. Students focusing on Western art must take at least one course in Asian/Islamic art. In addition, students must take 6 credits in courses that are not art historical in content. The remaining 9 credits may be either in art history or outside the discipline; this is decided in consultation with the adviser and the director of graduate studies.

Two Plan B papers are required, the first of which should be completed by the end of the first year of full-time study.

Language Requirements—Students must attain reading proficiency in a second language directly related to their course of study.

Final Exam—The final exam is written. See the department’s Graduate Student Handbook (PDF) for details.

Minor Requirements for Students

Majoring in Other Fields—For an M.A. degree, a minimum of 11 graduate credits in art history is required for a minor.

Ph.D. Degree Requirements
A minimum of 54 course credits (about 18 courses) 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; a minimum of 12 credits in a minor or supporting field is required.

Language Requirements—Students must attain reading proficiency in at least two foreign languages. Contact the director of graduate studies for details.

Minor Requirements for Students

Majoring in Other Fields—A doctoral minor requires a minimum of 12 credits in art history.

Asian Literatures,
Cultures, and Media

Contact Information—Department of Asian Languages and Literatures, University of Minnesota, 453 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-625-6534; fax 612-624-5513; aclmdgs@umn.edu; www.all.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Joseph R. Allen, SM
Catherine B. Asher, Art History, ASM
Daniel Brewer, French and Italian, ASM
Richa Nagar, Gender, Women, and Sexuality Studies, ASM
Arlene A. Teraoka, German, Scandinavian, and Dutch, ASM
Ann B. Waltner, History, ASM

Associate Professor
Jeffrey Broadbent, Sociology, ASM
Jigna Desai, Gender, Women, and Sexuality Studies, ASM
Keya Ganguly, Cultural Studies and Comparative Literature, ASM
Christine Maran, SM
Michael Molasky, SM
Maki Isaka Morinaga, SM
Paul Rouzer, SM
Simona Sawhney, SM
Ajay Skaria, History, ASM

Assistant Professor
Mark Anderson, SM
Jason McGrath, SM
Hiromi Mizuno, History, ASM
Guripal Sahota, SM

Lecturer
Ravi Prasad, AM
Ling Wang, AM

Other
Zhen Zou, Degree and Credit Programs, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The Asian literatures, cultures, and media (ALCM) program is organized around three intersecting categories of knowledge: 1) language of concentration, 2) focus of study, and 3) theory or problematic. Students must designate a language of concentration on their ALCM program application form. Currently, students may select Chinese, Japanese, or Hindi/Urdu for their language of concentration.

Language Requirements—Advanced knowledge in the chosen language of concentration.

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); 4) oral exam (in English) by the above committee, based on the submitted papers.

Ph.D. Degree Requirements


Language Requirements—Advanced reading ability and spoken competence in the language of concentration, as assessed by the Ph.D. qualifying exam. Some students may require additional foreign language study, depending on the dissertation topic.

Minor Requirements for Students Majoring in Other Fields—For the doctoral minor, students are expected to take a minimum of 15 credits in graduate courses offered in the Department of Asian Languages and Literatures, 8 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.

Astrophysics

Contact Information—Department of Astronomy, University of Minnesota, 356 Tate Laboratory of Physics, 116 Church Street S.E., Minneapolis, MN 55455 (612-624-4811; fax 612-626-2029; grad-req@astro.umn.edu; www.astro.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Cynthia A. Cattell, Physics, ASM
Kris D. Davidson, SM
Robert D. Gehrz, SM
Shaul Hanany, Physics, ASM
Roberta M. Humphreys, SM
Terry J. Jones, SM
Thomas W. Jones, SM
Robert L. Lysak, Physics, ASM
Keith A. Olive, Physics, ASM
Robert O. Pepin, Physics, ASM
Yong-zhong Qian, Physics, ASM
Lawrence Rudnick, SM
Evan D. Skillman, SM
Charles E. Woodward, SM
Paul R. Woodward, SM
John R. Wygant, Physics, ASM

Associate Professor
Alexander Heger, ASM
Marco Pelose, ASM
Liliya L. R. Williams, SM

Adjunct Associate Professor
Kim A. Yenn, ASM

Assistant Professor
Vuk Mandic, ASM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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.

**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.

**Special Application Requirements**—A statement of career goals, scores from the GRE General (Aptitude) Test and Subject (Advanced) Test in physics, and three letters of recommendation are required. Applications for financial aid are due January 10. Applications are accepted for entry into fall semester only.

**Facilities**—The Department of Astronomy has purchased a five percent share in the Large Binocular Telescope (LBT) on Mount Graham in southeastern Arizona. The LBT is currently completing commissioning through a consortium of universities and research institutes led by the University of Arizona. First light images were obtained in the fall of 2005; initial science projects began in early 2007. This purchase also allows the department to trade time on the LBT for time on several other telescopes—including the 6.5 meter upgraded Multiple Mirror Telescope, the two 6.5 meter Magellan telescopes in the southern hemisphere, and the 10 meter Heinrich Hertz millimeter radio telescope—as well as other smaller telescopes in Arizona, providing guaranteed access to multi-wavelength capabilities.

The University also operates a 60-inch telescope on Mount Lemmon, near Tucson, Arizona, which is well equipped for both optical and infrared observations. A 30-inch telescope with a CCD camera and infrared instruments is maintained at the O’Brien Observatory about 40 miles from the Twin Cities campus. Excellent shop facilities support our instrument development for the telescopes at O’Brien and Mount Lemmon and for major national observatories such as the NASA Infrared Telescope Facility (IRTF) in Hawaii and for the LBT.

The Automated Plate Scanner has been used to digitize the entire Palomar Sky Survey resulting in a massive catalog of over 89 million objects, including star and galaxy positions, magnitudes, and colors. The catalog of the first epoch survey is available on the Web, with data from the second epoch survey available in the department.

The astronomy department maintains a large network of linux-based computers used for the reduction and analysis of X-ray, ultraviolet, optical, and radio observations. The department is connected through an ethernet backbone to clusters of supercomputers and super-workstations at the University’s Minnesota Supercomputing Institute and the Laboratory for Computational Science and Engineering. These facilities are available to faculty and students for their research.

In addition, members of the department regularly use such national facilities as the Kitt Peak National Observatory; Cerro Tololo Inter-American Observatory in Chile; National Radio Astronomy Observatory’s facilities in Green Bank and the VLA; Arecibo Radio Observatory; the IRTF In Hawaii; and the NASA space based facilities such as the Hubble Space Telescope, the Far Ultraviolet Space Explorer, the Spitzer Infrared Telescope Facility, the Chandra X-ray Space Telescope.

**Courses**—Refer to Astronomy (AST) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—A 4xxx astrophysics course may be counted toward the M.S. or Ph.D. degree programs.

**M.S. Degree Requirements**

The master’s degree requires a minimum of 30 credits, including one semester of classical physics (PHYS 5011). Additional requirements depend on whether the student chooses the thesis (Plan A) or non-thesis (Plan B) option. Plan A requires 20 credits of coursework and 10 thesis credits. Plan B requires 30 credits of coursework. Completion of the degree normally takes two years.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**—For the master’s minor, 8 credits in astrophysics are required.

**Ph.D. Degree Requirements**

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 the second 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.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—For the Ph.D. minor, 12 credits in astrophysics are required.

**Audiology**


**Biochemistry, Molecular Biology, and Biophysics**

**Contact Information**—Director of Graduate Studies, Department of Biochemistry, Molecular Biology, and Biophysics, University of Minnesota, 6-155 Jackson Hall, 321 Church Street S.E., Minneapolis, MN 55455 (612-625-5179; fax 612-625-2163; bmbbgp@umn.edu; www.cbs.umn.edu/bmbbgp/graduate).

For information on the master’s and doctoral degree programs offered in conjunction with the University of Minnesota Duluth, contact the Associate Director of Graduate Studies, Department of Biochemistry and Molecular Biology, University of Minnesota, 251 School of Medicine, 1035 University Drive, Duluth, MN 55812 (218-726-7922).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

**Regents Professor**

Lawrence Que Jr., Chemistry, SM

**Professor**

Matthew T. Andrews, Biology, Duluth, SM
Ian M. Armitage, SM
Leonard J. Banaszak, (emeritus), SM
David A. Bernlohr, SM
Victor A. Bloomfield, SM
Robert J. Brooker, Genetics, Cell Biology and Development, SM
Anath Das, SM
Antony Michael Dean, Biotechnology Institute, SM
Lester R. Drewes, Biochemistry and Molecular Biology, Duluth, SM
James Ervasti, SM
James A. Fuchs, SM
Thomas S. Hays, Genetics, Cell Biology and Development, SM
Eric Hendrickson, SM
Alan B. Hooper, SM
Romas J. Kazlauskas, SM
David C. LaPorte, SM
John D. Lipscomb, SM
Dennis M. Livingston, SM
Kevin H. Mayo, SM
Sharon E. Murphy, SM
Gary L. Nelsestuen, SM
Michael B. O’Connor, Genetics, Cell Biology and Development, SM
Douglas H. Ohlendorf, SM
Harry T. Orr, Laboratory Medicine and Pathology, SM

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
Catalysis, metabolic pathways, bioenergetics, in living organisms. In the broadest sense, of the structures and processes that occur on an explanation at the molecular level. Biology, and biophysics program focuses.

Curriculum—The biochemistry, molecular biology, and biophysics program focuses on all major fields.

Graduate School requirements that apply to the majors in the College of Biological Sciences, Medical School, Institute of Technology, and College of Veterinary Medicine.

Prerequisites for Admission—The program is flexible enough to accommodate students with a variety of educational backgrounds. Applications from students with undergraduate or master's degrees in the biological, chemical, or physical sciences are encouraged. 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. Students are admitted only to the Ph.D. 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 official scores from the General Test of the GRE are required. The GRE Subject Test in biochemistry, cell and molecular biology, and genetics is strongly recommended, but not required. The recommended date for receipt of completed applications is January 2. Completed files are reviewed between January and February. Graduate studies typically begin fall semester. Information about an early start program involving participation in laboratory research beginning on July 1 may be obtained from the Director of Graduate Studies.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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. BIOC 4331 and 4332 may also be considered if approved by the directors of study of both the major and minor programs.

Ph.D. Degree Requirements

Requirements for the doctoral degree include core coursework and laboratory experiences taken by all students, followed by one or more courses in one of the areas of specialization. In addition, all students are expected to participate in seminars involving student reports on current literature and research. A thesis based on original laboratory research is required.

M.S. Plan A Degree Requirements

Requirements for the M.S. degree include core coursework and laboratory experiences taken by all students, followed by one or more courses in one of the areas of specialization. In addition, all students are expected to participate in seminars involving student reports on current literature and research. A thesis based on original laboratory research is required.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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. BIOC 4331 and 4332 may also be considered if approved by the directors of study of both the major and minor programs.

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Language Requirements—None.

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Language Requirements—None.

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Language Requirements—None.

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Language Requirements—None.

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Language Requirements—None.

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Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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. BIOC 4331 and 4332 may also be considered if approved by the directors of study of both the major and minor programs.

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Language Requirements—None.
nationally and internationally on a number of health care issues, the Center embraces a robust mission of public policy. The Center has expertise in clinical ethics, research ethics, and religious studies. The faculty represents a broad array of fields, with backgrounds in philosophy, medicine, nursing, public health, health policy, law, education, family social science, and religious studies. The faculty has expertise in clinical ethics, research ethics, and ethics in health policy. The Center embraces a robust mission of public engagement. Its faculty influences policy nationally and internationally on a number of issues including decision-making at end of life, research on human subjects, ethics and genetic technologies, and public health preparedness.

M.A. Plan A Degree Requirements

Prerequisites for Admission—A bachelor’s degree is required for admission. 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.

Special Application Requirements—The M.A. program in bioethics admits students only for matriculation in the fall semester. Applications will begin to be reviewed November 1, with offers of admission being extended on a rolling basis. Preference will be given to early applicants. Applications will close April 30.

Applicants must submit scores from the GRE General Test. LSAT or MCAT scores may be submitted in lieu of GRE scores. Standardized test scores will not be required from applicants who have completed a doctoral-level degree at a U.S. institution of higher learning. Applicants without such a degree but with significant professional experience (e.g., experienced RNs) may petition to have the standardized test requirement waived. Applicants for whom English is a second language should supply TOEFL scores. The Center for Bioethics may also require an interview to verify English fluency. 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.

Use of 4xxx-level Courses—No 4xxx courses may be included in degree programs for the bioethics M.A.

Master’s Degree Requirements

Students in this Plan A (thesis-based) master’s degree program are required to take at least 20 credits of courses including 9 credits of required courses including one course fulfilling an area requirement, 5 credits of bioethics electives, and 6 credits of electives from a supporting field. A full listing of required courses can be found at www.ahc.umn.edu/bioethics/education/gradprogram/degreeq/home.html. A complete list of bioethics courses that can be used to fulfill the elective requirement is available at www.ahc.umn.edu/bioethics/education/completebthx/home.html. A sample list of courses appropriate to the related field requirement can be found at www.ahc.umn.edu/bioethics/prod/groups/ahc/@pub/@ahc/documents/asset/ahc_96014.pdf. Courses fulfilling this requirement must be chosen in consultation with the student’s adviser to ensure their appropriateness for the student’s course of study. Students may elect a graduate minor to fulfill this requirement. 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.

Note: 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.

Master’s Thesis—Students are also required to complete at least 10 thesis credits and write a thesis. The thesis committee includes two bioethics graduate faculty members and one graduate faculty member outside of Bioethics. The “outside” member of the committee is from the graduate faculty of the minor field, if the student has completed a graduate minor. The final oral for the master’s degree is conducted as a closed examination, attended by only the student and the examining committee.

Language Requirements—None

Final Exam—The final exam is oral.

Minor Only Requirements

The Center for Bioethics offers a minor in bioethics for master’s (M.A. and M.S.) and doctoral students with approval of the director of graduate studies in bioethics. The minor provides a structured program of study as well as formal recognition for academic accomplishments in the field. While recognizing that philosophy is a focal discipline for the study of bioethics, the minor offers numerous opportunities for multidisciplinary study, including in history and philosophy of medicine, health law and public policy, health care economics, professional ethics, clinical ethics, medical humanities, and moral development.

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. Courses that satisfy requirements and serve as electives can be found at www.ahc.umn.edu/bioethics/education/graduate/home.html.

Prerequisites for Admission—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. Students are encouraged to have some previous exposure to philosophy or
biomedicine or both. Graduate students in philosophy are expected to have successfully completed at least one graduate course in ethical theory.

**Special Application Requirements** — Contact the director of graduate studies in bioethics for an Intent to Enroll Form. The form is also available in a PDF from the Center for Bioethics Web site at www.ahc.umn.edu/bioethics/education/graduate/home.html. Enrollment is contingent upon approval by the director of graduate studies for bioethics.

**Courses** — Contact the minor program office or the Center for Bioethics Web site at www.ahc.umn.edu/bioethics/education/graduate/home.html for information on relevant coursework.

**Use of 4xxx Courses** — Some 4xxx courses are allowed as indicated in the guidelines for the bioethics minor, available from the director of graduate studies or the Center for Bioethics Web site at www.ahc.umn.edu/bioethics/education/graduate/home.html.

## Bioinformatics

### Minor Only

**Contact Information** — Graduate Minor Program in Bioinformatics, Institute of Health Informatics, University of Minnesota, MMC 912, 330 Diehl Hall, 505 Essex Street S.E., Minneapolis, MN 55455 (612-625-8440; fax 612-625-7166; www.binf.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**

Daniel Boley, Computer Science, M
John Carlis, Computer Science, M
Lynda B. M. Ellis, Laboratory Medicine and Pathology, M
Claudia Neuhauser, Ecology, Evolution, and Behavior, M
Hans Othmer, Mathematics, M
Wei Pan, Biostatistics, M
Lawrence P. Wackelt, Biochemistry, Molecular Biology, and Biophysics, M
Nevin Dale Young, Plant Pathology, M

**Associate Professor**

Colin Campbell, Pharmacology, M
Yang Da, Animal Science, M
Scott Fahrenkrug, Animal Science, M
George Karpius, Computer Science, M
Yiannis Kaznessis, Chemical Engineering and Materials Science, M
Arkady Khodursky, Biochemistry, Molecular Biology, and Biophysics, M
Georgiana May, Ecology, Evolution, and Behavior, M
Cavan Reilly, Biostatistics, M

**Curriculum** — The bioinformatics minor is available to master’s (M.A. and M.S.) and doctoral students. The minor includes core coursework in computer and biological sciences and opportunities to interact with others interested in bioinformatics. The curriculum encourages interdisciplinary interaction, communication, and synthesis. The minor is intended to provide graduate-level biological or computer science students with basic training in bioinformatics as a complement to their major science background and broaden their professional abilities. The program of study is tailored in advance by consultation between the student and the director of graduate studies for the bioinformatics minor. All courses taken to fulfill minor requirements must be graded A–F.

**Prerequisites for Admission** — Admission to a master’s or doctoral degree-granting program within the Graduate School and preparation of a minor program of coursework approved by the director of graduate studies in bioinformatics is required. Potential programs must be discussed with the director of graduate studies.

**Courses** — Courses are taken from a designated course list available online at www.binf.umn.edu/courses/index.php.

**Use of 4xxx Courses** — BIOL 4003—Genetics, BIOC 4950—Computer Simulation and Data Analysis in Biochemistry, and CSCI 4707—Practice of Database Systems are the only 4xxx courses that may be included on Degree Program Forms.

### Minor Only Requirements

The master’s and doctoral minors are developed in consultation with, and must be approved in advance by, the director of graduate studies for bioinformatics. The master’s minor requires at least 9 credits, including CSCI 5481—Computational Techniques for Genomics, one of several genomics courses, and a third designated course. Other courses may be substituted upon the recommendation of the director of graduate studies.

The doctoral minor requires at least 15 credits, including the master’s courses, one of several courses in statistical genomics, and an elective. Other courses may be substituted upon the recommendation of the director of graduate studies.

## Biological Science

**Contact Information** — Master of Biological Science, Professional Program, College of Biological Sciences, 123 Snyder Hall, 1475 Gortner Avenue, Saint Paul, MN 55108 (612-625-3133; fax 612-624-2785; biolink@umn.edu; www.cbs.umn.edu/biolink/mbs).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**

Karen Ashe, AM2
Henry H. Balfour Jr., Laboratory Medicine and Pathology, AM2
Gregory J. Beilman, Surgery, AM2
Jay Bell, Soil, Water, and Climate, AM2
Judith G. Berman, Molecular, Cellular, Developmental Biology and Genetics, M2
David A. Bernlohr, Biochemistry, Molecular Biology, and Biophysics, M2
Linda J. Brady, Food Science and Nutrition, AM2
Robert M. Brambl, Plant Biology, M2
Paul P. Cleary, Microbiology, AM2
Gary M. Dunny, Microbiology, AM2
Leonard C. Ferrington, Entomology, AM2
James A. Fuchs, Biochemistry, Molecular Biology, and Biophysics, M2
Susan M. Galatowitsch, Horticultural Science, AM2
Daniel D. Gallagher, Food Science and Nutrition, AM
Marc A. Hillyner, Chemistry, AM2
Ralph W. Holzenthal, Entomology, AM2
Christopher N. Honda, Neuroscience, AM2
Paul A. Iaizzo, Surgery, AM2
Stephen Jameson, Laboratory Medicine and Pathology, AM2
Ronald R. Jemmer, Microbiology, AM2
Ross G. Johnson, Molecular, Cellular, Developmental Biology and Genetics, AM2
Romas J. Kazlauskas, Biochemistry, Molecular Biology and Biophysics, M2
John H. Kersey, Laboratory Medicine and Pathology, AM2
Youngki Kim, Pediatrics, AM2
Richard King, Pediatrics, AM2
Mindy S. Kurzer, Food Science and Nutrition, AM2
David L. Largaespada, Molecular, Cellular, Developmental Biology and Genetics, AM2
Jack L. Lewis, Orthopedic Surgery, AM
Michael Maurer, Pediatrics, M2
Gary L. Nelsestuen, Biochemistry, Molecular Biology, and Biophysics, AM2
Harry T. Orr, Laboratory Medicine and Pathology, M2
Lisa A. Peterson, Environmental Health Sciences, AM2
Laura P. W. Ranum, Molecular, Cellular, Developmental Biology and Genetics, M2
Gary A. Reineccius, Food Science and Nutrition, AM2
Michael J. Sadowsky, Soil, Water, and Climate, AM2
Leslie A. Schiff, Microbiology, AM2
Patrick M. Schlievert, Microbiology, AM2
Janet L. Schottel, Biochemistry, Molecular Biology and Biophysics, M2
Michael J. Simmons, Molecular, Cellular, Developmental Biology and Genetics, M2
Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—A professional master of biological science (M.B.S.) degree is offered with concentrations in areas such as biochemistry, basic biology (animal, plant, cell, applied, and general), biotechnology, biophysics, ecology, environment, evolution, food science and nutrition, genetics, microbiology, molecular biology, and neuroscience. This is a multicollege, cooperative degree program among the Colleges of Biological Sciences; Veterinary Medicine; and Food, Agricultural and Natural Resource Sciences. The program is administered by the College of Biological Sciences and the degree is conferred by the Graduate School.

The M.B.S. is a highly flexible graduate-level, practitioner-based program offered to meet the needs of a substantial portion of the working community who wish or need to increase their knowledge in areas related to modern biology. The program provides educational opportunities beyond those that aim at maintaining and improving productivity within the professions. It fills a gap in the present educational system for those who have neither the time nor the flexibility to earn a graduate degree through more traditional channels. It also provides this population with the most current information and advanced skills in their areas of professional interest, and gives them acknowledgment for their achievement. The degree enables recipients to learn new job skills, change professional emphasis, or provide added value to their present job.

Courses—Contact the program office for information on relevant coursework.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

M.B.S. Coursework Only Degree Requirements

The program includes coursework, seminars, independent study, workshops, and a capstone project. With guidance from faculty advisers, students complete 30 credits. M.B.S. candidates may transfer up to 8 credits into the program. Core credits may be waived or substituted if the student can show proficiency in the subject area, pending advisory committee approval. If a core credit is waived, the credits must still be earned in an elective course. Coursework is taken from the regular curriculum in the participating colleges, as well as from other approved credit-bearing courses (e.g., intensive short courses and Internet courses). An overall GPA of 3.00 is preferred for the degree to be awarded. A student with 8 or more credits of incomplete (I) coursework will not be allowed to register for additional courses until the coursework marked with I is completed.

Language Requirements—None.

Final Exam—A capstone project is required.

Biomedical Engineering

Contact Information—Department of Biomedical Engineering, University of Minnesota, 7-105 Nils Hasselmo Hall, 312 Church Street S.E., Minneapolis, MN 55455 (612-624-8396; fax 612-626-6583; bmbengp@umn.edu; www.umn.edu/bme). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Robert P. Hebbel, Medicine, SM

Professor
James Ashe, Neuroscience, SM
Roberto Ballarini, Civil Engineering, ASM
Victor H. Barocas, SM
David G. Benditt, Medicine, SM
John C. Bischof, Mechanical Engineering, SM
Wei Chen, Radiology, SM
William K. Durfee, Mechanical Engineering, SM
Emad Ebbini, Electrical and Computer Engineering, SM
Timothy J. Ebner, Neuroscience, SM
Arthur G. Erdman, Mechanical Engineering, SM
Stanley M. Finkelstein, Laboratory Medicine and Pathology, SM
John E. Foker, Surgery, SM
Michael G. Garwood, Radiology, M2
Bruce E. Hammer, Radiology, SM
Ramesh Harjani, Electrical and Computer Engineering, M2
Bin He, Biomedical Engineering, SM
Goran Hellekant, Physiology and Pharmacology, Duluth, SM
Wei-Shou Hu, Chemical Engineering and Materials Science, SM
Kenneth H. Keller, Chemical Engineering and Materials Science, SM
Robert LaPrade, Orthopaedic Surgery, M2
Paul C. Letourneau, Neuroscience, SM
Jack L. Lewis, Orthopaedic Surgery, SM
Keith G. Lurie, Emergency Medicine, M2
James B. McCarthy, Laboratory Medicine and Pathology, SM
Jeffrey McCullough, Laboratory Medicine and Pathology, M2
David Odde, SM
Hans G. Othmer, School of Mathematics, ASM
Dennis L. Polla, Center for the Development of Technological Leadership, SM
Rajesh Rajamani, Mechanical Engineering, ASM
Ronald A. Siegel, Pharmaceutics, SM
Twin Cities Degree Programs and Faculty

Ephraim M. Sparrow, Mechanical Engineering, SM
Doris Taylor, Integrative Biology and Physiology, SM
Gerald Timm, Urological Surgery, ASM
Robert T. Tranquillo, Biomedical Engineering, SM
Charles L. Truwit, Pediatrics, M2
Kamil Uğurbil, Radiology, SM
J. Thomas Vaughan, Radiology, SM
Timothy S. Wiedmann, Pharmaceutics, SM
Jay Zhang, Medicine, SM

Adjunct Professor
Paul A. Iaizzo, Anesthesiology, SM

Associate Professor
Jerome H. Abrams, Surgery, SM
Edgar A. Arriaga, Chemistry, SM
Alan J. Bank, Medicine, M2
Joan E. Bechtold, Orthopaedic Surgery, M2
Michael Bowser, Chemistry, SM
William B. Gleason, Laboratory Medicine and Pathology, SM
James E. Holte, Electrical and Computer Engineering, SM
Allison Hubel, Mechanical Engineering, SM
Susanta K. Hui, Therapeutic Radiology, AM2
Paula Ludewig, Physical Medicine and Rehabilitation, AM2
Greg Metzger, Radiology, ASM
Joachim Mueller, Physics and Astronomy, ASM
Tom Novacheck, Orthopaedic Surgery, AM
A. David Redish, Neuroscience, SM
Michael H. Schwartz, Orthopaedic Surgery, SM
Carl S. Smith, Urologic Surgery, M2

Adjunct Associate Professor
Euisik Yoon, Electrical and Computer Engineering, SM

Assistant Professor
Taner Akkin, Biomedical Engineering, SM
Alptekin Aksan, Mechanical Engineering, ASM
Shai Ashkenazi, Biomedical Engineering, SM
Patrick Bolan, Radiology, AM2
Matthew Chafee, Neuroscience, AM2
Michel Cramer-Bornemann, M.D., Neurology, AM2
Kevin Dorfman, Chemical Engineering and Materials Science, ASM
Geoffrey M. Ghose, Neuroscience, M2
Efrosini Kokkoli, Chemical Engineering and Materials Science, SM
Tay Netoff, Biomedical Engineering, SM
David Nuckley, Physical Therapy, ASM
Sang-Hyun Oh, Electrical and Computer Engineering, ASM
Klearchos K. Papas, Surgery, SM
Osha Roopnarine, Biochemistry, Molecular Biology, and Biophysics, SM
Jonathan N. Sachs, SM
Wei Shen, Biomedical Engineering, SM
Alena Talkachova, Biomedical Engineering, SM
Chun Wang, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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.

Prerequisites for 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.

Special Application Requirements—Three letters of recommendation and GRE scores are required of all applicants. For international students, the preferred performance minimum for the TOEFL is 575 (paper) or 89 (Internet).

Courses—Refer to Biomedical Engineering (BMEN) in the course section of this catalog or in the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—No more than 3 credits of 4xxx courses may be included. These courses require approval of the adviser and director of graduate studies.

M.S. Degree Requirements

The M.S. is offered under two plans: Plan A (with thesis) and Plan B (with project). Each program requires courses in mathematics, biology, biomedical engineering, and relevant areas of science and engineering, and a minor or related field. Plan A requires completion of 25 course credits. Plan B requires completion of 35 course credits. Both plans require coursework in a physical or biological science is required. In most cases, the coursework is not considered part of the degree program.

Ph.D. Degree Requirements

The Ph.D. program requires coursework in mathematics, biology, biomedical engineering, and relevant areas of science and engineering (typically 40 credits, including those satisfying a minor field or supporting program), a written preliminary exam, an oral preliminary exam, a dissertation, and a final oral exam.

Language Requirements—None.

Minor Requirements for Students

Majoring in Other Fields—The doctoral minor requires at least 12 credits, including two BMEN core courses (5001, 5101, 5201, 5311, 5351 or 5401), one course with a biological sciences emphasis (may be BMEN 5501), and one course with an engineering emphasis. All courses must be at 5xxx or higher.

Biophysical Sciences and Medical Physics

Contact Information—Biophysical Sciences and Medical Physics Program, Department of Radiology, University of Minnesota, MMC 292, Room B272 Mayo Building, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-6638; hanse032@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Victor A. Bloomfield, Biochemistry, Molecular Biology, and Biophysics, SM
Bianca M. Conti-Fine, Biochemistry, Molecular Biology, and Biophysics, SM
Ralph DeLong, Oral Sciences, M2
Stanley M. Finkelstein, Laboratory Medicine and Pathology, SM
John E. Foker, Surgery, SM
Michael G. Garwood, Radiology, SM
Bruce J. Gerbi, Therapeutic Radiology, SM
Rolf Gruetter, Radiology, SM
Bruce E. Hammer, Radiology, SM
Patrick Higgins, Therapeutic Radiology, M2
Robert H. Margolis, Otolaryngology, SM
Scott H. O’Grady, Animal Science, SM
Robert P. Patterson, Physical Medicine and Rehabilitation, SM
E. Russell Ritenour, Radiology, SM
Chang W. Song, Therapeutic Radiology, SM
David D. Thomas, Biochemistry, Molecular Biology, and Biophysics, SM
Kamil Uğurbil, Radiology, SM
Daniel A. Vallera, Therapeutic Radiology, M2
Warren J. Warwick, Pediatrics, SM

Associate Professor
Parham Alaei, Therapeutic Radiology, M2
Alan J. Bank, Medicine, M2
James E. Holte, Electrical Engineering, SM
Susanta K. Hui, Therapeutic Radiology, M2
Yoichi Wantanabe, Therapeutic Radiology, M2
Richard S. Ziegler, Pediatrics, M2
Curriculum

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 hospital-based medical physicists through a program that includes opportunities for

Majoring in Other Fields—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. At least 6 credits of BPHY courses are required.

Minor Requirements for Students Majoring in Other Fields—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. A total of 30 credits is required, including 14 in the major and 6 in a related field or minor.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—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. At least 6 credits of BPHY courses are required.

Ph.D. Degree Requirements

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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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.
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 the 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 BBSEM graduate program offers master’s (M.S.B.B.S.E.M. Plan A and Plan B) and doctorate (Ph.D) degrees. Students seeking a graduate degree should have a bachelor’s degree in engineering, mathematics or the physical or biological sciences, or a related field from a recognized U.S. or international university. Applicants should have a preferred performance level of at least a 3.00 grade point average (on a 4.00 grading scale). Students having lower grade point averages may be admitted subject to review and approval by the graduate program committee and meeting prior conditions agreed upon by the adviser, student, and the graduate program committee. Students planning to work toward the Ph.D. may apply to the M.S.B.B.S.E.M. program and earn a master’s degree on the way to earning the Ph.D, or may apply directly to the Ph.D. program.

Special Application Requirements —The Graduate Records Examination (GRE) is not required, but GRE scores are highly recommended for students who have degrees from institutions outside the United States, or have a low GPA. The GRE is required for consideration of graduate fellowships. Students are admitted each semester.

Courses—Refer to Bioproducts and Biosystems Engineering (BBE) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

M.S.B.B.S.E.M. Degree Requirements
Students are required to complete a minimum of 14 course credits in the major field, 6 course credits in a related field or a minor for master’s degree. Major field is defined as subject areas directly in the area of study. Plan A students must take an additional 10 thesis credits (BBE 8777). Plan B is similar to the Plan A except that instead of completing a major research project and writing a thesis, students complete a smaller project or projects that involve a total of about 120 hours of work and write Plan B papers on their projects. Plan B students take 20 course credits plus 10 credits in areas agreed upon by the adviser and graduate faculty. The program of study with detailed coursework plan must be approved by the director of graduate studies and selected faculty member(s) from graduate program committee.

Language Requirements—None.

Final Exam—Students must present a public seminar and pass a final oral exam. Students must also meet all Graduate School requirements regarding the final exam.

Minor Requirements for Students Majoring in Other Fields—A minor consists of at least 6 credits of BBE courses numbered 4xxx or higher.

Ph.D. Degree Requirements
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.

Language Requirements—None.

Final Exam—Students must pass preliminary written and oral exams, write a dissertation, and pass a final oral exam. Students must also meet all Graduate School requirements regarding the final exam.

Minor Requirements for Students Majoring in Other Fields—A minor consists of at least 12 credits of BBE courses numbered 4xxx or higher.

Biostatistics

Contact Information—Student Services Center, School of Public Health, University of Minnesota, MMC 819, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-3500 or 1-800-774-8636; fax 612-626-6931; sph-ssc@umn.edu; www.sph.umn.edu or www.biostat.umn.edu). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Bradley P. Carlin, SM
John E. Connell, SM
Chap T. Le, SM
James D. Neaton, SM
Wei Pan, SM

Adjunct Professor
Daniel J. Sargent, AM2
Jeffrey A. Sloan, AM2

Associate Professor
Sudipto Banerjee, SM
Lynn E. Eberly, SM
Patricia M. Grumbach, SM
Birgit Grund, ASM
Timothy E. Hanson, SM
James S. Hodges, SM
Andrew Mugglin, M2
Cavan S. Reilly, SM
William Thomas, M2
Melanie M. Wall, SM

Assistant Professor
Saonli Basu, M2
Tracy L. Bergemann, M2
Susan Duval, AM2
Hongfei Guo, M2
Na Li, M2
Xianghua Luo, M2
Richard Maclehorse M2
David B. Nelson, M2
Kyle Rudser, M2
Baolin Wu, M2

Adjunct Assistant Professor
Karla Ballman, AM2
Judith A. Punyko, AM2

Research Associate
Katherine Huppler Hullsiek, M2
Robert E. Leduc, M2
Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

For application procedures, see the School of Public Health Web site at www.sph.umn.edu/pro.

Curriculum—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.

Prerequisites for Admission—For the M.S., multivariable calculus and linear algebra, an introductory course in applied statistics, and programming in C, Fortran, or other high-level programming language are required. For the Ph.D., a bachelor’s or master’s degree in mathematics, statistics, or biostatistics.

Three letters of recommendation and the GRE are required. Applicants should have an overall GPA of 3.10. Applicants to the M.S. program should have a GPA of 3.40 in quantitative courses, 450 on the verbal GRE, and 550 on the quantitative GRE. Applicants to the Ph.D. program should have a GPA of 3.70 in quantitative courses, 550 on the verbal GRE, and 650 on the quantitative GRE. Applicants to either program who are not native speakers of English should have a TOEFL score of 600 (paper), 250 (computer), or 100 (Internet), or a score of 7.0 on IELTS.

Special Application Requirements—Students should apply for admission during fall semester only. New students generally are not admitted in spring semester.

Courses—Refer to Public Health (PUBH), where most biostatistics courses are numbered 64xx, 74xx or 84xx, or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—No 4xxx courses may be used to satisfy any graduate degree program requirements in biostatistics.

M.S. Degree Requirements
For the M.S. Plan B degree, students must complete 11 courses with a GPA of 3.00, pass a written exam, complete the Plan B project, and pass a final oral exam. Most students need two years of full-time study to finish the degree. The required credits are divided among three areas: 1) seven required courses in statistical theory and biostatistics methods; 2) one elective course in health science; 3) three elective courses in biostatistics. Details of the program are in the Student Handbook at www.biostat.umn.edu. The M.S. Plan A thesis degree is for those who have completed advanced work, such as a Ph.D. in a mathematical science and who want to begin dissertation research in biostatistics methodology after only one year of coursework. Students complete at least 20 credits (14 in biostatistics and 6 in related fields), pass a written exam, complete the Plan A thesis, and a final oral exam.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—The master’s minor in biostatistics requires two courses from the following list: PUBH 7420, 7430, 7435, 7440, 7445, 7450. Details for minor requirements at www.biostat.umn.edu.

Ph.D. Degree Requirements
The Ph.D. program requires seven core courses (including mathematical statistics, linear models, probability models, and Bayesian methodology) 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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A masters minor for students majoring in statistics consists of two required courses, PUBH 7420 and 7450, and a choice of two courses from the following: PUBH 7455, 8442, 8452, 8462, 8472, 8482.

A doctoral minor for students in programs other than statistics consists of two required courses: either PUBH 7401, PUBH 7402, or PUBH 7405, PUBH 7406; and two courses from the following: PUBH 7407, 7420, 7430, 7435, 7440, 7445, 7450. Details for minor requirements at www.biostat.umn.edu.
Twin Cities Degree Programs and Faculty

John H. Kareken, (emeritus), Finance, ASM
Barbara J. Loken, Marketing and Logistics Management, SM
Erzo Luttmer, Economics, Finance, ASM
Ian H. Maitland, Strategic Management and Organization, SM
Alfred A. Marcus, Strategic Management and Organization, SM
Joan Meyers-Levy, Marketing and Logistics Management, SM
Christopher J. Nachtsheim, Operations and Management Science, SM
Timothy J. Nantell, Finance, SM
Mary L. Nichols, Strategic Management and Organization, SM
Akshay R. Rao, Marketing and Logistics Management, SM
Judith Rayburn, Accounting, SM
Kenneth J. Roering, Marketing and Logistics Management, SM
Robert W. Ruekert, Marketing and Logistics Management, SM
Harry J. Sapienza, Strategic Management and Organization, SM
Roger G. Schroeder, Operations and Management Science, SM
Myles Shaver, Strategic Management and Organization, SM
Kingshuk K. Sinha, Operations and Management Science, SM
Andrew H. Van de Ven, Strategic Management and Organization, SM
Jan Werner, Economics, Finance, ASM
Andrew F. Whitman, Human Resources and Industrial Relations, ASM
Andrew Winton, Finance, SM
Akbar Zaheer, Strategic Management and Organization, SM
Srila Zaheer, Strategic Management and Organization, SM
Shaker A. Zahra, Strategic Management and Organization, SM
Mahmood A. Zaidi, Human Resources and Industrial Relations, ASM

Associate Professor
Gediminas Adomavicius, Information and Decision Sciences, SM
Rajesh K. Aggarwal, Finance, SM
Rohini Ahiwalia, Marketing and Logistics Management, SM
Stuart Albert, Strategic Management and Organization, SM
Ravi Babna, Information and Decision Sciences, SM
Karen L. Donohue, Operations and Management Science, SM
Gordon L. Duke, Accounting, SM
Susan Meyer Goldstein, Operations and Management Science, SM
Zhaoyang Gu, Accounting, SM
Robert A. Hansen, Marketing and Logistics Management, SM
William Li, Operations and Management Science, SM
Kevin Linderman, Operations and Management Science, SM
Om Narasimhan, Marketing and Logistics Management, SM
Stephen T. Parente, Finance, SM
Paul E. M. Povel, Finance, SM
M. Johnny Rungtusanatham, Operations and Management Science, SM
Priti P. Shah, Strategic Management and Organization, SM
Pervin Shroff, Accounting, SM
Rajdeep Singh, Finance, SM
Mani R. Subramani, Information and Decision Sciences, SM
Paul Vaaler, Strategic Management and Organization, SM
Kathleen D. Vohs, Marketing and Logistics Management, SM
Mary E. Zeilmer-Bruhn, Strategic Management and Organization, SM

Assistant Professor
Santiago Badreshsh, Finance, M2
Frederico Belo, Finance, M2
Tony H. Cui, Marketing and Logistics Management, M2
Mingcheng Deng, Accounting, MS
Jane E. Ebert, Marketing and Logistics Management, M2
Daniel Forbes, Strategic Management and Organization, M2
Clayton Forester, Accounting, M2
Yu Gao, Accounting, M2
Jeremy Graveline, Finance, M2
Vladas Griskevicius, Marketing and Logistics Management, M2
Thomas Issaevitch, Accounting, M2
Sophie LeRoy, Strategic Management and Organization, M2
Arik Lifschitz, Strategic Management and Organization, M2
Felix Meschke, Finance, M2
Prokriti Mukherji, Marketing and Logistics Management, M2
Gautam Ray, Information and Decision Sciences, M2
Joseph Redden, Marketing and Logistics Management, M2
Yuqing Ren, Information and Decision Sciences, M2
Doriana Ruffino, Finance, M2
Rachna Shah, Operations and Management Science, M2
Enno Siemson, Operations and Management Science, M2
Gurneeta V. Singh, Strategic Management and Organization, M2
P. K. Toh, Strategic Management and Organization, M2
Carlos Torelli, Marketing and Logistics Management, M2
Yue T. Wang, Finance, M2
Jianfeng Yu, Finance, M2
Ivy Zhang, Accounting, M2

Lecturer
Gary W. Carter, AM2
James M. Gahlon, AM2
Thomas D. Legg, AM2
Terry Tranter, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 six areas of specialization: accounting, finance, information and decision sciences (including the management information systems and decision science subfields); marketing and logistics management; operations and management science; and strategic management and organization (covering the subfields of strategy, organization behavior, entrepreneurship and business-government-society, all of which include an international focus).

Prerequisites for Admission—Applicants must have completed a four-year undergraduate degree in any field of study. Admission depends on the applicants grades, test scores (GMAT or GRE), and strength of the letters of recommendation and statement of purpose.

Special Application Requirements—Applicants must submit to the Carlson School Ph.D. Program Office the following items: 1) one copy of the Graduate School application (downloaded from the ApplyYourself online application system); 2) official copies of the GMAT or GRE scores taken no more than five years prior to application to the Ph.D. Program Office; and 3) official TOEFL or IELTS scores (international applicants only). All other application materials (official application, application fee, statement of purpose, and three letters of recommendation) should be sent directly to the Graduate School through the ApplyYourself online application system. Applicants also need to have official transcripts submitted to the Graduate School from each college or university they have attended. Doctoral study begins in fall semester only. The application deadline is December 31 each year for fall admission consideration. Applications are evaluated on a rolling basis beginning late January and continuing through March.

Courses— Refer to Accounting (ACCT); Business Administration (BA); Finance (FINA); Information and Decision Sciences (IDSC); Management (MGMT); Marketing (MKTG); and Operations and Management Science (OMS) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to the approval of the adviser and director of graduate studies.
Ph.D. Degree Requirements
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 courses in the field of specialization, in research methodology, and in a minor or supporting program. Students in all areas must complete at minimum 40 semester credits of graduate coursework. All areas require a written and oral examination at the end of the second year, as well as a research paper requirement and dissertation proposal defense.

Accounting—This area of concentration requires a minimum of 12 credits from accounting Ph.D. seminars and a total of at least 40 credits of degree program coursework. Students may take a minimum of 16 credits in a minor area outside the Carlson School of Management, or at least 16 credits in supporting programs taken across fields relevant to their research interests, e.g., finance, economics, statistics, or psychology.

Finance—Finance is viewed as a field of applied economics. Students achieve a strong foundation in economic theory and empirical methods, while taking finance seminars and supporting/methods coursework. A minimum of 40 degree credits are required to move to the prelim stage. Supporting coursework typically consists of a doctoral-level sequence in microeconomic theory and econometric analysis. In addition, students should complete a minimum of 8 additional elective credits in economics, statistics, accounting, or a related field.

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, 8711, and 8801 sections 1 and 2. Research methods courses that students can take include regression, experimental design, multivariate statistics, and econometric modeling.

Marketing and Logistics Management—The department requires students to complete its Ph.D. seminars (at least 20 credits total) 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).

Operations and Management Science—Students must complete six OMS Ph.D. seminars (OMS 8651, 8652, 8711, 8721, 8735, and 8745). Students supplement this with at least 16 credits from outside the department for a minor or supporting program, plus methodology coursework in math or statistics. The department also recommends that students take MGMT 8302—Seminar in Organization Theory and one course in linear programming.

Strategic Management and Organization—Students are required to take at least five core MGMT Ph.D. seminars (20 cr), which must include one course from each of three areas (strategy, organization studies, ethics-international management-entrepreneurship), plus all remaining Ph.D. seminars in the student’s area of specialization (strategy, organization studies, etc.). Alternatively, students may choose to combine two areas as their major area of concentration (e.g., strategy/international management, organization studies/entrepreneurship). It is highly recommended that students take the department’s theory building seminar. As part of the supporting field requirement (16 cr), students must take 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, sociology).

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—For a doctoral minor, students must complete a cohesive program of at least 16 credits (at least four courses) of graduate work in one of the six areas of concentration. This program of study is developed in consultation with an adviser who is a full member of the graduate faculty in business administration.

Use of 4XXX Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

M.B.T. Plan B Degree Requirements
The M.B.T. requires 30 credits, including 6 credits in specified courses dealing with accounting and business and economic tax policy, 10 credits in specified tax courses, and 14 credits of elective tax courses. All students must have completed coursework in finance, marketing, accounting, economics, statistics, management, business law, operations management, information and decision sciences, and strategic management. Although not prerequisites for admission to the M.B.T. program, these courses must...
be completed before the degree is granted. They can be taken concurrently with M.B.T. program courses. Usually students who enter the program with business degrees have completed most, if not all, of this coursework.

Language Requirements—None.

Cell and Developmental Biology

See Molecular, Cellular, Developmental Biology and Genetics.

Cellular and Integrative Physiology

Contact Information—Cellular and Integrative Physiology Program, Department of Integrative Biology and Physiology, University of Minnesota, 6-125 Jackson Hall, 321 Church Street S.E., Minneapolis, MN 55455 (612-625-9178; fax 612-625-5149; http://physiology.med.umn.edu/grad/index.html).

Additional information concerning the Duluth campus is available by contacting the Academic Director of Graduate Studies, Department of Physiology and Pharmacology, University of Minnesota, 308 and 345 School of Medicine, 1035 University Drive, Duluth, MN 55812 (phys@umn.edu; www.med.umn.edu/duluth/about/PhysPharm/graduatePHSL.html as well as www.ahc.umn.edu/duluth/programs). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Robert P. Hebbel, Medicine, ASM

Professor
Mustafa N. Al’Absi, Medical School Duluth, AM2
Robert J. Bache, ASM
David A. Bernlohr, Biochemistry, Molecular Biology, and Biophysics, ASM
Peter B. Bitterman, Medicine, ASM
Frank B. Cerra, Surgery, ASM
William C. Engelhard, Surgery, ASM
John E. Foker, Surgery, ASM
Daniel J. Garry, SM
Goran B. Hellekant, Medical School Duluth, SM
Lois J. Heller, Medical School Duluth, SM
Paul A. Iaizzo, Surgery, SM
David H. Ingbar, Medicine, SM
Arthur S. Leon, Kinesiology, ASM
David G. Levitt, Integrative Biology and Physiology, SM
Walter C. Low, Neurosurgery, SM
Joseph M. Metzger, SM
Scott M. O’Grady, Animal Science, SM
John W. Osborne, Integrative Biology and Physiology, SM

Doris A. Taylor, Integrative Biology and Physiology, SM
LaDora V. Thompson, Physical Medicine and Rehabilitation, SM
Gerald W. Timm, Urologic Surgery, ASM
O. Douglas Wangensteen, Integrative Biology and Physiology, SM
Jianyi Zhang, Medicine, ASM

Adjunct Professor
Victor S. Koscheyev, SM

Associate Professor
W. Dale Branton, Neuroscience, ASM
Janet L. Fitzakerley, Medical School Duluth, M2
Jurgen F. Fohlmeister, Integrative Biology and Physiology, SM
Stephen A. Katz, Integrative Biology and Physiology, SM
David E. Mohrman, Medical School Duluth, M2
Edward K. Stauffer, Medical School Duluth, M2
Lorentz E. Wittmers Jr., Medical School Duluth, SM
Kathleen R. Zahs, Integrative Biology and Physiology, M2

Assistant Professor
Vincent A. Barnett, Integrative Biology and Physiology, M2
Glenn H. Nordehn, Medical School Duluth, AM2
Anthony J. Weinhaus, Integrative Biology and Physiology, M2

Lecturer
Lisa Carney Anderson, Integrative Biology and Physiology, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 programs in the Twin Cities have a cardiovascular emphasis, although other areas of specialization are represented. Students enter the M.S. program from one of two sites. On the Duluth campus, students can enroll in coursework and participate in research in several basic areas. The Twin Cities campus has a masters program that focuses on training people working in various biotechnology, biomedical, and bioengineering companies in the Twin Cities area. Such individuals working on relevant physiological projects may benefit from this formal training. The curriculum can be blended into a part-time graduate program, allowing continued employment while working for the M.S. degree.

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 includes 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.

Prerequisites for Admission—For the major, 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 M.S. and 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 or spring semester. The graduate program’s Web site (above) contains step by step application instructions.

Courses—Refer to Physiology (PHSL) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xx courses on Degree Program Forms is subject to both adviser and director of graduate studies approval.
M.S. Degree Requirements

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—A degree for individuals involved in research and employed at local companies 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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A minimum of 6 graduate credits in physiology is required (with approval by the director of graduate studies).

Ph.D. Degree Requirements

The Ph.D. program requires courses in cellular physiology and medical physiology. The coursework is tailored to the student’s interests with input from the director of graduate studies and the adviser. During the first year, students rotate through three laboratories, 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. 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.

Language Requirements—None.

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. Approval is required by the director of graduate studies.

Chemical Engineering and Materials Science and Engineering

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; cemsgrad@umn.edu; www.cems.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Frank S. Bates, SM
Lanny D. Schmidt, SM

Professor
Eray S. Aydil, SM
Roberto Ballarini, Civil Engineering, ASM
Victor H. Barocas, Biomedical Engineering, ASM
Raul Caretta, SM
Edward L. Cusser, SM
Prodromos Daoutidis, SM
Jeffrey J. Derby, SM
Lorraine F. Francis, SM
C. Daniel Frisbie, SM
William W. Gerberich, SM
Steven L. Girshick, Mechanical Engineering, ASM
Wayne L. Gladfelter, Chemistry, ASM
J. Woods Halley, Physics and Astronomy, ASM
Marc A. Hillmyer, Chemistry, ASM
Wei-Shou Hu, SM
Kenneth H. Keller, SM
David L. Kohliedt, Geology and Geophysics, ASM
Uwe R. Kortshagen, Mechanical Engineering, ASM
Timothy P. Lodge, SM
Christopher W. Macosko, SM
Alon V. McCormick, SM
David J. Norris, SM
David J. Odde, Biomedical Engineering, ASM
Hans G. Othmer, Mathematics, ASM
David A. Shores, SM
Ronald A. Siegel, Pharmacy, ASM
J. Ilia Siepmann, Chemistry ASM
William H. Smyrl, SM
Friedrich Sieriec, SM
Robert T. Tranquillo, SM
Michael Tsapatsis, SM
Renata M. Wentzcovitch, SM

Associate Professor
Marcio D. Carvalho, ASM
Yiannis Kaznessis, SM
Satish Kumar, SM
Christopher Leighton, SM
David C. Morse, SM
Claudia Schmidt-Dannert, Biochemistry, Molecular Biology, and Biophysics, ASM
Beth Stadler, Electrical and Computer Engineering, ASM

Assistant Professor
Aditya Bhan, SM
Matteo Coccocioni, SM
Kevin D. Dorfman, SM
Russell J. Holmes, SM

Research Associate
Greg D. Haugstad, Characterization Facility, AM

Efrosini Kokkoli, SM
K. Andre Mkhoyan, SM
Chun Wang, Biomedical Engineering, ASM

Chemical Engineering and Materials Science and Engineering

Curriculum—Research activities are broadly organized in the areas of theory and computation; reaction engineering and chemical process synthesis; biotechnology and bioengineering; polymers; ceramics and metals; electronic and magnetic materials; and coating processes and interfacial engineering. The 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.

Prerequisites for Admission—A bachelor’s degree in chemical engineering, materials science, metallurgy, ceramics, polymer engineering, chemistry, physics, mechanical engineering, or electrical engineering is required. Applicants may be accepted without this prerequisite, but may be required to complete additional preparatory studies prescribed by their adviser or the director of graduate studies.

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
after admission. An M.S. is not a prerequisite for admission to the Ph.D. program. Students requesting a research assistantship from the department should apply directly to the Ph.D. program. Only under special circumstances will the department admit students requesting a research assistantship to the M.S. program.

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 scores of at least 560 (paper), 220 (computer), or 83 (Internet, including 21 on writing and 19 on reading) for the TOEFL. 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.

Research Centers and Facilities, Professional Courses, and Major Collaborating Programs—A number of outstanding interdisciplinary centers supplement the department, including the National Science Foundation Materials Research Science and Engineering Center, the Nanofabrication Center, the Materials Characterization Facility, the Corrosion Research Center, the Industrial Partnership for Research in Interfacial and Materials Engineering, the Army High Performance Computing Research Center, the BioTechnology Institute, the Institute for Theoretical Physics, the Minnesota Supercomputing Institute for Advanced Computational Research, and the Institute for Mathematics and its Applications. Department faculty and students participate in all of these centers, creating powerful facilities and many opportunities to explore interdisciplinary research interests.

Courses—Refer to Chemical Engineering (CHEN) and Materials Science (MATS) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Chemical engineering allows MATS 4214 to be taken for graduate credit. Materials science allows MATS 4212, 4214, 4221, 4301, and 4511 to be taken for graduate credit. All other CHEN or MATS 4xxx courses must have adviser and director of graduate studies approval.

M.Ch.E. or M.Mat.S.E. Design Project Degree Requirements
This professional master’s in engineering degree is designed for employees of local industries who wish to pursue their studies part-time. It is intended to provide a fifth year of professional work and is offered under the design project track. No financial support is available from the program. The M.Ch.E. and M.Mat.S.E. are terminal degrees. Only under exceptional circumstances is a student allowed to transfer to an M.S. program.

Both degrees require a minimum of 14 course credits in the major field and a minimum of 6 credits in the minor or related fields. The 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 for an M.S. thesis, the project can contain elements that the thesis would not, such as economic considerations, design consultation, and social relevance.

Language Requirements—None.

Final Exam—A final oral exam focused on the design project is required.

Minor Requirements for Students Majoring in Other Fields—Approval of the chemical engineering or materials science director of graduate studies is required for a master’s minor.

M.S.Ch.E. and M.S.Mat.S.E. Plan A Degree Requirements
The M.S.Ch.E. and M.S.Mat.S.E. are offered only under Plan A (with thesis). The degrees require a minimum of 14 course credits in the major and a minimum of 6 credits in a minor or in one or more related fields. The program normally is completed in about 18 months. Students interested in a degree without a thesis should consider the professional master’s in chemical engineering or materials science outlined above.

Many students entering these programs change to the Ph.D. program before or after completing the M.S. degree. Application for a change of status is done in consultation with the adviser and the director of graduate studies.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—Approval of the chemical engineering or materials science director of graduate studies is required for a master’s minor.

Ph.D. Degree Requirements
The Ph.D. is primarily a research degree and performance that leads to a research thesis is emphasized. Supporting coursework is planned in consultation with the adviser. The Ph.D. requires a minimum of 21 course credits within the major, and 12 course credits in a minor or supporting program.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—For a minor in chemical engineering or materials science, students must successfully complete at least four of the core graduate courses in the minor program and obtain approval by the director of graduate studies.

Chemical Physics

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; chmapply@umn.edu; www.chem.umn.edu/chemphys).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Allen M. Goldman, Physics, SM
Lanny D. Schmidt, Chemical Engineering and Materials Science, SM
Donald G. Truhlar, Chemistry, SM

Professor
Christopher J. Cramer, Chemistry, SM
David M. Ferguson, Medicinal Chemistry, Pharmacognosy, SM
C. Daniel Frisbie, Chemical Engineering and Materials Science, SM
Jiali Gao, Chemistry, SM
J. Woods Halley, Physics, SM
Cheng-Cher Huang, Physics, SM
Kenneth R. Leopold, Chemistry, SM
Sanford Lipsky, Chemistry, SM
Jeffrey T. Roberts, Chemistry, SM
J. Ilja Siepmann, Chemistry, SM
David D. Thomas, Biochemistry, SM
Renata M. Wentzcovitch, Chemical Engineering and Materials Science, SM
Xiaoyang ZHU, Chemistry, SM

Associate Professor
David A. Blank, Chemistry, SM
Philippe Bühlmann, Chemistry SM
Doreen G. Leopold, Chemistry, SM
David C. Morse, Chemical Engineering and Materials Science, SM
Gianluigi Veglia, Chemistry, SM
Darrin M. York, Chemistry, SM

Assistant Professor
Kevin D. Dorfman, Chemical Engineering and Materials Science, SM
Christy L. Haynes, Chemistry, SM
Aaron M. Massari, Chemistry, SM
Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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.

**Prerequisites for Admission**—Applicants should have adequate preparation in mathematics, physics, and chemistry. For financial support, applicants should apply either to the Department of Chemistry or the Department of Physics. Applicants not requiring financial support have their academic qualifications reviewed by the director of graduate studies in chemical physics.

**Special Application Requirements**—Three letters of recommendation are required.

**Courses**—Refer to Chemistry (CHEM), Physics (PHYS), Chemical Engineering (CHEN), Materials Science (MATS), Mathematics (MATH), Chemical Physics (CHPH) and Scientific Computation (SCIC) in the course section of this catalog or in **Twin Cities Courses** on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Only 4xxx courses from departments other than chemistry or physics are allowed. Approval is not needed for one 4xxx course; a second course may be allowed subject to director of graduate studies and adviser approval.

**M.S. Degree Requirements**
The M.S. degree offered under Plan A (with thesis) requires at least 20 course credits and 10 thesis credits. M.S. Plan B 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.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

**Ph.D. Degree Requirements**
A proficiency exam in physical chemistry is required. The Ph.D. program ordinarily consists of at least 24 course credits that include coursework in chemistry and/or physics with options for coursework in quantum mechanics, thermodynamics, statistical physics, and chemical dynamics. Students must also complete 24 thesis credits.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—Ph.D. minor requirements are determined by the director of the graduate studies, the student, and the adviser.

**Chemistry**

**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; chmapply@umn.edu; www.chem.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Regents Professor**
Frank S. Bates, Chemical Engineering and Materials Science, ASM
Lawrence Que Jr., SM
Donald G. Truhlar, SM

**Professor**
George Barany, SM
Victor A. Bloomfield, Biochemistry, ASM
Peter W. Carr, SM
Christopher J. Cramer, SM
John E. Ellis, SM
C. Daniel Frisbie, ASM
Jiali Gao, SM
Gunda Georg, Medicinal Chemistry, ASM
Wayne L. Gladfelter, SM
Gary Roland Gray, SM
Marc A. Hillmyer, SM
Thomas R. Hoye, SM
Steven R. Kass, SM
Kenneth R. Leopold, SM
John D. Lipscomb, Biochemistry, ASM
Sanford Lipsky, SM
Timothy P. Lodge, SM
Kent R. Mann, SM
Alon V. McCormick, Chemical Engineering and Materials Science, ASM
Wayland E. Noland, SM
David J. Norris, Chemical Engineering and Materials Science, ASM
Jeffrey T. Roberts, SM
J. Ilja Siepmann, SM
Andreas Stein, SM
William B. Tolman, SM
Carston R. Wagner, Pharmacy, ASM
Xiaoyang Zhu, SM

**Associate Professor**
Edgar A. Arriaga, SM
David A. Blank, SM
Michael T. Bowser, SM
Philippe Bühlmann, SM
Mark D. Distefano, SM
William B. Gleason, Laboratory Medicine and Pathology, ASM
Doreen G. Leopold, SM
Kristopher McNell, SM
R. Lee Penn, SM
T. Andrew Taton, SM
Giuliuigi Veglia, SM
Darrin M. York, SM

**Assistant Professor**
Christopher J. Douglas, SM
Andrew M. Harned, SM
Christy L. Haynes, SM
Aaron M. Massari, SM
Valerie C. Pierre, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—Graduate work in the Department of Chemistry is organized into six specialty areas: analytical chemistry, chemical biology, inorganic chemistry, materials chemistry, organic chemistry, and physical chemistry. Interdisciplinary work is also an option.

**Prerequisites for Admission**—Applicants must offer the substantial equivalent of the courses in analytical, inorganic, organic, and physical chemistry 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 79 (Internet) on the TOEFL, as well as GRE scores.

**Proficiency Examinations**—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, they are offered two more times during the academic year.
Courses—Refer to Chemistry (CHEM) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Only 4xxx courses from other departments are allowed. Approval is not needed for one 4xxx course; a second course may be allowed subject to director of graduate studies and adviser approval.

M.S. Degree Requirements

M.S. students are expected to pass the proficiency exam in their specialty area in their first academic year in residence. Plan A requires 20 course credits and 10 thesis credits; Plan B requires 30 course credits, which would include 8 credits for the two Plan B project courses.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—Six course credits from graduate-level chemistry courses are required for a master’s minor.

Ph.D. Degree Requirements

The Ph.D. program requires 24 course credits and 24 thesis credits. Students are also required to pass four out of five proficiency exams (see above) by the end of their first academic year in residence.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Twelve course credits from graduate-level chemistry courses are required for a Ph.D. minor.

Child Psychology

Contact Information—Child Psychology Program, University of Minnesota, 204 Child Development Building, 51 East River Road, Minneapolis, MN 55455 (612-624-4127; fax 612-624-6373; www.education.umn.edu/icd).


For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor

Megan R. Gunnar, SM

Professor

Dale A. Blyth, 4H Youth Development Center, AM2
Sandra L. Christenson, Educational Psychology, AM2
Dante Cicchetti, SM
Andrew Collins, SM
Nicki R. Crick, SM
Byron Egeland, SM
Xiaojia Ge, SM
Michael K. Georgieff, Pediatrics, SM
Harold D. Grotevant, Family Social Science, AM2
Susan C. Hupp, Educational Psychology, AM2
William Iacono, Psychology, ASM
Michael P. Maratos, SM
Ann S. Masten, SM
Scott R. McConnell, Educational Psychology, AM2
Herbert L. Pick Jr., SM
Arthur J. Reynolds, SM
Maria D. Sera, SM
Elsa G. Shapiro, Pediatrics, AM2
Jeffry A. Simpson, Psychology, AM2
L. Alan Sroufe, SM
Richard A. Weinberg, SM
Albert Yonas, SM
Steven R. Yussen, SM
Philip David Zelazo, SM

Associate Professor

Stephanie M. Carlson, SM
Canan Karatekin, SM
Monica Luciana, Psychology, ASM
Kathleen Thomas, SM

Assistant Professor

Abigail Gewirtz, SM
Melissa Koenig, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 applied areas may specialize in developmental psychopathology and clinical science or school psychology.

The developmental psychopathology and clinical science (DPCS) program is a cooperative effort between the Institute of Child Development and the Department of Psychology to train leaders in research and teaching. Training draws on the unique strengths of each program. Students are admitted to the Ph.D. program in child psychology through the Institute of Child Development and to this training program by the agreement of program faculty in both departments.

The APA-approved school psychology program is a cooperative program of the Institute of Child Development, the Department of Psychology, and the Department of Educational Psychology. Students are admitted jointly to one of the cooperating departments and to the school psychology program. Students must meet the standards and requirements of both the admitting department and the school psychology program.

Prerequisites for Admission—The equivalent of three semester (or four quarter) courses in psychology and one course in statistics are required.

Special Application Requirements—New students are normally admitted in fall semester. Application deadline is in December of the preceding year. Applicants must submit the departmental applications 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 official 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.

Courses—Refer to Child Psychology (CPSY) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Child psychology Ph.D. students may include 4xxx courses as part of their supporting program coursework with director of graduate studies’ approval and if the course is taught by a member of the graduate faculty in the supporting program.

M.A. Degree Requirements

The Institute of Child Development does not offer admission for a master’s degree. Students may choose to complete a master’s degree (typically Plan B) during their progress toward the Ph.D. Requirements for the M.A. are met through either Plan A or Plan B. Both require a full academic year of coursework.
Plan A requires a minimum of 20 course credits (a minimum of 14 in the major and 6 in the minor/related field) and 10 thesis credits.

Plan B requires 30 course credits, of which 14 credits must be in child psychology and 6 credits in one or more related fields. A project equivalent to 120 hours of work is also required.

**Language Requirements**—None.

**Final Exam**—The final exam for Plan A is oral; typically, the final exam for Plan B is written.

**Ph.D. Degree Requirements**

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, 14 credits in a supporting program, 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. Required courses include CPSY 8301, 8302, 8304, 8311, 8321, 8360, 8888, 8994, and statistics through EPSY 8263 or equivalent.

**Minor Requirements for Students Majoring in Other Fields**—A Ph.D. minor requires 12 credits in child psychology, to include CPSY 8301 (4 cr), 8302 (4 cr), and 8996 (1–6 cr). Remaining credits can be taken from 4xxx (subject to their own program’s approval) or 8xxx courses.

**Chinese**

See Asian Literatures, Cultures, and Media.

**Civil Engineering**

**Contact Information**—Department of Civil Engineering, University of Minnesota, 122 Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax 612-626-7750; civesgs@umn.edu; www.ce.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**

Roger E. A. Arndt, SM  
Roberto Ballarini, SM  
Patrick L. Brezonik, SM  
Steven L. Crouch, SM  
Gary A. Davis, SM  
Emmanuel M. Detournay, SM  
Andrew Drescher, SM  
Ef Foufoula-Georgiou, SM  
Catherine E. French, SM  
Theodore Galambos, (emeritus), ASM  
John S. Gulliver, SM  
Miki Hondzo, SM  
Joseph F. Labuz, SM  
Panos Michalopoulos, SM  
John L. Nieder, Bioproducts and Biosystems Engineering, ASM  
Chris Paola, Geology and Geophysics, ASM  
Arturo E. Schultz, SM  
Michael J. Semmens, SM  
Carol K. Sheld, SM  
Fotis Sotiropoulos, SM  
Heinz G. Stefan, SM  
Henryk K. Stolarski, SM  
Otto D. L. Strack, SM  
Vaughan R. Voller, SM  
Bruce N. Wilson, Bioproducts and Biosystems Engineering, AM2

**Adjunct Professor**

Peter A. Cundall, ASM

**Associate Professor**

William A. Arnold, SM  
Randal J. Barnes, SM  
Bojan B. Guzina, SM  
Raymond M. Hozalski, SM  
Gerald Johnson, M2  
Lev Khazanovich, SM  
Kevin J. Krizek, Urban and Regional Planning, AM2  
Timothy M. LaPara, SM  
David M. Levinson, SM  
Mihai O. Marasteanu, SM  
Paige J. Novak, SM  
Fernando Porté-Agél, SM  
Matt Simcik, Environmental Health Services, AM2

**Assistant Professor**

Jason Cao, Public Affairs, AM2  
Nikolas Geroliminis, SM  
Kimberly Hill, SM  
Henry Liu, SM  
Julian Marshall, SM  
Dylan B. Millet, Soil, Water, and Climate, AM2  
Taichiro Okazaki, SM  
Sangwon Suh, Bioproducts and Biosystems Engineering, AM2  
Brandy M Toner, Soil, Water, and Climate, AM2  
Steven F. Wojtkiewicz, SM

**Adjunct Assistant Professor**

Paul D. Capel, AM2

**Senior Research Associate**

John Hourdos, AM2  
Soﬁa G. Mogilevskaya, ASM  
Omid Mohseni, AM2  
Eugene Skok, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—Emphases are available in environmental engineering (e.g., pollutant fate and transport, process modeling, soil and groundwater remediation, water and wastewater treatment), geomechanics engineering (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).

**Prerequisites for Admission**—A bachelor’s degree in an engineering, basic science, or mathematics program is preferred. 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. For the M.C.E. program, an ABET-accredited bachelor’s degree in engineering is required.

**Special Application Requirements**—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 31 in order to begin the following fall semester.

**Courses**—Refer to Civil Engineering (CE) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Inclusion of 4xxx department courses is subject to adviser and director of graduate studies approval. Students from other majors may include such courses subject to their own program’s approval. 4xxx courses can not be required courses for undergrad civil or geological engineering undergraduate majors.

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
M.C.E. Coursework Only and Design Project Degree Requirements

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 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 12 to 18 months to complete on a full-time basis. The M.C.E. degree requires 30 credits and is offered under two plans. One requires a minimum of 20 course credits and preparation of a design project (10 cr); the design project must be carried out by the student in consultation with a faculty adviser. The other plan is a coursework-only degree program and requires 30 course credits. At least 6 of the course credits must be taken outside the department for either plan.

Language Requirements—None.

Final Exam—A final oral exam is required.

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.

M.S. Degree Requirements

The master of science (M.S.) degree balances education in engineering fundamentals and design with research and development. The M.S. degree provides preparation for students wishing to pursue a career in industry or to continue studies toward a Ph.D. degree. Students are expected to follow a coherent program of coursework and research in one of the following subareas: 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 and typically takes 18 to 24 months to complete.

The M.S. degree requires 30 credits and is offered under two plans. Plan A emphasizes research and preparation of a thesis and Plan B emphasizes coursework. The thesis must be written on a research project carried out in consultation with a faculty adviser and should result in a scientific or technical contribution to the field. Under Plan B, students must demonstrate the ability to work independently and present the results of such work effectively by completing one to three Plan B papers as determined by the faculty adviser. A wide variety of studies have been submitted as Plan B papers, including computer programs, annotated bibliographies, field or laboratory investigations, and the analysis/design of special engineering problems. Plan A requires 20 course credits and 10 thesis credits. Plan B requires 30 course credits. At least 6 of the course credits must be taken outside the department for either Plan A or Plan B.

Language Requirements—None.

Final Exam—The final exam is oral.

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.

Ph.D. Degree Requirements

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 normally after completing the M.S. degree. The Ph.D. program is typically completed in five 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. A typical program consists of 45 credits of coursework beyond the bachelor’s degree, plus 24 thesis credits. A supporting program or minor consisting of at least 12 credits taken outside the department must be included. 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.

Language Requirements—None.

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.

Classical and Near Eastern Studies

Contact Information—Department of Classical and Near Eastern Studies, University of Minnesota, 245 Nicholson Hall, 216 Pillsbury Avenue S.E., Minneapolis, MN 55455 (612-625-5353; fax 612-624-4894; cnes@umn.edu; http://cnes.cla.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor

Thomas S. Clayton, English, ASM

Professor

Elizabeth Belfiore, SM
Andrea Berlin, SM
Frederick Cooper, Art History, ASM
Sheila McNally, Art History, ASM
S. Douglas Olson, SM
Sandra Peterson, Philosophy, ASM
Calvin J. Roetzel, SM
Theofanis G. Stavrou, History, ASM
Peter Wells, Anthropology, ASM

Associate Professor

Richard Graff, Rhetoric, ASM
Nita Krevans, SM
Bernard Levinson, SM
Christopher Nappa, SM
Oliver Nicholson, SM
Philip Sellew, SM
George Sheets, SM
John Steyaert, Art History, ASM
Eva Von Dassow, M2

Assistant Professor

Spencer Cole, M2
Andrew Gallia, History, AM2
Alex Jassen, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 appeals 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 M.A. can usually receive credit for some earlier coursework, subject to the approval of the graduate faculty and graduate school requirements. Related special facilities include the Center for Medieval Studies, the Center for Jewish Studies, and the Center for Modern Greek Studies.

Prerequisites for Admission—For the major track in ancient and medieval art and archaeology, a background in archaeology, art history, and history sufficient to begin graduate level studies in the discipline, and evidence of language-acquisition ability. For the major track in classics, sufficient knowledge to begin graduate reading courses in either Greek or Latin and at least intermediate ability in the other language. For the major tracks in Greek or Latin, sufficient knowledge to begin graduate reading courses in the language of the track. For the major in religions in antiquity, an undergraduate background in the field and sufficient knowledge to begin graduate reading courses in classical Hebrew, Greek, or Latin. Some course prerequisites can be made up on provisional admission.

Applications are welcome from students with undergraduate majors in fields such as ancient Near Eastern studies, art history, biblical studies, classical archaeology, classics, history, Jewish studies, linguistics, and religious studies.

Special Application Requirements—In addition to the online Graduate School application, applicants must send directly to the Department of Classical and Near Eastern Studies the department application (available on the department Web site); other supporting materials, including recommendations and a writing sample, can be uploaded directly into the Graduate School’s online application. For nonnative speakers of English, a copy of the TOEFL is required. Students may be admitted in any academic term, but financial assistance is normally available only to applicants admitted for fall semester (application deadline: January 4).

Courses—Refer to Akkadian (AKKA), Aramaic (ARM), Classical and Near Eastern Studies (CNES), Coptic (COPT), Greek (GRK), Hebrew (HEBR), Latin (LAT), Religious Studies (RELS), and Sumerian (SUM) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to prior approval by the adviser and the director of graduate studies.

Ancient and Medieval Art and Archaeology Track—M.A. Degree Requirements

The degree 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. The minimum requirement for Plan A is 38 credits (including 10 thesis credits), and for Plan B, 31 credits.

Language Requirements—Reading knowledge of one modern foreign language appropriate to the student’s program is required (normally German or French or Italian).

Final Exam—The final exams are written and oral.

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794, as well as 9 credits in graduate art/archaeology courses with a CNES designator.

Ancient and Medieval Art and Archaeology Track—Ph.D. Degree Requirements

The degree 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.

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794, as well as 12 credits in graduate art/archaeology courses with a CNES designator.

Classics Track—M.A. Degree Requirements

This program provides a 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 or German or Italian) and proficiency in reading 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).

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).

Classics Track—Ph.D. Degree Requirements

This program 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 proficiency in reading Greek.
and Latin as demonstrated by a department exam based on a set reading list is required.

**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 LAT 8120).

**Greek Track—M.A. Degree Requirements**

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 41 credits (including 10 thesis credits), and for Plan B, 31 credits.

**Language Requirements**—One modern research language as appropriate, preferably French or 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).

**Minor Requirements for Students Majoring in Other Fields**—Students must complete CNES 5794, as well as 9 graduate credits of Greek (excluding GRK 8120).

**Greek Track—Ph.D. Degree Requirements**

A core of advanced work in Greek 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 of ancient history in addition to completing all M.A. course requirements. 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 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 Ancient Greek as demonstrated by a department exam based on a set reading list is required.

**Minor Requirements for Students Majoring in Other Fields**—Students must complete CNES 5794, as well as 15 graduate credits in Greek (excluding GRK 8120).

**Latin Track—M.A. Degree Requirements**

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 41 credits (including 10 thesis credits), and for Plan B, 31 credits.

**Language Requirements**—One modern research language as appropriate, preferably German or 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).

**Minor Requirements for Students Majoring in Other Fields**—Students must complete CNES 5794, as well as 9 graduate credits of Latin (excluding LAT 8120).

**Latin Track—Ph.D. Degree Requirements**

A core of advanced work in Latin is supplemented by a minor or supporting program in a related field or area of interest. Students may study several ancient religions. The Plan A requires 28 credits in the major, 6 credits in a related field, plus 10 thesis credits. The Plan B requires 28 credits in the major plus 6 credits in a related field.

**Religions in Antiquity Track—M.A. Degree Requirements**

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. The Plan A requires 28 credits in the major, 6 credits in a related field, plus 10 thesis credits. The Plan B requires 28 credits in the major 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).

**Classics**

See Classical and Near Eastern Studies.

**Clinical Laboratory Science**

**Contact Information**—Clinical Laboratory Science Program, Center for Allied Health Programs, University of Minnesota, MMC 711, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-625-8952; fax 612-625-5901; cls@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Regents Professor**

Robert P. Hebbel, Medicine, M2

**Professor**

Fred S. Apple, Laboratory Medicine and Pathology, M2

Henry H. Balfour Jr., Laboratory Medicine and Pathology, M2

Paul P. Cleary, Microbiology, M2

Agustin P. Dalmaso, Laboratory Medicine and Pathology, M2

Gary M. Dunny, Microbiology, M2

John H. Eckfeldt, Laboratory Medicine and Pathology, M2

Patricia Ferrieri, Laboratory Medicine and Pathology, M2

Stephen S. Hecht, Laboratory Medicine and Pathology, M2

Tucker W. LeBien, Laboratory Medicine and Pathology, M2

J. Jeffrey McCullough, Laboratory Medicine and Pathology, M2

R. Scott Melvor, Laboratory Medicine and Pathology, M2

Gary L. Neslousten, Biochemistry, M2

Gundu H. R. Rao, Laboratory Medicine and Pathology, M2

Jagdev M. Sharma, Veterinary and Biomedical Sciences, M2

Amy P. Skubitz, Laboratory Medicine and Pathology, M2

Michael Y. Tsai, Laboratory Medicine and Pathology, M2

Daniel A. Vallera, Therapeutic Radiology, M2

Carol L. Wells, Laboratory Medicine and Pathology, M2

Michael J. Wilson, Laboratory Medicine and Pathology, M2
Associate Professor
Angela Panoskalitis-Mortari, Pediatrics, M2
William R. Swaim, Laboratory Medicine and Pathology, M2

Assistant Professor
Connie J. Gebhart, Veterinary and Biomedical Sciences, M2
Timothy C. Hallstrom, Laboratory Medicine and Pathology, M2
Kelli L. Hippen, Laboratory Medicine and Pathology, M2
Michael R. Vernereis, Pediatrics, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—This program offers students with basic science, medical technology, or M.D. backgrounds the opportunity to gain competence in a specialized area of laboratory medicine. It provides training in the research, supervisory, and teaching aspects of the field. Students pursue investigative work in one of six specialty areas: clinical chemistry, genetics/molecular genetics, hematology, immunology, microbiology, or laboratory management.

Prerequisites for Admission—A bachelor’s degree in a basic science or in medical technology, including standard college courses in organic/inorganic chemistry, biochemistry, physics, mathematics, and biology is required. Previous laboratory experience is desirable. M.D.s currently in a fellowship training program at the University of Minnesota are also eligible.

Special Application Requirements—Applicants must forward to the Clinical Laboratory Science Program three letters of recommendation, an autobiographical outline that includes a statement of career goals, and scores from the General Test of the GRE. A preferred TOEFL score of 550 (paper), 213 (computer), or 79 (Internet) is required for applicants whose native language is not English. For M.D. fellows at the University of Minnesota, the GRE and letters of recommendation are not required. However, the fellow’s division director should provide a letter of support for the applicant’s training.

Courses—See Clinical Laboratory Science (CLS) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—The program accepts CLSP 4xxx courses when cross-listed with CLS 5xxx courses and approved by the adviser and/or director of graduate studies, (e.g., CLSP 4102 and 4103—Diagnostics Microbiology: Lecture and Lab). However, credit will not be granted if the CLS equivalent of these CLSP courses was taken as part of an undergraduate degree.

M.S. Plan A Degree Requirements

The M.S. is a multidisciplinary program that prepares the medical technologist, basic science undergraduate, or M.D. fellow for a career in research, teaching, or industry within a specialized area of laboratory medicine. Students pursue investigative work in one of six specialty areas: clinical chemistry, genetics/molecular genetics, hematology, immunology, microbiology or laboratory management. Each area has required courses, but flexibility is maintained to allow students to choose some coursework that meets individual requirements and research interests.

Requirements include at least 17 credits in the specialty area, at least 6 credits in a minor area or in related fields outside the specialty area, 10 thesis credits, and 2 student seminar credits.

Language Requirements—None.

Final Exam—The final exam is oral.

Clinical Research

Contact Information—Student Services Center, School of Public Health, University of Minnesota, MMC 819, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-3500; fax 612-626-6931; sph-ssc@umn.edu; www.sph.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

Professor
Gregory J. Beilman, Surgery, M2
Donna Z. Bliss, Nursing, M2
Hanna Bloomfield, Medicine, M2
Jay Cohn, Medicine, M2
Allan J. Collins, Medicine, M2
Daniel Duprez, Medicine, M2
Maurice Dysken, Psychiatry, M2
Kristine E. Ensrud, Medicine, M2
Michael Garwood, Radiology, M2
Richard H. Grimm, Medicine, M2
Dorothy Hatsukami, Psychiatry, M2
Bernhard J. Hering, Surgery, M2
James R. Johnson, Medicine, M2
Jeffrey Kahn, Bioethics, M2
Frank Lederle, Medicine, M2
Russell V. Luepker, Epidemiology and Community Health, M2
Robert Madoff, Surgery, M2
Philip McGlave, Medicine, M2
Jeffrey S. Miller, Medicine, M2
Antoinette Moran, Pediatrics, M2
Jim D. Neaton, Biostatistics, M2
Joseph Neglia, Pediatrics, M2
Dennis Niewoehner, Medicine, M2
Mark S. Paller, Medicine, M2
Bruce A. Peterson, Surgery, M2
Julie Ross, Pediatrics, M2
David Rothenberger, Surgery, M2
S. Charles Schulz, Psychiatry, M2
Elizabeth R. Seagust, Medicine, M2
Alan R. Sinaiko, Medicine, M2
David E. Sutherland, Surgery, M2
Daniel J. Weisdorf, Medicine, M2
Douglas Yee, Medicine, M2

Associate Professor
K. Scott Baker, Pediatrics, M2
Paul Bohjanen, Microbiology, M2
Tracie C. Collins, Medicine, M2
Patricia Fontaine Conboy, Family Medicine and Community Health, M2
Edward W. Greeno, Medicine, M2
Pankaj Gupta, Medicine, M2
Alan T. Hirsch, Medicine, M2
Hassan N. Ibrahim, Medicine, M2
Mike T. John, Diagnostic/Biological Sciences, M2
Robert Kratzke, Medicine, M2
Anna Petryk, Pediatrics, M2
Julia Steinberger, Pediatrics, M2
Marie E. Steiner, Pediatrics, M2
John William Thomas, Biostatistics, M2
Todd Tuttle, Surgery, M2
Beth A. Virnig, Health Policy/Management, M2

Assistant Professor
Alan K. Berger, Medicine, M2
Susan J. Duval, Epidemiology and Community Health, M2
Steven S. Fu, Medicine, M2
Ajay Israni, Epidemiology and Community Health, M2
Carolyn Torkelson, Family Medicine and Community Health, M2
Timothy P. Whelan, Medicine, M2
Mark W. Yeazel, Family Medicine and Community Health, M2

Senior Research Associate
John O. Look, Developmental/Surgical Sciences, M2

Other
Jasjit Ailhuwalia, Medicine, M2
Mary Jo Kreitzer, Center for Spirituality and Healing, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—This interdisciplinary program trains health professionals to design, implement, and manage research in human populations. Because the field is fast becoming more complex, sophisticated, and regulated, there is an emerging recognition of, and demand for, formalized training. This program focuses primarily on patient-oriented health research, including mechanisms of human disease, therapeutic interventions, clinical trials, and development of new techniques. It focuses less on epidemiologic and behavioral studies.
or on outcomes research and health services research; students interested in these areas may be better served by seeking a master of public health (M.P.H.) degree.

**Prerequisites for Admission**—The program is designed for individuals interested in a research career in academia, industry, research institutes, health agencies, or regulatory agencies. Applicants must have an advanced health professional degree such as M.D., D.D.S., D.O., D.N.P., D.C., D.V.M., Pharm.D., Ph.D., or advanced doctoral degree in a clinical biomedical field; or advanced nursing degree (e.g., M.S. in nursing). Students must have completed or 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**—In addition to the School of Public Health requirements listed in their catalog, the M.S. has specific application requirements including a health science professional degree, and training sufficient to be eligible for a license to practice as supported in the form of an official transcript. An official TOEFL score with a preferred performance level of at least 600 (paper), 250 (computer) or 100 (Internet) is required of international students who have earned all of their degrees from non-native English speaking countries. There are three exceptions: 1) Students who have taken and successfully passed the ECFMG or USMLE exams do not need to submit a TOEFL score. 2) University of Minnesota medical fellows or medical fellow specialists who have taken at least 24 credits as part of their University fellowship are exempt from providing an official TOEFL score if they provide a transcript of these credits. 3) Students who have taken the MELAB as an alternative exam to the TOEFL. The GRE is not required. 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.

**NOTE:** faculty members at the University of Minnesota above the rank of instructor have additional administrative procedures required by the Graduate School. Contact the major coordinator at epichstu@umn.edu early in the process.

For an online application, see the School of Public Health Web site at www.sph.umn.edu/education/cr/home.html or www.grad.umn.edu/current_students/forms/cos.pdf.

**Courses**—Refer to the clinical research program available on the School of Public Health Web site at www.sph.umn.edu/education/cr/home.html for courses pertaining to the program.

**Use of 4xxx Courses**—Inclusion of any 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

### M.S. Plan A Requirements

The M.S. requires 38 credits, including 3 elective credits and 10 thesis credits. Coursework in clinical research, biostatistics, epidemiology, clinical trials, grant writing, and ethics are required. Elective courses are chosen in consultation with an adviser. The thesis requires an active role in an ongoing approved clinical research project, and has specific requirements which are clarified in the student guidebook.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**—The master’s minor requires at least 6 credits. Contact the major coordinator for more information at epichstu@umn.edu.

### Cognitive Science

**Contact Information**—Center for Cognitive Sciences, University of Minnesota, 205 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-625-9367; fax 612-626-7253; cogsci@umn.edu; www.cogsci.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

**Regents Professor**

Apostolos Georgopoulos, Neuroscience, SM

**Professor**

James Ashe, Neuroscience, ASM

Andrew Elfenbein, English, M2

Maria Gini, Computer Science and Engineering, SM

Jeanette Gundel, Linguistics, SM

Sheng He, Psychology, SM

Paul Johnson, Information and Decision Sciences, SM

Michael Kac, Philosophy, M2

Daniel J. Kersten, Psychology, SM

Gordon Legge, Psychology, SM

Michael P. Maratos, Child Development, SM

Chad James Marsolek, Psychology, SM

Bruce Overmier, Psychology, SM

Herb Pick, Child Development, SM

Wade Savage, (emeritus), Philosophy, ASM

Maria Sera, Child Development, SM

Dave Stephens, Ecology, Evolution, and Behavior, M2

Albert Yonas, Child Development, SM

**Associate Professor**

Charles R. Fletcher, Psychology, SM

Jonathan Gewertz, Psychology, SM

Yuhong Jiang, Psychology, SM

Mary Kennedy, Speech, Language, and Hearing Sciences, M2

David Redish, Neuroscience, M2

Hooi Ling Soh, Linguistics, M2

**Adjunct Associate Professor**

Celia Wolk Gershenson, Psychology, M2

**Assistant Professor**

Matthew Chafee, Neuroscience, M2

Peter Hanks, Philosophy, M2

Victoria Interrante, Computer Science and Engineering, M2

Bernard Mettler, Aerospace Engineering and Mechanics, M2

Serguei Pakhomov, Pharmaceutical and Health Care, M2

Paul Schrater, Psychology, M2

William Schuler, Computer Science and Engineering, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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.

**Prerequisites for Admission**—There are no specific prerequisites for admission. Students admitted normally have a broad undergraduate background that includes some cognitive science courses. Students may also be admitted with an M.A. in a related discipline (e.g. psychology, linguistics, philosophy, computer science), in which case some of their credits from the M.A. may count towards the cognitive science Ph.D.

**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.

Courses—Refer to Cognitive Science (CGSC) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program. Due to the interdisciplinary nature of the degree, courses from various programs throughout the university are also integrated into the degree program. See www.cogsciphd.umn.edu for a list of relevant courses.

Use of 4xxx Courses—Inclusion of 4xxx courses in degree programs is subject to adviser and director of graduate studies approval.

Ph.D. Requirements
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.

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.

Final Exam—The final exam is oral.

Language Requirements—None

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.

Communication Disorders

Communication Studies

Contact Information—Department of Communication Studies, University of Minnesota, 225 Ford Hall, 224 Church Street S.E., Minneapolis, MN 55455 (612-624-5800; www.comm.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Elaine Tyler May, ASM

Professor
Donald B. Browne, SM
Karyn K. Campbell, SM
W. Andrew Collins, ASM
Alan G. Gross, SM
Laura J. Gurak, ASM
Dean E. Hewes, SM
Edward Schiappa, SM
Mary M. Lay Schuster, ASM

Robert L. Scott, (emeritus), ASM
Amy L. Sheldon, SM
Michael Sunnafrank, Communication, Duluth, AM2
Arthur E. Walzer, SM

Associate Professor
Rosita D. Albert, SM
Richard J. Graff, Writing Studies, ASM
Ronald W. Greene, SM
Susanne M. Jones, SM
Ascan F. Koerner, SM
Laurie Ouellette, ASM
Gilbert Rodman, SM
Catherine Squires, ASM
Mary D. Vavrus, SM
Kirt H. Wilson, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 electronic media studies, feminist media studies, ethnic and racial minorities in media, critical media literacy, political economy of media, popular culture, and media regulation and industries. Coursework outside the department is usually in the
fields of American studies, political science, cultural studies, mass communication, or women’s studies.

**Prerequisites for 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. All prerequisites must be completed before admission.

**Special Application Requirements**—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. A deadline of January 1 is recommended for students applying for teaching assistantships or University fellowships for the following academic year.

**Courses**—Refer to Communication Studies (COMM) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Inclusion of 4xxx courses on Degree Program 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.

**M.A. Degree Requirements**
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.

**Language Requirements**—None.

**Ph.D. Degree Requirements**
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 related field or official graduate school 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.

**Language Requirements**—None.

**Comparative and Molecular Biosciences**

**Contact Information**—Director of Graduate Studies, Comparative and Molecular Biosciences Graduate Program, College of Veterinary Medicine, 443VMC, 1365 Gortner Avenue, Saint Paul, MN 55108 (612-626-1948; fax 612-626-2825; cvmmssp@umn.edu; www.cvm.umn.edu/cmb).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**
Alvin J. Beitz, Veterinary and Biomedical Sciences, SM
David R. Brown, Veterinary and Biomedical Sciences, SM
Cathy Sue Carlson, Veterinary Population Medicine, SM
Michael Conzemius, Veterinary Clinical Sciences, SM
Stephen Ekker, Genomics, SM
Douglas N. Foster, Animal Science, SM
Sagar Goyal, Veterinary Population Medicine, SM
Richard Isaacson, Veterinary and Biomedical Sciences, SM
Mathur S. Kannan, Veterinary and Biomedical Sciences, SM
David Largaespada, Genetics, Cell Biology and Development, SM
Alice A. Larson, Veterinary and Biomedical Sciences, SM
Samuel K. Maheswaran, Veterinary and Biomedical Sciences, SM
Louis Mansky, Diagnostic and Biological Sciences, SM
James R. Mickelson, Veterinary and Biomedical Sciences, SM
Jaime Modiano, Veterinary Clinical Sciences, SM
Thomas W. Molitor, Veterinary Population Medicine, SM
Michael P. Murtough, Veterinary and Biomedical Sciences, SM
Scott M. O’Grady, Animal Science, SM
Clifford Steer, Medicine, SM
Stephanie J. Valberg, Veterinary Population Medicine, SM
Robert Washabau, Veterinary Clinical Sciences, SM

**Associate Professor**
John Collister, Veterinary and Biomedical Sciences, SM
Kay S. Faaberg, Veterinary and Biomedical Sciences, SM
Scott Fahrenkrug, Animal Science, SM
Rueben Harris, Biochemistry, Molecular Biology and Biophysics, SM
Yinduo Ji, Veterinary and Biomedical Sciences, SM
James R. Lokensgard, Medicine, SM
Laura J. Mauro, Animal Science, SM
Elizabeth Pluhar, Veterinary Clinical Sciences, SM
Kent Reed, Veterinary and Biomedical Sciences, SM
Mark S. Rutherford, Veterinary and Biomedical Sciences, SM
Leslie Sharkey, Veterinary Population Medicine, SM
Randall Singer, Veterinary and Biomedical Sciences, SM
Srinand Sreevatsan, Veterinary Population Medicine, SM
Anthony Tobias, Veterinary Clinical Sciences, SM
Bruce K. Walcheck, Veterinary and Biomedical Sciences, SM
Scott Wells, Veterinary Population Medicine, SM

**Assistant Professor**
Maxim Cheean, Medicine, SM
Timothy Johnson, Veterinary and Biomedical Sciences, M2
Kim Mansky, Dentistry, M2
John Ohlifest, Pediatrics, M2
Pratima Pakala, Surgery, M2
Ned Patterson, Veterinary Clinical Sciences, SM
Pam Skinner, Veterinary and Biomedical Sciences, SM
Catherine St. Hill, Veterinary Clinical Sciences, M2
Troy Trumble, Veterinary Population Medicine, M2
Lucy Vulchanova, Veterinary and Biomedical Sciences, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—The comparative and molecular biosciences (CMB) graduate program is interdisciplinary and intercollegiate, drawing faculty from the College of Veterinary Medicine; Medical School; College of Food, Agricultural and Natural Resource Sciences; and School of Public Health. The mission of the CMB graduate program is to train outstanding researchers in the basic mechanisms of animal and human health and disease. The program brings together both basic and clinical scientists to provide students with individualized, cutting-edge research training on the causes, mechanisms, and manifestations of disease. Broad areas of research focus include genetic and
infectious diseases, and comparative aspects of biology and pathology across various species. Specific research disciplines include immunology, microbiology, pathology, genetics and genomics, cellular and molecular biology, neuroscience, physiology, and pharmacology. The scientific training students experience lead to careers as independent investigators in academia, industry, and government.

**Prerequisites for Admission**—A bachelor’s degree in a biological or basic science is required. Previous laboratory experience is strongly preferred.

**Special Application Requirements**—Applicants must submit scores from the GRE General Test, a C.V. or résumé, 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 research experience as well as career interests, goals, and objectives. International students are also required to submit official TOEFL scores. Students may apply at any time; however, submission of all application materials by January 1 is required to ensure consideration for fellowships and research assistantships awarded for the next academic year. Students are typically admitted for fall semester.

**Courses**—Refer to Comparative and Molecular Biosciences (CMB) in the course section of this catalog or in **Twin Cities Courses** on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Use of 4xxx courses is not permitted toward degree requirements.

**M.S. Plan A Degree Requirements**
The M.S. requires a core curriculum of fundamental coursework and laboratory experiences as well as at least 6 course credits in a minor or related field. Students complete a minimum of 20 course credits and 10 thesis credits; the thesis is based on original laboratory research.

**Language Requirements**—None.

**Final Exam**—The final exam is written and oral.

**Ph.D. Degree Requirements**
The Ph.D. requires a core curriculum of fundamental coursework and laboratory experiences as well as at least 12 credits of minor/supporting program courses. Considerable flexibility is available for students in selecting their minor/supporting program courses to construct a program around their own interests and research. Students typically complete 24–30 credits in the major field and 12 credits in a minor or supporting program for a recommended total of 36–42 credits. In addition, 24 thesis credits are required. All students are required to complete a teaching experience.

**Language Requirements**—None.

### Comparative Literature

#### Contact Information
Department of Cultural Studies and Comparative Literature, University of Minnesota, 235 Nicholson Hall, 216 Pillsbury Drive S.E. (612-624-8099); fax 612-626-0228; complit@umn.edu; http://complit.cla.umn.edu.

For latest graduate faculty listings, see [www.grad.umn.edu/faculty/rosters/faculty.html](http://www.grad.umn.edu/faculty/rosters/faculty.html).

**Regents Professor**
Richard Leppert, SM

**Professor**
Timothy Brennan, SM
John Mowitt, SM
Harvey Sarles, SM
Jochen Schulte-Sasse, German, Scandinavian, and Dutch, SM
Nicholas Spadaccini, Spanish and Portuguese Studies, AM2
Arlene Teraoka, German, Scandinavian, and Dutch, ASM
Jack Zipes, German, Scandinavian, and Dutch, ASM

**Associate Professor**
Maria Brewer, French and Italian, ASM
Jane Blocker, Art History, ASM
Robert Brown, SM
Cesare Casarino, SM
Keya Ganguly, SM
Leslie Morris, German, Scandinavian, and Dutch, ASM
Thomas Pepper, SM
Simona Sawhney, Asian Languages and Literatures, AM2
Gary Thomas, SM

**Assistant Professor**
Hisham Bizri, SM
Shaden Tageldin, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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, the University 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 inquiry, directing much of its energies toward emergent literatures, within both First- and Third-World cultures, as well as toward related problems ranging from narrative to postcolonial studies.

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, and sociology. In all cases, students should consult with an adviser concerning course selections.

**Prerequisites for Admission**—Although most students in the program have undergraduate majors in language or literature, applicants with other undergraduate backgrounds are considered.

**Special Application Requirements**—Scores from the General (Aptitude) Test of the GRE are required. Applications for admission as well as applications for financial aid are generally due the first week in December. Check the department Web site for specific dates.

**Courses**—Refer to Comparative Literature (CL) in the course section of this catalog, the current Class Schedule, and flyers available in the department office or in **Twin Cities Courses** on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Use of 4xxx courses may be permitted in majors or minors for the M.A. or Ph.D. degree with the approval of the adviser and director of graduate studies.

### M.A. Plan B Degree Requirements

Students normally are not admitted to work toward the M.A. degree, but in the event that they are in good standing and decide not to finish the Ph.D., they may apply for a terminal M.A. Twenty-nine credits of coursework including 6 credits of the basic seminar (CL 8001–8002), 3 credits of CSDS 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, and 3 credits either in CL courses or in the related minor field are required. One Plan B paper is required.

**Language Requirements**—In addition to English, high proficiency in one language and basic proficiency in another language.
are required. The choice of languages is made with respect to the student’s area of specialization and in consultation with, and approval of, the adviser.

**Final Exam**—The final exams are written and oral.

**Minor Requirements for Students Majoring in Other Fields**—A minimum of 12 credits are required for a master’s minor, which must include CL 8001 and 8002.

**Ph.D. Degree Requirements**

The Ph.D. requires 47 credits as follows: 6 credits of the basic seminar (CL 8001–8002), 3 credits of CSDS 8901—Pedagogy of Cultural Studies and Comparative Literature, 2 credits of CL 8902—Methodologies Colloquium, 24 credits in CL courses (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), and 12 credits in coursework that constitutes a supporting program. A supporting program may be a formal Graduate School minor, or it may be a program designed by students in consultation with their advisers. Overall, the degree should include 12 credits of 8xxx courses (exclusive of CL 8001-8002 and 8901). 24 thesis credits are also required.

**Language Requirements**—In addition to high proficiency in English, the following language competencies are required: high proficiency in a second language (may include native tongue if not English) and basic proficiency in two additional languages. The choice of languages is made with respect to the student’s area of specialization and in consultation with and approval of, the adviser. Language requirements must be completed before taking the preliminary examination.

**Minor Requirements for Students Majoring in Other Fields**—A minimum of 12 credits is required for the doctoral minor and must include CL 8001 and 8002.

**Comparative Studies in Discourse and Society**

**Contact Information**—Department of Cultural Studies and Comparative Literature, University of Minnesota, 235 Nicholson Hall, 216 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-8099; fax 612-626-0228; csds@umn.edu; http://clds.cla.umn.edu).

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.grad.umn.edu/faculty_rosters/faculty.html).

**Regents Professor**  
Richard Leppert, SM

**Professor**  
John Archer, SM  
Timothy Brennan, SM  
Ellen Messer-Davidow, ASM  
John Mowitt, SM  
Paula Rabinowitz, ASM  
Harvey Sarlese, SM  
Jochen Schulte-Sasse, German, Scandinavian, and Dutch, SM  
Arlene Teroaka, German, Scandinavian, and Dutch, ASM  
Jack D. Zipes, German, Scandinavian, and Dutch, ASM

**Associate Professor**  
Jane Blocker, Art History, ASM  
Robert Brown Jr., SM  
Cesare Casarino, SM  
Maria Damon, English, ASM  
Keya Ganguly, SM  
Roger P. Miller, Geography, ASM  
Leslie Morris, German, Scandinavian, and Dutch, ASM  
Thomas Pepper, SM  
Katherine Solomonson, Architecture, ASM  
Gary C. Thompson, SM  
Jacquelyn N. Zita, Gender, Women, and Sexuality Studies, ASM

**Assistant Professor**  
Hisham Bizri, SM  
Shaden Tageldin, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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 research seminar that develops critical and analytic skills and introduces current theoretical perspectives with the study of historical problems. 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. Apart from the basic research seminar, each entering graduate student enrolls in CSDS 8901—Pedagogy of Cultural Studies and Comparative Literature, which focuses on developing skills and experience in teaching and other professional concerns, and CSDS 8902—Methodologies Colloquium, which introduces students to the research interests and approaches of the core faculty.

**Prerequisites for Admission**—Applicants are required to have a B.A. in a humanities or social science discipline or other relevant field with clear evidence of comparative work. Because the program involves broad, often interdisciplinary, courses of study and a variety of emphases, the graduate admissions committee carefully reviews each applicant’s background in terms of analytical skills, knowledge of subject matter, experience, language preparation, and especially, congruity with faculty interests and expertise.

**Special Application Requirements**—Scores from the General (Aptitude) Test of the GRE are required. Applications for admission as well as applications for financial aid are generally due the first week in December. Check the department Web site for specific dates.

**Courses**—Refer to Comparative Studies in Discourse and Society (CSDS) in the course section of this catalog, the current Class Schedule, and the department Web site or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—4xxx courses may be included in majors or minors for the M.A. or Ph.D. degree with the approval of the adviser and director of graduate studies.

**M.A. Plan B Degree Requirements**

Students normally are not admitted to work toward the M.A. degree, the event that they are in good standing and decide not to finish the Ph.D., they may apply for a terminal M.A. Twenty-nine credits of coursework including 6 credits of the basic seminar (CL 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, and 3 credits either in CSDS courses or in the related minor field are required. One Plan B paper is required.

Language Requirements—Reading knowledge of one foreign language appropriate to the student’s program is required.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 credits is required for a master’s minor, which must include CSDS 8001 and 8002.

Ph.D. Degree Requirements
The Ph.D. requires 47 graduate credits of coursework as follows: 6 credits of basic seminar (CSDS 8001–8002), 2 credits of CSDS 8902—Methodologies Colloquium, 3 credits of CSDS 8901—Pedagogy of Cultural Studies and Comparative Literature, 24 credits in CSDS courses (with approval of the adviser and the director of graduate studies for the minor), and 12 credits or more (as necessary) to complete a formal minor in another Graduate School program, excluding comparative literature. If a minor is not pursued in another program, the student must complete 12 credits in coursework outside of CSDS, CSCL, or CL courses, in a coherent and complementary program to be approved by the adviser and the director of graduate studies. Overall, the degree should include 12 credits of 4xxx courses (exclusive of CSDS 8001–8002 and 8901). 24 thesis credits are also required.

Language Requirements—Reading knowledge of two foreign languages appropriate to the student’s program is required. Language requirement must be completed before taking the preliminary examination.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 is required for a Ph.D. minor and must include CSDS 8001 and 8002.

Complementary Therapies and Healing Practices

Minor Only and Postbaccalaureate Certificate

Contact Information—Center for Spirituality and Healing, MMC 505, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-624-5166; fax 612-626-5280; www.csh.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Linda J. Brady, M
Mary Jo Kreitzer, M
Barbara Leonard, M
Ruth A. Lindquist, M
Pamela J. Schreiner, M
Marilyn Speedie, M
Mark S. Umbrecht, M

Associate Professor
Linda L. Chlan, M
Laura Dukett, M
Linda Halcon, M
Craig A. Hassel, M
Cheryl Robertson, M
Carla Tabourne, M

Assistant Professor
Karen Lawson, M

Lecturer
Miriam Cameron, M
Pat Culliton, M
Carolyn Garcia, M
Rebecca Gorman, M
Annette Heiderscheit, M
Kathleen Marshall, M
Dennis J. McKenna, M
Karen Monsen, M
Deborah Ringdahl, M
Erik Storlie, M
Sue M. Towey, M

Curriculum—The graduate minor in complementary therapies and healing practices is an interdisciplinary program designed to expose students to the global range of 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 complementary and alternative health care. Specifically, the minor provides students with a theoretical basis for applying complementary therapies and healing practices; prepares students to research complementary therapies and healing practices; and prepares students to work collaboratively with other health professionals and patients in a multicultural, pluralistic health care 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 and 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.

Prerequisites for Admission—Applicants to the graduate minor are available to masters and doctoral students. To have the minor formally designated on a transcript students must be enrolled in a major in the Graduate School and have completed—or concurrently be enrolled in—a graduate research course upon beginning the first course in the minor. Note that the research course is in addition to the specified credits required for the minor. Students should work out their program of study with the director of graduate studies for the minor early in their graduate study.

Courses—Refer to Center for Spirituality and Healing (CSPH) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site. Contact the minor program office for the most current information on relevant coursework pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses in the degree program is permitted based on approval of the graduate faculty and the director of graduate studies.

Minor Requirements
Masters and doctoral students take CSPH 5101 (3 cr) and 8101 (2 cr). Masters students take an additional 3 credits for a total 8 credits; doctoral students must take an additional 7 credits for a total of 12 credits. Note that students cannot use course credits to satisfy requirements for both a major and the minor.

Postbaccalaureate Certificate

Curriculum—The certificate program is open to graduate students both in a major at the master’s or doctoral levels or those not in a graduate program. The curriculum for the certificate program has three areas of focus: clinical applications, spirituality, and cross-cultural health and healing. The certificate program is individualized.

Prerequisites for Admission—Applicants must have a bachelor’s degree in a health-related field such as nursing or a graduate degree in medicine, public health, or pharmacy from an accredited U.S. institution or a foreign equivalent and a 3.00 GPA. Non-English speaking students need a TOEFL score of 550 (paper), 213 (computer), or 79 (Internet).

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
Special Application Requirements—In addition to the Graduate School 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 complementary 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. Goal statement, letters of support, and C.V. should be mailed to: Center for Spirituality and Healing, MMC 505, 420 Delaware Street S.E., Minneapolis, MN 55455.

The director of the Center for Spirituality and Healing assigns an adviser to each student as they are admitted to the certificate program. Advisers are any of the graduate faculty holding member status in the complementary therapies and healing practices minor. Students complete the Graduate School’s postbaccalaureate program form, have it signed by the adviser and director of graduate studies, and filed with the Graduate School. The program must be filed before completion of 6 credits. Eligible coursework includes a minimum of 12 CSPH graduate credits or those courses from other majors or minors in the Graduate School that the CSPH faculty has approved for use in the CSPH minor. Students may transfer in up to 3 credits after approved by the CSPH director of graduate studies. Twenty percent of total credits may be taken S-N. The student must complete the program in no more than four years if enrolled for certificate only. Registration is required every fall and spring semester.

Courses—Refer to Center for Spirituality and Healing (CSPH) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site. Contact the minor program office for the most current information on relevant coursework pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses is not permitted.

Certificate Requirements

A total of 12 credits are required to complete the certificate. Required courses: CSPH 5101—Introduction to Complementary 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. To earn a certificate, the preferred GPA for all courses is 2.80.

Health Coaching Track Under the Postbaccalaureate Certificate

Curriculum—This field of study is designed for health care professionals or those enrolled in a graduate health professions program such as nursing, social work, psychology, medicine, nutrition, pharmacy, chiropractic, or licensed acupuncture. The track’s four semesters prepare students to coach individuals on a path to greater health and healing. Coaches also serve within clinics and health care systems by being vehicles for communication between conventional and complementary practitioners and by holding a larger vision of holism and integration. Additionally, individuals who complete the track gain a greater understanding of and commitment to their own personal growth and healing.

Prerequisites for Admission—Applicants must have a bachelor’s degree in a health-related field such as nursing or a graduate degree in medicine, public health, or pharmacy from an accredited U.S. institution or a foreign equivalent and a 3.00 GPA. Non-English speaking students need a TOEFL score of 550 (paper), 213 (computer), or 79 (Internet).

Special Application Requirements—In addition to the certificate application requirements listed above, health coaching track applicants must submit an additional letter of support as well as a two- to five-page personal statement focusing on what led them to their current and future interest in health coaching as a professional activity. Students must complete the program in no more than four years if enrolled for certificate only. Registration is required every fall and spring semester.

Courses—Refer to the track requirements section.

Use of 4xxx Courses—Use of 4xxx courses is not permitted.

Track Requirements

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. A total of 18 credits are required to complete this track within the certificate. 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 (1 cr), and a professional internship in health coaching. To earn a certificate, the preferred GPA for all courses is 2.80.

Composition, Literacy, and Rhetorical Studies

See Literacy and Rhetorical Studies.

Computer Science

Contact Information—Department of Computer Science and Engineering, University of Minnesota, 4-192 Electrical Engineering/Computer Science, 200 Union Street S.E., Minneapolis, MN 55455 (612-625-4002; fax 612-625-0572; admissions@cs.umn.edu; www.cs.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Daniel L. Boley, SM
John V. Carlia, SM
Vladimir Cherkassky, Electrical and Computer Engineering, ASM
David H. Du, SM
Maria Gini, SM
Alok Gupta, Carlson School of Management, AM2
Caroline Hayes, AM2
Mats Heimdahl, SM
Wei Chung Hsu, SM
Ravi Janardan, SM
Paul E. Johnson, Information and Decision Sciences, AM2
Daniel J. Kersten, Psychology, ASM
Larry L. Kinney, Electrical and Computer Engineering, AM2
Joseph A. Konstan, SM
Yojin Kumar, SM
David J. Lilja, Electrical and Computer Engineering, AM2
Richard Maclin, Computer Science, Duluth, AM2
Gopalan Nadathur, SM
Nikolaos P. Papanikolopoulos, SM
John T. Riedl, SM
Jaideep Srivastava, SM
Anand R. Tripathi, SM
Pen-Chung Yew, SM
Zhi-Li Zhang, SM
The M.C.S. is a coursework-only degree and is intended to be a terminal degree. The Department of Computer Science and Engineering also supports a master of science in software engineering (M.S.S.E.) degree. Many faculty from the Department of Computer Science and Engineering also participate in the graduate program in scientific computation.

**Prerequisites for Admission**—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.

**Special Application Requirements**—The program requires that all applicants complete the department online application as well as the Graduate School online application. The names and e-mails of three recommenders are required and they will be requested to upload their letters of recommendation to the CSE online application only. Scores from the General (Aptitude) Test of the GRE are required for M.S. and Ph.D. program applicants. The Subject Test is optional, although highly recommended, especially for those seeking financial assistance. If taken, it should be in the undergraduate major field or, if it is not offered in that field, in computer science, mathematics, or engineering. Master’s and Ph.D. students are accepted for fall admission only. The application deadline is April 1. Students seeking financial aid must apply by December 15.

**Research Facilities**—Graduate students have access to a wide range of computing facilities and equipment from the powerful supercomputers in the Minnesota Supercomputer Institute and Army Research Laboratory Department of Defense Supercomputing Resource Center to handheld and portable computers used in research on mobile and location-aware computing. Specialized laboratories provide support for advanced graphics and visualization, virtual reality, computer networking, and distributed robotics. More general-purpose dedicated laboratories support a wide range of research activities, and shared graduate student laboratories provide extra computing for class work and other studies.

**Use of 4xxx Courses**—Use of CSCI 4xxx courses on Degree Program Forms is not permitted. Credits from 4xxx courses from an outside department may be used for related field course requirements if the course grants graduate credit.
Ph.D. Degree Requirements
The Ph.D. requires at least 43 course credits of which 13 must be in CSCI courses and at least 12 in a minor or supporting program. Students must also fulfill the breadth requirement of six courses in three different areas: theory, systems, and applications. Additionally, at least 24 thesis credits are required. Students are expected to complete all courses in their degree program with a GPA of at least 3.45.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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. A minimum GPA of 3.25 is preferred for these courses.

Conservation Biology
Contact Information—Director of Graduate Studies, Conservation Biology Graduate Program, University of Minnesota, 187 McNeal Hall, 1985 Buford Avenue, Saint Paul, MN 55108 (612-624-7751; consbio@umn.edu; www.consbio.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Peter B. Reich, Forest Resources, SM
G. David Tilman, Ecology, Evolution, and Behavior, SM

Professor
Ira R. Adelman, Fisheries, Wildlife, and Conservation Biology, SM
Deborah L. Allan, Soil, Water, and Climate, SM
David A. Andow, Entomology, SM
Marvin E. Bauer, Forest Resources, SM
Jay C. Bell, Soil, Water, and Climate, M2
Charles R. Blinn, Forest Resources, SM
Paul V. Bolstad, Forest Resources, SM
Thomas E. Burk, Forest Resources, SM
Vernon B. Cardwell, Agronomy and Plant Genetics, SM
Yosef Cohen, Fisheries, Wildlife, and Conservation Biology, SM
James W. Curtsinger, Ecology, Evolution, and Behavior, SM
Francesca J. Cuthbert, Fisheries, Wildlife, and Conservation Biology, SM
K. William Easter, Applied Economics, SM
Mohamed E. El Halawani, Animal Science, SM
Susan M. Galatowitsch, Horticultural Science, SM
Robert G. Haight, Forest Resources, SM
Nicholas R. Jordan, Agronomy and Plant Genetics, SM
Anne R. D. Kapuscinski, Fisheries, Wildlife, and Conservation Biology, SM
Scott M. Lanyon, Bell Museum of Natural History, SM
Robert McMaster, Geography, SM
L. David Mech, Fisheries, Wildlife, and Conservation Biology, SM
Claudia Neuhauser, Ecology, Evolution, and Behavior, SM
Raymond M. Newman, Fisheries, Wildlife, and Conservation Biology, SM
Gerald J. Niemi, Natural Resources Research Institute, Duluth, SM
Craig Packer, Ecology, Evolution, and Behavior, SM
James A. Perry, Fisheries, Wildlife, and Conservation Biology, SM
A. Stephen Polasky, Applied Economics, SM
Anne E. Pusey, Ecology, Evolution, and Behavior, SM
Patrick T. Redig, Veterinary Clinical Sciences, SM
Carlisle F. Runge, Applied Economics, SM
Abdul Samad, Fishery Sciences, SM
Ingrid E. Schneider, Forest Resources, SM
Ruth G. Shaw, Ecology, Evolution, and Behavior, SM
J. L. David Smith, Fisheries, Wildlife, and Conservation Biology, SM
Peter W. Sorensen, Fisheries, Wildlife, and Conservation Biology, SM
George R. Spangler, Fisheries, Wildlife, and Conservation Biology, SM
Robert W. Sterner, Ecology, Evolution, and Behavior, SM
Robert M. Zink, Ecology, Evolution, and Behavior, SM

Adjunct Professor
David E. Andersen, Fisheries, Wildlife, and Conservation Biology, SM
Doug H. Johnson, Fisheries, Wildlife, and Conservation Biology, SM
Jeffrey W. Lang, Fisheries, Wildlife, and Conservation Biology, SM
Diane L. Larson, Ecology, Evolution, and Behavior, SM
Stephen J. O’Brien, Fisheries, Wildlife, and Conservation Biology, SM
Bruce C. Vondracek, Fisheries, Wildlife, and Conservation Biology, SM

Associate Professor
Neil Anderson, Horticultural Science, SM
Gerald T. Ankley, Fisheries, Wildlife, and Conservation Biology, SM
Todd Arnold, Fisheries, Wildlife, and Conservation Biology, SM
Robert B. Blair, Fisheries, Wildlife, and Conservation Biology, SM
Jeffrey Broadbent, Sociology, SM
Jay S. Coggins, Applied Economics, SM
Tamara Giles-Vernick, History, SM
Jay T. Hatch, Postsecondary Teaching and Learning, SM
Sarah Hobbie, Ecology, Evolution, and Behavior, SM
Frances R. Homans, Applied Economics, SM
Pamela Jakes, Forest Resources, ASM
Sharon A. Jansa, Ecology, Evolution, and Behavior, SM
Susan D. Jones, Ecology, Evolution, and Behavior, SM
Mike Kilgore, Forest Resources, SM
Katherine Klink, Geography, SM
Jennifer Kuzma, Humphrey Institute of Public Affairs, SM
John P. Loegering, Agricultural and Natural Resources, Crookston, M2
Steven Manson, Geography, SM
Laura R. Musacchio, Landscape Architecture, SM
Kristen C. Nelson, Forest Resources, SM
Karen S. Oberhauser, Fisheries, Wildlife, and Conservation Biology, SM
Daniel J. Philippin, English, SM
Rachel Schurman, Sociology, SM
Andrew M. Simons, Fisheries, Wildlife, and Conservation Biology, SM
Roderick H. Squires, Geography, SM
Steven J. Taft, Applied Economics, SM
Ronald Tilson, Fisheries, Wildlife, and Conservation Biology, SM
George D. Weiblen, Plant Biology, SM

Adjunct Associate Professor
David C. Fulton, Fisheries, Wildlife, and Conservation Biology, SM
David L. Garbers, Fisheries, Wildlife, and Conservation Biology, SM
Frederick J. Jannett, Fisheries, Wildlife, and Conservation Biology, SM
Ullas K. Karanth, Fisheries, Wildlife, and Conservation Biology, SM

Assistant Professor
Charles S. Anderson, Fisheries, Wildlife, and Conservation Biology, AM2
Dennis R. Becker, Forest Resources, SM
Jeanine M. Cavender-Bares, Ecology, Evolution, and Behavior, SM
Jacques Finlay, Ecology, Evolution, and Behavior, SM
Diane Larson, Ecology, Evolution, and Behavior, SM
Rebecca Anne Montgomery, Forest Resources, SM
Helene Murray, Agronomy and Plant Genetics, ASM
Karen S. Oberhauser, Fisheries, Wildlife, and Conservation Biology, SM
Donald L. Pereira, Fisheries, Wildlife, and Conservation Biology, ASM
Edward Swain, Fisheries, Wildlife, and Conservation Biology, AM2
Susy Ziegler, Geography, SM

Adjunct Assistant Professor
David H. Bengston, Forest Resources, SM
Meredith W. Cornett, Forest Resources, SM
Kenneth H. Kozak, Bell Museum of Natural History, SM
Clarence L. Lehman, Ecology, Evolution, and Behavior, SM

Lecturer
Thomas R Fiuata, Humphrey Institute of Public Affairs, SM
Research Associate
Dean A. Current, Forest Resources, AM2
Lee E. Frelich, Forest Resources, SM
Paul Harold Glaser, Earth Sciences Geology/Geophysics, AM2
Lorin Kent Hatch, Fisheries, Wildlife and Conservation Biology, AM2
Loren M. Miller, Fisheries, Wildlife, and Conservation Biology, M2
Ronald Moen, Natural Resources Research Institute, Duluth, SM
Naomi Zeitouni, Applied Economics, SM
Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum** — The conservation biology 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.

**Prerequisites for 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 expected first 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 only are admitted for fall semester.

**Research Facilities** — Faculty are involved in local, regional, national, and international programs of research and education. Local research facilities include Cedar Creek Ecosystem Science Reserve, Cloquet Forestry Center, Itasca Biological Station and Laboratories, the Bell Museum of Natural History. Fisheries and aquatic biology research is conducted in the many lakes, rivers, and streams that Minnesota is famous for and in 13,000 feet of wet-lab space on the St Paul campus with dedicated wells and water conditioning equipment. The program is strongly linked with on-campus institutes such as the Institute for Social, Economic, and Ecological Sustainability and the Interdisciplinary Center for the Study of Global Change.

**Courses** — Conservation biology students take courses offered by a variety of colleges and departments across the University, including but not limited to fisheries, wildlife, and conservation biology; ecology, evolution, and behavior; soil, water, and climate; forest resources; geography; sociology; applied economics; and public policy. Acceptable courses for the degree are chosen in consultation with the adviser.

**Use of 4xxx Courses** — Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

**M.S. Degree Requirements**

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.

**Language Requirements** — None.

**Final Exam** — The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields** — 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.

**Ph.D. Degree Requirements**

Ph.D. students complete 46 credits, including 10 credits in courses required as part of the major, 12 credits in a minor or supporting program, 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).

**Language Requirements** — None.

**Minor Requirements for Students Majoring in Other Fields** — 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.

**Control Science and Dynamical Systems**

**Contact Information** — Control Science and Dynamical Systems Center, University of Minnesota, 107 Akerman Hall, 110 Union Street S.E., Minneapolis, MN 55455 (612-625-3364; csdy@umn.edu; www.csdy.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**

Gary J. Balas, Aerospace Engineering and Mechanics, SM
Daniel L. Boley, Computer Science and Engineering, SM
Prodomos Daoutidis, Chemical Engineering and Materials Science, SM
Max Donath, Mechanical Engineering, SM
David P. Fan, Genetics and Cell Biology, SM
William L. Garrard, Aerospace Engineering and Mechanics, SM
Tryphon T. Georgiou, Electrical and Computer Engineering, SM
Maria Gini, Computer Science and Engineering, SM
Daniel D. Joseph, Aerospace Engineering and Mechanics, SM
Mostafa Kaveh, Electrical and Computer Engineering, SM
John C. Kieffer, Electrical and Computer Engineering, SM
Larry L. Kinney, Electrical and Computer Engineering, SM
Perry Y. Li, Mechanical Engineering, SM
Walter Littman, Mathematics, ASM
Richard P. McGehee, Mathematics, SM
Peter Olver, Mathematics, SM
Nikolaos P. Papanikolopoulos, Computer Science and Engineering, SM
Rajesh Rajamani, Mechanical Engineering, SM
George R. Sell, Mathematics, ASM
Marian S. Stachowicz, Electrical and Computer Engineering, Duluth, ASM
Kim A. Stelson, Mechanical Engineering, SM
Ahmed H. Tewfik, Electrical and Computer Engineering, SM
Yiyuan Zhao, Aerospace Engineering and Mechanics, SM

**Associate Professor**

Demoz Gebre Egziabher, Aerospace Engineering and Mechanics, SM

**Assistant Professor**

Mihailo Jovanovic, Electrical and Computer Engineering, SM
Bernard Mettler, Aerospace Engineering and Mechanics, SM

**Other**

Dale F. Enns, Aerospace Engineering and Mechanics, ASM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.
Counseling and Student Personnel Psychology

See Educational Psychology.

Creative Writing

Contact Information—Director of Graduate Studies, Department of English, University of Minnesota, 222 Lind Hall, 207 Church Street S.E., Minneapolis, MN 55455 (612-625-6366; creawrit@umn.edu; www.creativewriting.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Patricia M. Hampel, M2
Madelon M. Sprengnether, M2

Professor
Michael Dennis Browne, M2
Ray Gonzalez, M2
Julie Schumacher, M2

Adjunct Professor
Charles Baxter, M2

Associate Professor
Lois B. Cucullu, M2
Maria Damon, M2
M. J. Fitzgerald, M2
Charles J. Sugin, M2
David Treuer, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The Department of English offers the master of fine arts 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.

Courses—Refer to English: Creative Writing (ENGW), and English: Literature (ENGL), in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

M.F.A. Degree Requirements

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, ENGW 8140/50/60 (4 cr); four writing workshops (16 cr), three of which must be in the student’s genre of choice and include one 8xxx course, and one of which must be outside the student’s primary genre; language and literature courses (7 cr); related field (6 cr); and a creative project, a book-length manuscript suitable for publication (12 credits, 8 of which are for thesis seminar and 4 for thesis credit registration).

Language Requirements—None.

Final Exam—The M.F.A. defense requires students to discuss their creative work as well as a literary essay that they write in response to a self-selected list of 20 books.

Culture and Teaching

See Education, Curriculum, and Instruction.

Dentistry

Contact Information—School of Dentistry, University of Minnesota, 15-136 Malcolm Moos Health Sciences Tower, 515 Delaware Street S.E., Minneapolis, MN 55455 (612-624-7934; fax 612-624-0027;wegne009@umn.edu; www.dentistry.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
M. Bashar Bakdash, Developmental/Surgical Sciences, M2
Muriel J. Bebeau, Primary Dental Care, M2
Soraya M. Beiraghi, Developmental/Surgical Sciences, M2
David O. Born, Primary Dental Care, M2
Edward C. Combe, Restorative Sciences, M2
Ralph DeLong, Restorative Sciences, M2
Anthony J. DiAngelis, Primary Dental Care, AM2
Robert J. Fiegal, Diagnostic and Biological Sciences, M2
James R. Fricton, Diagnostic and Biological Sciences, M2
Mark C. Herzberg, Diagnostic and Biological Sciences, M2
James E. Hinrichs, Developmental/Surgical Sciences, M2
Patrick M. Lloyd, Restorative Sciences, M2
Bryan S. Michalowicz, Developmental/Surgical Sciences, M2
Jorge M. Perdigão, Restorative Sciences, M2
Nelson L. Rhodes, Diagnostic and Biological Sciences, M2
James Q. Swift, Developmental/Surgical Sciences, M2
Michael J. Till, Developmental/Surgical Sciences, M2
Larry F. Wolff, Developmental/Surgical Sciences, M2

**Associate Professor**
Mansur Ahmad, Diagnostic and Biological Sciences, M2
Gary C. Anderson, Restorative Sciences, M2
Walter R. Bowles, Developmental/Surgical Sciences, M2
Mary E. Brosky, Restorative Sciences, M2
Darryl T. Hamamoto, Diagnostic and Biological Sciences, M2
James R. Holtan, Restorative Sciences, M2
Brett E. Larson, Developmental/Surgical Sciences, M2
Thomas D. Larson, Restorative Sciences, M2
Scott B. McClanahan, Developmental/Surgical Sciences, M2
Sandra L. Myers, Diagnostic and Biological Sciences, M2
Kathleen J. Newell, Primary Dental Care, M2
Paul Olin, Restorative Sciences, M2
Joy B. Osborn, Primary Dental Care, M2
Maria R. Pintado, Restorative Sciences, M2
Eric L. Schiffman, Diagnostic and Biological Sciences, M2
John K. Schulte, Restorative Sciences, M2
Stephen K. Shuman, Primary Dental Care, M2
Jill L. Stollenberg, Primary Dental Care, M2
Omar A. Zidan, Restorative Sciences, M2

**Clinical Associate Professor**
John P. Beyer, Developmental/Surgical Sciences, M2

**Adjunct Associate Professor**
Kate M. Hathaway, Diagnostic and Biological Sciences, M2

**Assistant Professor**
Massimo Costalonga, Developmental/Surgical Sciences, M2
Donald R. Nixdorf, Diagnostic and Biological Sciences, M2
Wook-Jin Seong, Restorative Sciences, M2

**Senior Research Associate**
John O. C. Look, Diagnostic/Surgical Sciences, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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 and dental hygiene educators, researchers, and clinicians teach the program, which is housed in the School of Dentistry. All students complete core coursework in teaching and evaluation in 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 Graduate School registration requirements. American Dental Association-accredited programs in the School of Dentistry that enroll students for the M.S. degree include endodontics, orthodontics, pediatric dentistry, periodontics, and prosthodontics. Other dental school clinical and postdoctoral programs that enroll students for the M.S. degree include those in geriatric dentistry and TMJ disorders/orofacial pain.

**Clinical Instruments**—The School of Dentistry dental clinics maintain a centralized instrument usage and sterilization system that provides clinical instrumentation and related services for graduate students enrolled in advanced clinical training programs. Usage fees, where applicable, are listed in the Class Schedule.

**Prerequisites for Admission**—Applicants must have received a D.D.S. or D.M.D. degree from an accredited U.S. institution. Students with comparable foreign degrees from recognized colleges or universities may also apply. Applications from individuals who have already completed or are enrolled in an advanced clinical training program (e.g., specialty residency program) are encouraged. A GPA of 3.00 or academic standing in the top one quarter of graduating class is the preferred performance level for admission. Applicants for whom English is a second language must also take the TOEFL, with a preferred performance level of 577 (paper), 233 (computer), or 90 (Internet).

**Special Application Requirements**—Applicants must submit three letters of recommendation directly to the department from persons familiar with their academic capabilities, along with a complete set of official transcripts and a clearly written, brief statement (under 500 words) which relates the applicant’s career goals to the goals of the program. Applicants who are planning concurrent studies in an advanced clinical training program (i.e., dental specialty residency) must contact that program for specific application deadlines and additional application requirements. (Official transcripts that have been submitted directly to a clinical residency program cannot be transferred to the Graduate School for application to the M.S. program.)

**Courses**—Refer to Dentistry (DENT) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses that pertain to this program. Information on additional 7xxx courses included in the M.S. curriculum can be obtained directly from the program office or School of Dentistry Web site. DENT 5xxx and 6xxx courses are designated for the School of Dentistry DDS program and are not considered for graduate credit.

**Use of 4xxx Courses**—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval. Under no circumstances will courses below 4xxx be considered for graduate credit.

**M.S. Degree Requirements**
The M.S. degree, which usually requires at least 18 months to complete, is offered under Plan A (with thesis) and Plan B (without thesis). Students in both plans must complete 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. Additionally, Plan A students must complete 10 thesis credits; Plan B students must complete 10 additional credits of coursework and submit three Plan B papers, one of which must be oriented toward research. Students must maintain a cumulative GPA of at least 3.00 in the program.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.
Design

Contact Information—Director of Graduate Studies, Design, University of Minnesota, 240 McNeal Hall, 1985 Buford Avenue, Saint Paul, MN 55108 (612-626-1219; fax 612-624-2750; designgrad@umn.edu; http://dha.design.umn.edu /programs/grad).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Joanne B. Eicher, (emeritus), ASM

Professor
William J. Angell, M2
Marilyn R. DeLong, SM
Edward G. Goetz, ASM
Denise A. Guerin, SM
Kim K. P. Johnson, SM
Karen L. LaBat, SM
Steven McCarthy, M2
Becky L. Yust, SM

Associate Professor
James Boyd-Brent, M2
Marilyn Bruin, SM
Elizabeth Bye, SM
Sauman Chu, SM
Jeffrey R. Crump, M2
Sherrin A. Gahring, M2
Delores A. Ginthner, (emeritus), AM2
Brad Hokanson, SM
Daniel Jasper, M2
Barbara E. Martinson, SM
Gloria M. Williams, SM
Ann Ziebarth, SM
Stephanie A. Zollinger, SM

Assistant Professor
Lucy Dunne, M2
Tasoulla Hadjiyanni, M2
Hye-Young Kim, M2
Caren S. Martin, M2
Carol C. Waldron, M2
Juanjuan Wu, M2

Other
Lou Bunker-Helmich, AM
Kathleen E. Campbell, Goldstein Museum, AM
Mary Catherine Dalry, AM
Kathleen Harder, AM2
Lin Nelson-Mayson, Goldstein Museum, M

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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. The M.A., M.S., and Ph.D. degrees include formal tracks in apparel studies (including dress, history, and culture; product development; and retail merchandising and consumer studies); graphic design (including interactive design); housing studies; and interior design (including evidence-based design). The M.F.A. is available in the graphic design track and interactive design emphasis. The track in apparel studies advances both theoretical knowledge and applications for textile and apparel products related to human behavior. Students may focus on product development; dress, history, and culture; or retail merchandising and consumer studies. 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; visual systems research; situational and transformative design; and interactive design. The emphasis in interactive design provides students with experience in designing for the digital environment. The program integrates theory with practice in the application of emergent and established technologies to digital design solutions. Students complete a creative thesis. Students and faculty collaboratively develop designed objects and information resources that will enhance people’s lives. 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. 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). Advances in theoretical knowledge and study of the interactions of humans in interior environments prepare students 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 emerging innovation of design practice.

Prerequisites for Admission—Individuals must have adequate undergraduate education in the track and background in the basic disciplines of art, social science, physical science, and biological science appropriate to the track. To pursue a degree in the interior design track, a first professional degree in interior design is required. Students interested in pursuing a Ph.D. must first complete a master’s degree. Specific requirements may be obtained by contacting the director of graduate studies.

Special Application Requirements—Consult the director of graduate studies; scores from the GRE are required. Students pursuing a degree in an emphasis related to design are required to submit a portfolio consisting of 15–20 examples of recent work. Students pursuing a Ph.D. are required to submit a writing sample. Students are admitted for fall semester only.

Courses—Refer to Design (DES) and Design, Housing, and Apparel (DHA) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses that pertain to this program.

Use of 4xxx Courses—No more than 30 percent of a student’s official degree program may be comprised of 4xxx courses. Not all of the department’s 4xxx courses are available for graduate credit. Appropriate courses are selected in consultation with the student’s advisers.

M.A. and M.S. Degree Requirements

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.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students

Majoring in Other Fields—For a master’s minor, a minimum of 9 credits is required. Courses are selected in consultation with the director of graduate studies.

M.F.A. Degree Requirements

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.

Language Requirements—None.

Final Exam—The final exam is oral.

Ph.D. Degree Requirements

Students are required to take 4 credits in the core, 23 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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—For a doctoral minor, a minimum of 12 credits is required. Courses are selected in consultation with the director of graduate studies.

Design, Housing, and Apparel

See Design.

Development Studies and Social Change

Minor Only

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; icgc@umn.edu; www.icgc.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor

Allen Isaacman, History, M
Eric S. Sheppard, Geography, M
Kathryn A. Sikkink, Political Science, M

Professor

Ronald R. Aminzade, Sociology, M
Ragui A. Assaad, Public Affairs, M
Michael Barnett, Public Affairs, M
Rose Brewer, African American and African Studies, M
Francesca J. Cuthbert, Fisheries, Wildlife, and Conservation Biology, M
Raymond D. Duvall, Political Science, M
Ana Paula Ferreira, Spanish and Portuguese, M
Amy K. Kaminsky, Gender, Women, and Sexuality Studies, M
Anne R. D. Kapuscinski, Fisheries, Wildlife, and Conservation Biology, M
Sally Kenney, Public Affairs, M
Helga Leitner, Geography, M
John W. Mowitt, Cultural Studies and Comparative Literature, M
Rica Nagar, Gender, Women, and Sexuality Studies, M
August H. Nimtz Jr., Political Science, M
Ruth Okedi, Law School, M
James A. Perry, Fisheries, Wildlife, and Conservation Biology, M
Terry L. Roe, Applied Economics, M
Abdi I. Samatar, Geography, M
James L. Smith, Fisheries, Wildlife, and Conservation Biology, M
George R. Spangler, Fisheries, Wildlife, and Conservation Biology, M
John S. Wright, African American and African Studies, M

Associate Professor

Fernando E. Arenas, Spanish and Portuguese Studies, M
Elizabeth H. Boyle, Sociology, M
Bruce P. Braun, Geography, M
Cesar Casarino, Cultural Studies and Comparative Literature, M
Sarah C. Chambers, History, M
Jay S. Coggins, Applied Economics, M
Susan Craddock, Gender, Women, and Sexuality Studies, M
Jigna Desai, Gender, Women, and Sexuality Studies, M
Vinay Gidwani, Geography, M
Tamara Giles-Vernick, History, M
Michael Goldman, Sociology, M
Ian Greaves, Environmental Health Services, AM
Douglas R. Hartmann, Sociology, M
Qadri Ismail, English, M
Daniel Kellihier, Political Science, M
Deborah Levison, Public Affairs, M
Louis Mendoza, Chicano Studies, M
Kristen Nelson, Forest Resources, M
Karen S. Oberhauser, Fisheries, Wildlife, and Conservation Biology, M
Joanna O’Connell, Spanish and Portuguese Studies, M
Tade Okedi, Applied Economics, M
Daniel J. Philippon, English, M
Simona Sawhney, Asian Languages and Literatures, M
Rachel Schurman, Sociology, M
Ajay Skaria, History, M
Charles J. Sugnet, English, M

Assistant Professor

Barbara Frey, Human Rights Program, M
Greta Friedemann-Sanchez, Humphrey Institute, M
Keith Mayes, African American and African Studies, M
Helene Murray, Agronomy and Plant Genetics, M
Shaden M. Tageldin, Cultural Studies and Comparative Literature, M
Elizabeth J. Wilson, Public Affairs, M

Other

Karen Brown, International Center for Global Change, M

Curriculum—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 (embracing 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.

Prerequisites for Admission—Admission is contingent upon prior admission to a doctoral degree-granting program within the Graduate School 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.

Courses—Contact the minor program office for information on relevant coursework pertaining to the program.

Use of x4xx Courses—Courses used to fulfill minor requirements must be x5xx or above.

Minor Only Requirements

The doctoral minor requires a sequence of four core seminars (DSSC 8111, 8112, 8211–12, 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 School curriculum that are relevant to the field of development studies and social change.

Early Childhood Policy

Postbaccalaureate Certificate

Contact Information—Scott McConnell, Early Childhood Policy Certificate, Center for Early Education and Development, University of Minnesota, 215 Pattee Hall, 150 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-3058; ecpcert@umn.edu; http://education.umn.edu/SPS/programs/certificates/ECPolicy.html).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Barbara J. Leonard, Nursing, M
Scott McConnell, Educational Psychology, M
Richard Weinberg, Child Development, M

Associate Professor

Elizabeth Davis, Applied Economics, M
Dan Kellihier, Political Science, M
Ecology, Evolution, and Behavior

Contact Information—Department of Ecology, Evolution, and Behavior, Director of Graduate Studies, University of Minnesota, 100 Ecology Building, 1987 Upper Buford Circle, Saint Paul, MN 55108-6097 (612-625-5700; fax 612-624-6777; EEBGrad@CBS.UMN.EDU; WWW.CBS.UMN.EDU/EEB/GRADUATEPROGRAM).

For latest faculty listings, see WWW.GRAD.UMN.EDU/FACULTY/ROSTERS/FACULTY.HTML.

Regents Professor
Peter B. Reich, Forest Resources, SM
G. David Tilman, SM

Professor
Donald N. Alstad, SM
David A. Andow, Entomology, SM
Franklin H. Barnwell, SM
Patrick L. Brezonik, Civil Engineering, SM
James B. Cotner, SM
James W. Curtsinger, SM
Antony M. Dean, SM
Susan M. Galatowitsch, Horticultural Science, SM
Linda L. Kinkel, Plant Pathology, SM
Scott M. Lanyon, SM
L. David Mech, Fisheries, Wildlife, and Conservation Biology, SM
Craig Packer, SM
John Pastor, Duluth, SM
Stephen Polasky, SM
Anne E. Pusey, SM
Michael J. Sadowsky, Soil, Water, and Climate, SM
Ruth G. Shaw, SM
Peter W. Sorensen, Fisheries, Wildlife, and Conservation Biology, SM
Marla Spivak, Entomology, SM
David W. Stephens, SM
Robert W. Sterner, SM
Susan J. Weller, Entomology, SM
Robert M. Zink, SM

Adjunct Professor
Edward J. Cushing, SM
Robert Denison, SM
Claudia Neuhausner, SM

Associate Professor
David Fox, Geology and Geophysics, SM
George Heimpel, Entomology, SM
Sarah E. Hobbie, SM
Sharon Jansa, SM
Susan D. Jones, SM
Jennifer King, SM
Georgiana May, SM
Karen S. Oberhauser, Fisheries, Wildlife, and Conservation Biology, SM
Andrew M. Simons, Fisheries, Wildlife, and Conservation Biology, SM
Peter Tiffen, Plant Biology, SM
Michael Travisano, SM
George Weiblen, Plant Biology, SM
Assistant Professor
F. Keith Barker, SM
Mark Bee, SM

Mark Borrello, SM
Jeanine Cavender-Bares, SM
Jacques Finlay, SM
Jeffrey A. Gralnick, Biotechnology Institute, SM
Kenneth H. Kozak, Fisheries, Wildlife, and Conservation Biology, SM
Rebecca Montgomery, Forest Resources, SM
Helene Muller-Landau, SM
Jennifer Powers, SM
Imke Schmitt, Plant Biology, SM
Michael L. Wilson, SM

Adjunct Assistant Professor
Diane L. Larson, SM

Research Associate
Lee E. Frelich, Forest Resources, SM
Clarence Lehman, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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; paleoecology; ecology of vegetation; and theoretical ecology. Opportunities for field research are available in Africa, Alaska, Central America, and other parts of the world, as well as in local ecosystems. Seminars and individually designed tutorials are an important part of student programs and provide an exciting intellectual environment.

Prerequisites for 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.
Economics

Special Application Requirements—Students are admitted only in fall semester. Deadline for application is December 15. In addition to the online application to the Graduate School, a personal statement, scores from the general GRE test (current within the past five years), and transcripts should be sent directly to the EEB graduate program. The GRE subject test is recommended but not required.

Courses—Refer to Ecology, Evolution, and Behavior (EEB) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—As preparation for their preliminary examinations, Ph.D. students are expected to acquire basic knowledge in ecology, evolution, behavior, and organismal biology by taking graduate courses or 4xxx courses that are approved by the director of graduate studies. One of these courses can be a graduate seminar or reading course, and one of these courses can be substituted by an advanced undergraduate course taken prior to entering into the EEB graduate program.

M.S. Degree Requirements
The M.S. is offered under both Plan A (with thesis) and Plan B (without thesis). Both plans require a minimum of 14 course credits in the major and a minimum of 6 course credits in one or more related fields outside the major. Plan A also requires 10 thesis credits, and Plan B requires 10 additional course credits 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.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A minimum of 7 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.

Ph.D. Degree Requirements
A minimum of 3 course credits and 24 thesis credits are required in the major, and at least 12 course credits are required for either a minor in another field or a supporting program from several related fields.

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 50 percent time. Degree programs are planned by the student and an advisory committee of three to five faculty members.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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.

Economics

Contact Information—Director of Graduate Studies, Department of Economics, University of Minnesota, 1035 Heller Hall, 271 19th Avenue South, Minneapolis, MN 55455 (612-625-6833; fax 612-624-0209; econdgs@econ.umn.edu; www.econ.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Beth E. Allen, SM
Patrick Bajari, SM
Varadarajan V. Chari, SM
Roger D. Feldman, Public Health, ASM
Thomas J. Holmes, SM
Larry E. Jones, SM
Patrick J. Keeho, SM
Timothy Keeho, SM
Narayana Kocherlakota, SM
Erzo G. J. Luttmer, SM
Christopher Phelan, SM
Marcel K. Richter, SM
Jose Victor Rios-Rull, SM
Aldo Rustichini, SM
Craig E. Swan, SM
Warren E. Weber, AM2
Jan Werner, SM

Associate Professor
Kim Sau Chung, SM
George D. Green, History, AM2
Ellen McGrattan, AM2
Fabrizio Perri, SM
Amil Petrin, SM
James A. Schmitz, AM2

Assistant Professor
Christina Arellano, M2
Alessandra Fogli, M2
Fatih Guvenen, M2
Kyoo-Il Kim, M2
Minjung Park, M2
David Rahman, M2
Itai Sher, M2

Other
Simran Sahi, M2

Economics Degree Requirements—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.

Prerequisites for Admission—The general requirement is the capability to pursue Ph.D.-level work. Normally a student should have an undergraduate record from a recognized college that includes coursework in economic theory and mathematics (multivariate calculus and linear algebra).

Special Application Requirements—Students should submit their applications, including a record of GRE scores and three letters of recommendation, to the director of graduate studies. Applicants who would like financial aid should submit their materials no later than December 15. Students are admitted for fall semester only.

Courses—Refer to Economics (ECON) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—4xxx or 5xxx economics courses may not be included on the Degree Program Form for the economics Ph.D. program. Students may include 4xxx, 5xxx, and 8xxx courses outside economics. Approval of the student’s adviser and the director of graduate studies are needed to use 4xxx and 5xxx courses.

M.A. Degree Requirements
The M.A. is offered under Plan A (with thesis) or Plan B (without thesis). Coursework for the M.A. is drawn from the Ph.D. program and must include at least 10 credits of economic theory from the first-year Ph.D. courses in theory (for majors) or microeconomic analysis (for minors) and macroeconomics. Beyond these restrictions, the general Graduate School requirements govern. For the Plan B degree, a Ph.D. student will have completed requirements for the M.A. when the written preliminary
Language Requirements—None.

Final Exam—The final exam is oral for Plan A, written for Plan B.

Minor Requirements for Students Majoring in Other Fields—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.

Ph.D. Degree Requirements

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 program does not specify a minimum number of courses for the major; rather, the courses taken to help prepare for the preliminary exams constitute the major program. In addition, students must complete 12 credits outside the major for a supporting program, which may include economics courses not included in the major.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Requirements for a doctoral minor include five or more from among the following courses: ECON 8001–2–3–4 or 8101–2–3–4, and 8105–6–7–8; 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.

Education—Work and Human Resource Education

See Work and Human Resource Education.

Education, Curriculum, and Instruction

Contact Information—Department of Curriculum and Instruction, University of Minnesota, 125 Peik Hall, 159 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-2545; cigs@umn.edu; http://cehd.umn.edu/ci).

For latest faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Patricia G. Avery, SM
Richard W. Beach, SM
Deborah R. Dillon, SM
Lee Galda, SM
Roger T. Johnson, SM
Judith J. Lambrecht, Work and Human Resource Education, ASM
Frances P. Lawrenz, Educational Psychology, ASM
Cynthia Lewis, SM
David O’Brien, SM
Thomas R. Post, SM
S. Jay Samuels, Educational Psychology, ASM
Thomas Swiss, SM
Elaine E. Tarone, Linguistics, ESL, and Slavic Languages and Literatures, AM2
Barbara M. Taylor, SM
Ruth G. Thomas, SM

Associate Professor

Lisa D. Albright, School of Social Work, AM2
Martha H. Bigelow, SM
Kathleen Cramer, SM
Fred N. Finley, SM
Patricia James, Postsecondary Teaching and Learning, AM2
Murray S. Jensen, Postsecondary Teaching and Learning, AM2
Kendall King, SM
Timothy Lensmire, SM
Jane Plihal, SM
Gillian H. Roehrig, SM
Diane J. Tedick, SM
Constance L. Walker, SM
Susan K. Walker, M2

Assistant Professor

James W. Bequette, M2
Lesa Covington Clarkson, M2
Bhaskar Dahal, SM
Aaron H. Doering, SM
Lori A. Helman, M2
Benjamin M. Jacobs, M2
J. B. Mayo, M2
Charles D. Miller, M2
Tamara J. Moore, M2
Bic Ngo, M2
Mistilina Sato, M2
Ross VeLure Roholt, School of Social Work, AM2

Lecturer

Lisa Kimball, M2
Terrence Wyberg, M2

Other

Mary Bents, Associate Dean, College of Education and Human Development, AM2
David J. Ernst, Director of Academic Computing, College of Education and Human Development, AM2
Tara W. Fortune, Center for Advanced Research on Language Acquisition, AM2
Christine Greenhow, Research Associate, Curriculum and Instruction, M2
Michael Michlin, Center for Applied Research and Educational Improvement, AM
Jerome Stein, Senior Fellow, School of Social Work, AM2
Debra Stevens Peterson, Minnesota Center for Reading Research, AM2
Joyce A. Walker, Center for 4-H Youth Development, M2

Curriculum—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 M.A. and Ph.D. degrees include formal tracks in art education; elementary education; family, youth, and community (including education for community, parent and family education, and youth development and programming); learning technologies (including online distance learning, multimedia design and development, and K–12 technology integration); literacy education (including children’s and adolescent literature, critical literacy and English education, and reading education); mathematics education; science education; second languages and cultures education (including ESL, foreign language education, and bilingual and immersion education); and social studies education. The Ph.D. degree includes an additional formal track in culture and teaching (including critical white studies, immigrant and urban education, popular culture, and teacher preparation and development).
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.

Prerequisites for 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. A master’s degree is preferred for admission to some of the tracks within the Ph.D. program, but it is not always required.

Special Application Requirements—Applicants must submit scores from the General Test of the Graduate Record Examination (GRE) that are less than five years old, three letters of recommendation from individuals familiar with their scholarship and research potential, a complete set of official transcripts, and a clearly written statement of career interests, goals, and objectives. Master’s and doctoral applications are reviewed by department faculty once per academic year, with December 1 as the deadline.

Courses—Refer to Curriculum and Instruction (CI), and Mathematics Education (MTHE) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval. Students from other majors may include such courses subject to their own program’s approval.

M.A. Degree Requirements

In education, curriculum, and instruction, students may pursue Plan A (with thesis) or Plan B (with one or two papers). Plan A requires 15-18 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 a minimum of 30 credits, which includes a minimum of 14 credits in the major and at least 6 credits in one or more related fields outside the major. 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.

Language Requirements—Although language requirements for second languages and cultures (SLC) students are not specified in terms of degrees or coursework, each SLC student must give evidence of proficiency in communicating within the second language of choice. There is no language requirement for other tracks.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires a minimum of 6 credits selected in consultation with the director of graduate studies.

Ph.D. Degree Requirements

A total of 78 credits is required for the Ph.D. Requirements include three core courses (CI 8131, 8132, 8133 for 9 credits) and at least 15 other credits in the selected track. Students must also complete 12 credits in research methodology; 6 credits in educational foundations; 12 credits in a minor or supporting program; and 24 thesis credits. Specific courses and additional work vary depending upon the track and are planned with the adviser.

Language Requirements—Although language requirements for second languages and cultures (SLC) students are not specified in terms of degrees or coursework, each SLC student must give evidence of proficiency in communicating within the second language of choice. There is no language requirement for other tracks.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 credits is required for a minor. Requirements include a demonstrated understanding of foundational knowledge related to curriculum and instruction and consultation with the director of graduate studies.

Education Sciences

Minor Only

Contact Information—Minnesota Interdisciplinary Training in Education Research (MITER) Program office, Education Sciences Building, 56 East River Road, Suite 250/4101, Minneapolis, MN 55455 (612-626-8269; fax 612-626-8123; MITER@umn.edu; http://education.umn.edu/MITER).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor

Apostolos P. Georgopoulos, Neuroscience, M
Matt McGue, Psychology, M

Professor

Mark L. Davison, Educational Psychology, M
Christine A. Espin, Educational Psychology, M
Michael R. Harwell, Educational Psychology, M
David W. Johnson, Educational Psychology, M
Frances P. Lawrence, Educational Psychology, M
Gordon E. Legge, Psychology, M
Geoffrey M. Maruyama, Educational Psychology, M
Samuel L. Myers Jr., Humphrey Institute of Public Affairs, M
J. B. Overnierz, Psychology, M
Anthony D. Pellegrini, Educational Psychology, M
Michael D. Resnick, Pediatrics, M
John L. Romano, Educational Psychology, M
Maria D. Sera, Child Development, M
Barbara M. Taylor, Curriculum and Instruction, M
Paul W. van den Broek, Cognitive Science, M
James E. Ysseldyke, Educational Psychology, M

Associate Professor

Ernest C. Davenport Jr., Psychology, M
Jeffrey D. Long, Educational Psychology, M
Ben Munson, Speech, Language, and Hearing Sciences, M
Michael C. Rodriguez, Educational Psychology, M
John R. Warren, Sociology, M

Assistant Professor

Eric Grodsky, Sociology, M
Nicole Landi, Educational Psychology, M
Kristen McMaster, Educational Psychology, M
Tamara Moore, Curriculum and Instruction, M

Curriculum—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.

Prerequisites for Admission—This graduate minor is restricted to doctoral students. To have the minor formally designated on a transcript, students must be enrolled in a major in the Graduate School. Prerequisites include two graduate courses in statistical methods and one course in cognition and learning. A list of courses satisfying the prerequisites is available on the program Web site.

Courses—Refer to the program Web site for approved courses. Contact the minor program office for further information on relevant coursework pertaining to the program. With the prior approval of the Graduate Advisory Committee and the
Twin Cities Degree Programs and Faculty

Mary Hermes, Duluth, ASM
Walt Jacobs, AM
Karen L. Miksch, AM
Helen Mongan-Rallia, Duluth, AM2
Byron J. Schneider, M2
Joyce Strand, Duluth, AM
Catherine A. Wambach, AM
Stuart S. Yeh, SM

Assistant Professor
Joan G. DeJaegerhe, AM
Rashne R. Jehangir, AM
Frances Yavrus, SM
David J. Weerts, M2

Lecturer
Noro R. Andriamanalina, AM2
Rusty Barceló, AM2
Dale A. Blyth, AM2
Beverly J. Dretzke, AM2
Garrett-Dikkers, Amy, AM2
Amy S. Hewitt, AM2
Richard D. Howard, M
Julie S. Kalnin, AM
Gloria L. Kumagai, AM
Deanne L. Magnusson, AM2
Joseph H. Nathan, Public Affairs, AM2
Richard D. Nunneley, AM
Robert K. Poch, AM2
Kyla L. Wahlstrom, AM2
Ann Z. Werner, AM2

Other
Debra Ingram, AM
Karen Evans Stout, AM
Joyce Ann Walker, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The Department of Educational Policy and Administration 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. Students in the M.A. and Ph.D. programs choose from one of four complementary but distinct program tracks: educational administration (EdAd), evaluation studies (ES), higher education (HiEd), and comparative and international development education (CIDE). In addition, the department offers a variety of Ed.D. programs for practicing professionals and four preK–12 administrative licensure programs.

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 Web site address above 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.

Prerequisites for 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 related areas such as curriculum studies, public affairs, sociology, psychology, economics, political science, international relations, management science, measurement and statistics, and educational psychology.

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 official transcripts (sent directly from institution[s]) to the Graduate School), a current résumé, and three brief essays (personal statement, educational issue of interest, career goals). The GRE is not required for EdAd M.A. applicants but is required for application to other M.A. program tracks (CIDE, ES and HiEd) and all tracks in the doctoral degree programs (Ed.D. and Ph.D.). 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, except those for the CIDE Ph.D., are reviewed twice per semester. CIDE Ph.D. applications are reviewed on January 15 only. Submission of all application materials for all tracks by January 15 is strongly encouraged to ensure priority consideration for assistantships awarded on March 1 for the next academic year. All new students begin in fall semester unless permission to start earlier is granted by the program coordinator. The department application, letters of recommendation, résumé, and essays are sent directly to the department. The Graduate School application, GRE scores, transcripts (sent

Student’s adviser(s), courses not on this list may be approved as satisfying program requirements.

Use of 4xxx Courses—Use of 4xxx courses in the degree program is not permitted.

Minor Requirements
Coursework includes: a) two professional socialization courses presenting a general introduction to schools and educational research (3 cr each); b) two advanced courses in research methods and statistics (experimental research design, measurement, and statistical methods, 3 cr each), and c) two advanced courses in cognition and learning (addressing cognitive approaches to learning, 3 cr each), for a total of 18 credits.

Note: Students may not use course credits to satisfy requirements for both a graduate major and for the education sciences minor.

Educational Policy and Administration

Contact Information—Department of Educational Policy and Administration, University of Minnesota, 330 Wulling Hall, 86 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-1006); fax 612-624-3377; edpagrad@umn.edu; http://education.umn.edu/edpagrad.

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Melissa S. Anderson, SM
Robert H. Bruininks, Educational Psychology, SM
David W. Chapman, SM
Gerald W. Fry, SM
Jeanne F. Higbee, AM
David R. Johnson, SM
Jean A. King, SM
Robert B. Kvatik, Political Science, ASM
Linda Cleary-Miller, English, Duluth, AM2
R. Michael Paige, SM
Arthur Reynolds, Child Psychology, AM
Rebecca Ropers-Huilman, SM
Karen Rose Seashore, SM
Robert D. Tennyson, Educational Psychology, AM
Jennifer York-Barr, SM
James E. Ysseldyke, Educational Psychology, ASM

Associate Professor
Nicola A. Alexander, SM
David R. Arendale, AM
Heidi L. Barajas, AM2
C. Cryss Brunner, SM
Peter W. Deemerth, SM
Andrew Furco, M2
Frank A. Gulbrandsen, Duluth, ASM
Arthur M. Harkins, SM
Darwin D. Hendel, SM
directly from the institution(s), and TOEFL/IELTS score are sent to the Graduate School.

**Centers**—College centers directed by department faculty include the Institute on Community Integration (ICI), the Minnesota Postsecondary Education Research Institute (Minnesota-PERI) and the Center for Applied Research and Educational Improvement (CAREI). The centers provide research and graduate assistantship opportunities for department graduate students.

COURSES—Refer to Educational Policy and Administration (EDPA) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

**M.A. Degree Requirements**

The master’s is available under four program tracks: educational administration, evaluation studies, higher education, and comparative and international development education. The M.A. is offered under two plans. Plan A requires 14–18 course credits in EDPA, 6 course credits outside the department, and 10 thesis credits. Plan B requires 24–26 course credits in EDPA, 6 course credits outside the department, and a Plan B project. For details see the EDPA Web site under “Student Resources: Handbooks.”

Language Requirements—None.

Final Exam—The final exam is oral.

**Ph.D. Degree Requirements**

The Ph.D. is available in four program tracks: educational administration, evaluation studies, higher education, or comparative and international development education. All Ph.D. programs include 10 credits in department core courses, 18 or more credits in program core courses, 12 or more credits of research methodology courses, 12 or more course credits in a supporting program or minor, and 24 thesis credits. The minimum total of course credits varies by track (see Student Handbook on the Web site 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 Graduate School.

Language Requirements—None.

Final Exam—The final exam is oral.

**Ed.S. Certificate Requirements**

The specialist certificate requires a minimum of 60 credits: at least 30 credits in educational administration, including 3 credits in leadership and 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 administration; and a course in human relations. Up to thirty credits may be transferred from other programs outside the College of Education and Human Development or from other accredited universities. Registration for EDPA 5385—Licensure Seminar and EDPA—5386 Portfolio Seminar plus completion of an electronic portfolio and oral examination are required. The oral is an examination of all program areas as well as of the knowledge, skills, and dispositions for each competency required by the Minnesota Board of School Administrators for licensure as an educational administrator.

**Ed.D. Degree Requirements**

The doctor of education (Ed.D.) is a professionally oriented degree program for those who will provide leadership in educational institutions. The program emphasizes breadth of preparation in educational policy and administration and in related fields. Through courses, seminars, and independent study, students learn to apply the products of disciplined inquiry to educational policy issues and practical situations in educational environments. The Ed.D. is offered in two areas in educational policy and administration: educational administration (pre-K–12 schools) and higher education. Cohorts include those in the metropolitan area, out state Minnesota, and international schools. The Ed.D. degree is 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. Within the overall 76-credit or more framework (some credits may be brought in from previous graduate work), specific course requirements are developed for each program area and cohort. See the department Web site (above) 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 educational policy or practice.

Language Requirements—None.

Final Exam—The final exam is an oral defense.

**Educational Psychology**

Contact Information—Director of Graduate Studies Assistant, Department of Educational Psychology, University of Minnesota, 250 Education Sciences Building, 56 East River Road, Minneapolis, MN 55455 (612-624-6827; fax 612-624-8241; epsy-adm@umn.edu; www.education.umn.edu/EdPsych).

For specific track materials, contact the tracks as follows:

**Counseling and Student Personnel Psychology**—University of Minnesota, 250 Education Sciences Building, 56 East River Road, Minneapolis, MN 55455 (612-624-0042; fax 612-624-8241; cpp-adm@umn.edu)

**Psychological Foundations of Education, University of Minnesota**—250 Education Sciences Building, 56 East River Road, Minneapolis, MN 55455 (612-624-0042; fax 612-624-8241; psyf-adm@umn.edu)

**Quantitative Methods in Education**—University of Minnesota, 250 Education Sciences Building, 56 East River Road, Minneapolis, MN 55455 (612-624-0042; fax 612-624-8241; psyf-adm@umn.edu)

**School Psychology**—University of Minnesota, 250 Education Sciences Building, 56 East River Road, Minneapolis, MN 55455 (612-624-4156; fax 612-624-0879; schpsych@umn.edu).

**Special Education**—University of Minnesota, 250 Education Sciences Building, 56 East River Road, Minneapolis, MN 55455 (612-624-0367; fax 612-624-8241; sped-adm@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

**Professor**

William M. Bart, SM
Thomas Brothen, AM2
Robert H. Bruininks, SM
Sandra L. Christenson, SM
Eli Coleman, Family Medicine and Community Health, ASM
Nicki R. Crick, Child Development, ASM
Mark L. Davison, SM
Stanley L. Deno, SM
Byron Egeland, Child Development, ASM
Joan B. Garfield, SM
Sunny Sundal Hansen, (emeritus), ASM

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
Curriculum—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).

Prerequisites for Admission—There are no special prerequisites for admission at the M.A. level in any of the five tracks, or at the Ph.D. level in school psychology, psychological foundations of education, or quantitative methods in education. Applicants to the CSPP doctoral track should hold either a bachelor’s or master’s degree with a major in psychology, education, counseling, or a related field. CSPP applicants interested in earning the specialist certificate should hold an M.A. degree; if not, they should apply to both the M.A. and specialist certificate programs.

Special Application Requirements—Applicants must submit a department application (with clear indication of the desired track), a statement of goals and interests, three letters of recommendation, and a Graduate School Application accompanied by official transcripts from all colleges and universities attended. The GRE is required for all tracks; an interview is also required for those who make the initial cut in school psychology.

Applications to CSPP, school psychology, and special education are accepted for fall admission only. Applications to psychological foundations and quantitative methods in education are accepted throughout the year. Check directly with the program offices for current deadlines.

Courses—Refer to Educational Psychology (EPSY) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—None of the five tracks allow 4xxx or 6xxx coursework to be counted toward Graduate School degree program requirements.

Educational Psychology—Counseling and Student Personnel Psychology

The counseling and student personnel psychology (CSPP) program subscribes to the scientist/practitioner model, which assumes that scholarly inquiry and counseling practice are interdependent and complementary. The program’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.

M.A. Degree Requirements

Students must complete at least 48 credits, including credits in EPSY core courses (statistics, measurement, and learning), 30 credits in counseling theory and practice, and 6 credits in a related field or minor.

Language Requirements—None.

Final Exam—The final exam is written; students must also submit a portfolio.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires at least 6 credits of graduate-level EPSY courses.

Ph.D. Degree Requirements

Students must complete credits in EPSY core courses (statistics, measurement, learning, social psychology, issues in educational psychology, and research methods); 51 credits in counseling theory and practice, practica, and internships; 12 credits in a supporting program or minor; and 24 thesis credits.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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.

Certificate of Specialist Requirements

Students must complete at least 60 credits, including 13 credits in EPSY core courses (statistics, measurement, learning, research methods, and social psychology), and 26 credits in counseling theory and practice.

Language Requirements—None.

Final Exam—The final exam is oral.

K-12 School Counseling (for those seeking licensure only)

This licensure program is designed for professionals who already hold a master’s degree in counseling or a related field and want to broaden their career development with a K-12 school counseling license. It aligns with the licensing requirements of...
Educational Psychology—Psychological Foundations

Graduate study in psychological foundations of education prepares students for research and teaching positions in colleges and universities, schools, private industry, human service organizations, health science units, government agencies, and other research and development centers. The goal of psychological foundations of education is to apply and generate knowledge of psychological processes and metrolological procedures involved in learning and teaching.

The program offers M.A. and Ph.D. degrees with emphases in learning and cognition/educational technology or social psychological and social developmental processes in educational psychology (including human relations). Students typically choose one of these areas in addition to achieving broad competence in all aspects of the curriculum.

M.A. Degree Requirements

Students must complete at least 30 credits, including credits in EPSY core courses (statistics, measurement, learning, social psychology) and 6 credits in a related field or minor.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires at least 6 credits of graduate-level EPSY courses.

Ph.D. Degree Requirements

Students must complete credits in EPSY core courses (statistics, measurement, learning, social psychology, issues in educational psychology, and research methods), EPSY electives, 12 credits in a supporting program or minor, and 24 thesis credits.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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.

Educational Psychology—Quantitative Methods in Education (QME)

Graduate Study in QME prepares students for a wide variety of careers, including positions in test publishing firms, college and university teaching and research, research and evaluation centers, public school systems, state departments of instruction, and private industry. The goal of QME 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 program offers M.A. and Ph.D. degrees with 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.

M.A. Degree Requirements

Students must complete at least 30 credits, including credits in EPSY core courses (statistics, measurement, learning, social psychology) and 6 credits in a related field or minor.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires at least 6 credits of graduate-level EPSY courses.

Ph.D. Degree Requirements

Students must complete credits in EPSY core courses (statistics, measurement, learning, social psychology, issues in educational psychology, and research methods), EPSY electives, 12 credits in a supporting program or minor, and 24 thesis credits. In consultation with their advisers, students develop a curriculum and select courses and practicum placements that are appropriate for their interests, prior experience, and career directions.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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.

Educational Psychology—School Psychology

School psychology is an interdepartmental program involving the Departments of Educational Psychology, Psychology, and the Institute of Child Development. It 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 program 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.

M.A. Degree Requirements

School psychology does not offer the M.A. as a terminal degree; rather the M.A. is required to obtain the Ed.S. or Ph.D. in educational psychology. The M.A. is offered under Plan A (thesis) and Plan B (paper) and requires at least 30 credits: credits in EPSY core courses (statistics, measurement, learning, and social psychology) and 6 credits in a related field or minor. Plan A students must also take 10 thesis credits; Plan B students take 2 research credits (EPSY 8994).

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires at least 6 credits of graduate-level EPSY courses.

Ph.D. Degree Requirements

The Ph.D. program educates future school-based researchers with emphases in family/school partnerships, accountability systems, school dropout intervention and program development, research, and evaluation. Students must complete credits in EPSY core courses (statistics, measurement, learning, social psychology, issues in educational psychology, and research methods). In
consultation with their advisers, students develop a curriculum and select courses and practica placements that are appropriate for their interests, prior experience, and career directions.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—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.

**Certificate of Specialist Requirements**

The specialist program is designed for students who want to become practitioners. It meets the Minnesota certification requirements for school psychologists.

Students must complete at least 60 credits, including credits in EPSY core courses (statistics, measurement, learning, social psychology, and research methods) and NASP requirements that are delineated in terms of 11 domains of training (e.g., data-based decision-making and accountability, consultation and collaborations).

**Language Requirements**—None.

**Final Exam**—The final exam is written.

**Educational Psychology—Special Education**

M.A., Ph.D., and certificate of specialist degrees are offered in special education in the following specializations: 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.

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**M.A. Degree Requirements**

Students may emphasize consulting, college teaching, or research in one or more of the specializations.

Students must complete at least 30 credits, including credits in EPSY core courses (statistics, measurement, learning, and social psychology), 6 credits in special education foundations, and 6 credits in a related field or minor. Plan A students must take 10 thesis credits.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**—A master’s minor requires at least 6 credits of graduate-level EPSY courses.

**Ph.D. Degree Requirements**

The Ph.D. program trains graduates to address problems related to the full development of individuals with disabilities and their families. Intensive course-related learning and guided experiences prepare students to assume professional leadership. Further competencies may be achieved in four areas of emphasis: research, professional preparation, administration/policy, and clinical practice/community service.

Students must complete credits in EPSY core courses (statistics, measurement, learning, social psychology, issues in educational psychology, and research methods), 12 credits in special education (EPSY 8701 and 8702 and 6 additional credits which must be from EPSY 86xx or 87xx offerings), 12 credits in a supporting program or minor, and 24 thesis credits.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—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.

**Certificate of Specialist Requirements**

Students must complete at least 60 credits, including credits in EPSY core courses (statistics, measurement, learning, social psychology, and research methods) and 6 credits of special education foundations. The remaining coursework usually focuses on two or more special education areas, determined in consultation with the adviser.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

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**Electrical Engineering**

**Contact Information**—Director of Graduate Studies, Department of Electrical Engineering, University of Minnesota, 3-166 Electrical Engineering/Computer Science Bldg., 200 Union Street S.E., Minneapolis, MN 55455 (612-625-3564; fax 612-626-1136; jager001@umn.edu; www.ece.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**

Massoud Amin, SM
Stephen A. Campbell, SM
Vladimir Cherkassky, SM
Philip I. Cohen, SM
David H. Du, Computer Science and Engineering, ASM
Emad Ebbini, SM
Tryphon T. Georgiou, SM
Georgios Giannakis, SM
Anand Gopinath, SM
Bruce E. Hammer, Radiology, ASM
Ramesh Harjani, SM
Bin He, Biomedical Engineering, ASM
Mostafa Kaveh, SM
John C. Kieffer, SM
Larry L. Kinney, SM
Vipin Kumar, Computer Science and Engineering, ASM
James R. Leger, SM
David J. Lilja, SM
Zhi-Quan Luo, SM
Ned Mohan, SM
Jaekyun Moon, SM
Hal Ottosen, Rochester, ASM
Nikolaos P. Papanikolopoulos, Computer Science and Engineering, ASM
Keshab K. Parhi, SM
William P. Robbins, SM
P. Paul Ruden, SM
Sachin Sapatnekar, SM
Guillermo Sapiro, SM
Joseph J. Talghader, SM
Ahmed H. Tewfik, SM
J. Thomas Vaughan, Radiology, Magnetic Resonance Research, ASM
Randall H. Victoria, SM
Bruce F. Wollenberg, SM
Paul R. Woodward, Astronomy, ASM
Pen-Chung Yew, Computer Science and Engineering, ASM
Ofer Zeitouni, Mathematics, ASM
Zhi-Li Zhang, Computer Science and Engineering, ASM

**Adjunct Professor**

Jaijeet Roychowdhury, SM

**Associate Professor**

Kiarash Bazargan, SM
Tianhong Cui, Mechanical Engineering, ASM
Douglas W. Ernie, SM
Rhonda R. Franklin, SM
Demoz Gebre Egziabher, Aerospace Engineering and Mechanics, AM
Ted K. Higman, SM
James E. Holte, SM
Heinrich O. Jacobs, SM
Thomas Alfred Posbergh, AM
Stergios Roumeliotis, Computer Science and Engineering, ASM
modeling, and economic planning, and biological sciences, computer sciences, solar energy, applications.

Interdisciplinary work is also available in network theory, signal and image processing, semiconductor properties and devices, VLSI technology, lasers, fiber optics, magnetism, communication systems and theory.

Prerequisites for Admission—Graduate work is open to students who have shown exceptional scholarship and ability in an accredited undergraduate curriculum in electrical engineering or physics. Consideration is given to students who have completed another curriculum in engineering, science, 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. Students whose training is in engineering technology will not be considered for admission.

Special Application Requirements—Scores from the GRE (General Test only) are required of all students, except graduates of the University of Minnesota and part-time students working in industry. International students applying from within the United States should furnish letters from U.S. faculty members attesting to their ability to understand technical instruction in English. Students submitting transcripts from non-American institutions should furnish letters of recommendation that verify their academic standing in a specific way (e.g., class rank). Very few students are accepted for enrollment in spring semester or summer term. Applicants for fall semester admission should file a completed Admission Application with the Graduate School by December 15 for admission the following September. All students applying for graduate study should read detailed information on requirements for applying to the electrical engineering graduate program at www.ece.umn.edu/admissions/graduate/Department Application Information.shtml.

Courses—Refer to Electrical and Computer Engineering (EE) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—The electrical engineering graduate program allows all EE 4XXX Regular/Special Topics Regular or Lab Courses (excluding Senior Design/Coop/Independent Study) for graduate credit. Graduate credit for EE 4XXX classes is limited to 6 credits total. If by the end of fall semester 2007 students have completed 6 credits of 4xxx courses, any additional 4xxx courses will not be counted in their programs. Students who completed more than 6 credits of 4xxx courses by end of fall semester 2007 will be allowed to keep them in your program. Non-EE 4xxx courses acceptable for supporting/related field credit: MATH 4151, 4152, 4242, 4567, and 4606; and STAT 4101. All 4xxx physics courses are acceptable for graduate credit.

M.S.E.E. Degree Requirements

Every M.S.E.E. degree program must include 30 credits including at least 14 credits from EE courses at 5xxx or higher (6 credits of 4xxx EE courses can be used for the program) and at least 6 credits from courses outside EE at 4xxx or higher (normally from departments in the Institute of Technology or School of Statistics). These credits cannot come from colloquia or seminar registrations. A Plan A program (with thesis) cannot include more than 2 credits from projects, seminars, special investigations, or directed studies; in a Plan C program (coursework only), the limit is 2 credits. The Plan A program should include 10 thesis credits. Part-time students must choose Plan C; full-time students may choose either Plan A or Plan C. The student’s Degree Program Form listing all courses to be included toward the degree should be submitted no later than the end of the first year of the M.S.E.E. program. The department limits the number of GRAD 999 registrations.

Final Exam—The M.S.E.E. Plan A final exam is oral.

Minor Requirements for Students Majoring in Other Fields—The 6 credits for the master’s minor must be from classroom and laboratory courses graded A-F. Colloquia, seminar, and special investigations credits do not count toward meeting the minor requirements.

Ph.D. Degree Requirements

The Ph.D. requires at least 40 course credits including at least 6 credits in 8xxx courses, at least 14 credits in EE courses, and at least 12 credits in the supporting program or minor, which cannot include EE courses. In addition, 24 thesis credits are required. The program may contain up to 2 credits from seminars or special investigations registrations (excluding colloquia and practical training), and up to 8 credits of M.S. thesis registration, none of which can be used to meet the major requirements above. No credits can be included from colloquia or M.S. Plan B projects. At least 14 credits must be coursework taken at the University of Minnesota. The student’s Degree Program Form listing all courses to be included toward the degree should be submitted no later than the end of the second year of the Ph.D. program. Each Ph.D. student must participate in one of the department research area seminars and make at least three oral paper presentations before the thesis proposal is approved.
Minor Requirements for Students Majoring in Other Fields—The 12 credits for the Ph.D. minor must be from classroom and laboratory courses graded A-F. Colloquia, seminar, and special investigations credits do not count toward meeting the minor requirements.

Elementary Education
See Education, Curriculum, and Instruction.

English
Contact Information—Director of Graduate Studies, Department of English, University of Minnesota, 204 Lind Hall, 207 Church Street S.E., Minneapolis, MN 55455 (612-625-3882; fax 612-624-8228; gradeng@umn.edu; www/english.cla.umn.edu/grad).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Thomas S. Clayton, SM
Patricia M. Hampl, SM
Madelon Sprenger,SM

Professor
Timothy Brennan, Cultural Studies and Comparative Literature, SM
Michael Dennis Browne, SM
Maria Damon, SM
Andrew Ellenbein, SM
Genevieve J. Escure, SM
Shirley N. Garner, SM
Ray Gonzalez, SM
Edward M. Griffin, SM
Laura J. Gurak, Writing Studies, AM2
David B. Haley, SM
Michael Hancher, SM
Gordon D. Hirsch, SM
Karen A. Hoyle, Children's Literature Research Collections, AM2
Nabil I. Matar, SM
Ellen Messer-Davidow, SM
John W. Mowitt, Cultural Studies and Comparative Literature, ASM
Paula Rabinowitz, SM
Donald J. Ross Jr., Writing Studies, ASM
JulieSchumacher,SM
Geoffrey Sirc, SM
John A. Watkins, SM
Joel C. Weinsheimer, SM
John S. Wright, SM

Associate Professor
Robert L. Brown Jr., Cultural Studies and Comparative Literature, ASM
Lois Cucullo, SM
Lianna H. Farber, SM
Maria J. Fitzgerald, SM
Brian B. Goldberg, SM
Qadri Ismail, SM
Rebecca L. Krug, SM
Josephine D. Lee, SM
Evelyn Nien-Ming Ch'ien, SM
Daniel J. Philippon, SM
Janette Scandura, SM
Andrew Scheil, SM
Katherine W. Scheil, SM
Charles J. Sugnet, SM
David R. Treuer, SM
Michelle M. Wright, SM

Assistant Professor
Tony C. Brown, M2
Siobhan Craig, M2
Kirsten Jamsen, Director, Writing Center, M2
David B. Luke, M2
Natasha Tinsley, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Over the past 20 years, the field of English studies has dramatically changed 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 manifestoes. 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.

The department offers two master's degrees, the master of arts in English language and literature, and the master of fine arts in creative writing (see listing under Creative Writing). 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 Ph.D. and M.A. programs are broadly defined, allowing the student to shape a personal program of study. The English program encourages and supports interdisciplinary work. The M.F.A. program requires coursework in English and writing and emphasizes intensive work on a creative project.

Admission to the program—Students with a bachelor’s degree may apply either to the master's program or the doctoral program. An M.A. degree, but not an M.F.A. degree, can be gained en route to the Ph.D. degree. M.A. candidates who wish to continue their studies must formally apply for admission to the Ph.D. program.

Prerequisites for Admission—A minimum of four courses in English, three of which must be at the upper division level, is required for degree programs and the graduate major. The courses should be widely distributed.

Special Application Requirements—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, are required.

Applications to the M.F.A. in creative writing are reviewed by the creative writing faculty; these applications should include a substantial portfolio of writing. Candidates for all degrees are admitted fall semester only; all materials must be received by December 20.

Courses—Refer to English: Creative Writing (ENGW), and English: Literature (ENGL) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—A limited number of 4xxx courses may be included as appropriate for field and area requirements. Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

M.A. Plan B Degree Requirements

The minimum requirement for the M.A. is 30 credits. Coursework must include at least 24 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 sequence ENGL 5001-02 on methods and theory of literary study and three Plan B papers.

Language Requirements—A reading knowledge of one classical or modern language, approved by the director of graduate studies, is required.

Final Exam—The final exam is oral.
Minor Requirements for Students Majoring in Other Fields — The master’s minor consists of 9 credits in English. Course selection is determined in consultation with the director of graduate studies.

Ph.D. Degree Requirements
A minimum of 42 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 5002, preferably during the first year of doctoral study (6 cr); four English courses distributed among broad areas (minimum of 12 cr); four additional English courses in a focused area of emphasis (minimum of 12 cr); 12 credits in a supporting program. Students are encouraged to enroll in additional courses as appropriate.

Language Requirements — Proficiency in one language, classical or modern, or a reading knowledge of two, approved by the director of graduate studies, is required. Students specializing in medieval or early modern literature and culture are advised to include Latin as one of their languages.

Minor Requirements for Students Majoring in Other Fields — The Ph.D. minor consists of 12 credits in English. Course selection is determined in consultation with the director of graduate studies.

English as a Second Language

Contact Information — Director of Graduate Studies, English as a Second Language, University of Minnesota, 215 Nolte Center, 315 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-3331; fax 612-624-4579; iles@umn.edu; www.iles.umn.edu/esl).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Andrew D. Cohen, M2
Carol Klee, AM
Elaine E. Tarone, M2

Associate Professor
Martha Bigelow, AM
Kathryn Kohner, AM
Anne Lazaraton, M2

Assistant Professor
Douglas Margolis, M2

Other
Michael Anderson, AM
Jenise RoweKamp, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum — The program in English as a Second Language offers a course of study leading to an M.A. Degree holders are qualified to teach ESL to adults at the college or university level. The program emphasizes research and practice in language analysis, language acquisition, teaching methodology, materials development, and uses of technology in language teaching. Students are expected to do independent and creative work in one or two of these areas with the aim of developing a more complete understanding of the issues facing professionals in the field of teaching ESL today.

Prerequisites for Admission — A bachelor’s degree in the liberal arts or sciences with a strong academic record is required.

Special Application Requirements — Scores from the General (Apitude) Test of the GRE and three letters of reference are required. Nonnative speakers of English must submit either TOEFL scores (preferred 600 [paper], 250 [computer], or 100 [Internet]), or IELTS scores (preferred 7). Students may begin the program fall semester or first summer session. Applications for both admission dates are due on February 1.

Courses — Refer to English as a Second Language (ESL) and Teaching English as a Second Language (TESL) in the course section of this catalog or in Twin Cities Courses on or the University Catalog Web site for courses pertaining to the program. Use of 4xxx Courses — Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

M.A. Degree Requirements
The M.A. program in ESL normally takes two years to complete. The Plan A option 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. The Plan B option requires two qualifying papers, usually consisting of course papers which have been rewritten under the supervision of a faculty member. Plan A and Plan B students must complete 28 credits in required coursework and 6 credits of elective coursework in related fields. Plan A students must complete an additional 10 thesis credits for a total of 44 credits and Plan B students must complete an additional 3 credits in elective coursework for a total of 37 credits. Elective and related field courses must be chosen with the help of an adviser to ensure the relevance of courses to students’ goals.

Language Requirements — Proficiency, demonstrated by exam or coursework, in one language not native to the student is required upon completion of the program. Nonnative speakers of English who are admitted to the program are considered to have fulfilled the language requirement.

Final Exam — The final exam is oral.

Minor Requirements for Students Majoring in Other Fields — For a graduate minor in ESL, students must take ESL 5721, 5401, and 5402, for a total of 11 credits.

Entomology

Contact Information — Director of Graduate Studies, Department of Entomology, University of Minnesota, 219A Hodson Hall, 1980 Folwell Avenue., Saint Paul, MN 55108 (612-624-3636; fax 612-625-5299; entodept@umn.edu; www.entomology.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
David A. Andow, SM
Mark E. Ascerno, Jr., (emeritus), M2
Ann M. Fallon, SM
Leonard C. Ferrington, SM
Ralph W. Holzenthal, SM
William D. Hutchison, SM
Timothy J. Kurtti, SM
Karen A. Mesce, SM
Roger D. Moon, SM
Kenneth R. Ostlie, SM
David W. Ragsdale, SM
Marla Spivak, SM

Adjunct Professor
William E. Miller, SM

Associate Professor
George E. Heimpel, SM
Vera A. Krischik, SM
Ian Y. MacRae, SM
Uli Munderloh, SM
George D. Weiblen, SM
Susan J. Weller, SM

Adjunct Associate Professor
Susan Palchick-Silver, M2
Robert C. Venette, M2

Assistant Professor
Stephen A. Kells, SM

Adjunct Assistant Professor
Luke Skinner, M2
Steffen Pauls, M2

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 the natural and urban environments.

Prerequisites for 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 must be sent directly to the department. A 3.00 GPA (on a 4.00 scale) for undergraduate work, and 3.50 for prior graduate work are preferred for admission. GRE scores are required for admission. The preferred performance level on the GRE’s is the 70th percentile or above in each of the Verbal and Quantitative exams; however, admissions decisions are not based solely on GRE scores. All credentials in the application packet are considered in reaching an individual admission decision for each applicant. For non-English speaking students, a minimum score on the TOEFL exam of 550 (paper), 213 (computer), or 79 (Internet) is preferred for admission. Deadline for application is December 15 for full consideration for graduate fellowships and traineeships. Students may apply and be accepted at other times of year. Applications are reviewed individually by an admissions committee but only after all materials are complete.

Courses—Refer to Entomology (ENT) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is allowed but is subject to adviser and director of graduate studies approval.

M.S. Degree Requirements—Requirements for the M.S., supplemental to general Graduate School 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. 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.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires a minimum of 6 credits in 4xxx, 5xxx, or 8xxx entomology courses.

Ph.D. Degree Requirements—Ph.D. requirements include a minimum of at least 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.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—The doctoral minor requires a minimum of 12 credits in 4xxx, 5xxx, or 8xxx entomology courses.

Environmental Health—Student Services Center, School of Public Health, University of Minnesota, MMC 819, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-3500 or 1-800-774-8636; fax 612-624-4498; sph-ssc@umn.edu; www.sph.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Timothy R. Church, SM
Susan G. Gerberich, SM
Sagar M. Goyal, Veterinary Population Medicine, ASM
Craig W. Hedberg, SM
Jordan L. Holtzman, Medicine, ASM
Julie A. Jacko, SM
Patricia M. McGovern, SM
Debra K. Olson, SM
Michael T. Osterholm, SM
Lisa A. Peterson, SM
Gurumurthy Ramachandran, SM
Deborah L. Swackhammer, SM
William Toscano, SM

Adjunct Professor

Debora Boyle, Veterinary Population Medicine, ASM
John M. Shutke, ASM
Associate Professor

John L. Adgate, SM
Bruce Alexander, SM
Lisa M. Brousseau, SM
Colin Campbell, Pharmacology, ASM
Ian A. Greaves, SM
George Maldonado, SM
Jeffrey H. Mandel, AM2
Heather H. Nelson, Epidemiology, AM2
Carol Ann O’Boyle, Nursing, ASM
Matthew Simcik, SM
Randall Singer, SM
Elizabeth V. Wattenberg, SM

Adjunct Associate Professor

Alan P. Bender, Epidemiology, AM2
Rita B. Messing, Pharmacology, AM2

Assistant Professor

Nancy Nachreiner, SM
Peter Raynor, SM

Adjunct Assistant Professor

Beth A. Baker, Medicine, ASM
Hillary M. Carpenter, AM2
L. Ronald French, Epidemiology, AM2
Julian Marshall, Civil Engineering, ASM
Nico V. McCullough, AM2
John R. Mulhausen, ASM
Robert R. Roy, Veterinary Population Medicine, AM2
Allan N. Williams, ASM

Instructor

Kirk E. Smith, Veterinary Population Medicine, AM2

Other

Jeff B. Bender, ASM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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: environmental chemistry, environmental health policy, infectious disease, environmental and occupational epidemiology, environmental toxicology, the general environmental health program, occupational health nursing, occupational injury epidemiology and control, or the industrial hygiene program. The industrial hygiene program is accredited by the Applied Science Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, (410-347-7700).

Prerequisites for Admission—Minimum requirements include a baccalaureate degree with coursework in the basic sciences. Each specialty requires slightly different preparation.

Special Application Requirements—GRE scores, a letter describing the applicant’s professional objectives, and three letters of recommendation are required.

Courses—Refer to Public Health (PUBH), particularly numbers 81xx, in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program and for 61xx–71xx courses.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to the approval of the adviser and the director of graduate studies. Students from other major programs may include such courses subject to their own program’s approval.

M.S. Degree Requirements

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 depends on the chosen specialty area. Most specialty 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.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—Students completing a minor in environmental health must complete 6 credits in environmental health, including PUBH 6103, 6104, and 6105.

Ph.D. Degree Requirements

The Ph.D. focuses on research, supplemented with advanced coursework developed under the guidance of a faculty adviser and a Ph.D. committee. Students are required to register for 24 thesis credits. Students usually need a minimum of two to three years beyond the master’s degree to complete a doctorate.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Students are required to take a minimum of 12 credits in environmental health, including PUBH 6103, 6104, and 6105.

Epidemiology

Contact Information—Student Services Center, School of Public Health, University of Minnesota, MMC 189, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-3500 or 1-800-774-8636; fax 612-626-6931; sph-ssc@umn.edu; www.sph.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Timothy R. Church, M2
Richard S. Crow, M2
John R. Finnegan Jr., SM
Aaron R. Folsom, SM
Jean L. Forster, M2
Simone A. French, M2
Laël C. Gatewood, Laboratory Medicine and Pathology, M2
Richard H. Grimm, Medicine, SM
Myron D. Gross, Laboratory Medicine and Pathology, M2
Bernard L. Harlow, M2
Craig W. Hedberg, M2
John H. Himes, SM
David R. Jacobs Jr., SM
Robert W. Jeffery, SM
Robert L. Kane, SM
Harry A. Lando, SM
Arthur S. Leon, Kinesiology, SM
Alan R. Lipson, M2
Russell V. Luepker, SM
Leslie L. Lytle, SM
A. Marshall McBean, M2
Joseph P. Neglia, Pediatrics, M2
Dianne Neumarz-Sztainer, M2
Michael T. Osterholm, SM
Julie A. Ross, Pediatrics, SM
B. R. Rosser, M2
Pamela J. Schreiner, SM
Mary T. Story, SM

Associate Professor

Bruce H. Alexander, M2
Kristin E. Anderson, SM
Jeff B. Bender, Veterinary Population Medicine, M2
Ellen W. Demerath, M2
Lisa J. Harnack, M2
Wendy L. Hellestedt, SM
Deborah J. Henrikkus, M2
Rhonda J. Jones-Webb, M2
DeAnn Lazovich, M2
George Maldonado, M2
Heather H. Nelson, M2
J. Michael Oakes, M2
Charles N. Oberg, M2
James S. Pankow, SM
Mark A. Pereira, M2
Randall Singer, Veterinary and Biomedical Sciences, M2
Lyn M. Steffen, M2
Traci L. Toomey, M2
Michelle van Ryn, Family Medicine and Community Health, M2
Beth A. Virgir, M2
Jian-Min Yuan, M2

Adjunct Associate Professor

Alan P. Bender, M2

Assistant Professor

Alvaro Alonso, M2
Sonya S. Brady, M2
Susan J. Duval, M2
Marla E. Eisenberg, Pediatrics, M2
Darin J. Erickson, M2
Andrew P. Flood, M2
Eileen M. Harwood, M2
Keith J. Horvath, M2
Jennifer A. Linde, M2
Claudia A. Munoz-Zanzi, M2
Melissa Nelson, M2
Toben F. Nelson, M2
Ruby Nguyen, M2
Kimberly Robien, M2
John R. Sirad, M2
Logan G. Spector, Pediatrics, M2

Adjunct Assistant Professor

Sally A. Bushhouse, M2
Richard N. Danila, M2
Anne M. Jurek, M2
Catherine A. Lexau, M2
John W. Oswald, M2

Senior Research Fellow

Peter J. Hannan, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 63 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, 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.

Prerequisites for Admission—For the doctoral program, applicants must have completed or be about to complete a master’s degree in a related field. Applicants should have prior coursework in life or behavioral sciences. Applicants who have not completed a master’s degree in epidemiology or a related field are asked to apply to the master’s of public health in epidemiology through the School of Public Health. Because positions in the doctoral program are limited, selection is competitive with respect to academic background and experience.

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 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, indicating 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 15 of the year prior to beginning the doctoral program for scholarship consideration; the final deadline is February 15.

For an online application, see the School of Public Health Web site at www.sph.umn.edu/students/application/home.html.

NOTE: Students who are or ever were a student in the University of Minnesota Graduate School and are applying to any graduate or professional program in the University of Minnesota, must complete a change of status application. See the Graduate School Web site for the appropriate form and fee at www.grad.umn.edu/current_students/forms/cos.pdf.

Courses—Refer to the epidemiology Ph.D. program sheet available on the School of Public Health Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of any 4xxx courses on Degree Program Forms of majors or minors is subject to adviser and director of graduate studies approval.

M.S. Degree Requirements
Students are not admitted directly into the master’s 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’s of public health (M.P.H.) degree through the School of Public Health (SPH). For more information on the M.P.H. degree, visit the SPH Web site at www.sph.umn.edu.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students
Majoring in Other Fields—The master’s minor requires at least 8 credits.

Ph.D. Degree Requirements
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 63 credits. Students must pass written and oral preliminary exams, write and defend a dissertation, and prepare a first-authored manuscript for publication.

Coursework includes 17 credits in epidemiology, biostatistics, ethics, 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 12 credits of supporting program or minor coursework. In addition, the Graduate School requires 24 thesis credits as part of the doctoral requirements that can be taken once the preliminary qualifying exams are completed.

Language Requirements—None.

Minor Requirements for Students
Majoring in Other Fields—The minor requires 12 credits: 10 credits in epidemiology and biostatistics, and 2 credits in epidemiology elective courses. The director of graduate studies must approve the student’s selection of elective credits. Contact the major coordinator in epidemiology for information at epichstu@umn.edu.

Ergonomics
See Human Factors/Ergonomics.

Experimental Surgery
See Surgery.

Family Policy

Minor Only

Contact Information—Graduate Minor in Family Policy, Department of Family Social Science, University of Minnesota, 290 McNeal Hall, 185 Buford Avenue, Saint Paul, MN 55108 (612-625-3116; fax 612-625-4227; http://cehd.umn.edu/fsos/Graduate/famPolMinor.asp).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Jean W. Bauer, Family Social Science, M
Jeffrey L. Edleson, Social Work, M
Nancy Eustis, Public Affairs, M
Katherine Fennelly, Public Affairs, M
David Hollister, Social Work, M
B. Jan McCulloch, Family Social Science, M
Jeylan T. Mortimer, Sociology, M
Samuel Myers, Public Affairs, M
Kathryn Retting, Family Social Science, M
Marlene Stum, Family Social Science, M
Susan J. Wells, Social Work, M
Becky Yust, Design, Housing, and Apparel, M

Associate Professor
Marilyn Bruin, Design, Housing, and Apparel, M
Jeffrey R. Crump, Design, Housing, and Apparel, M
Elizabeth (Liz) E. Davis, Applied Economics, M
Maria Hanratty, Public Affairs, M
Kathleen E. Hull, Sociology
Linda E. Jones, Social Work, M
Erin L. Kelly, Sociology
Deborah Levison, Public Affairs, M
Elizabeth Lightfoot, Social Work, M
Joan Patterson, Epidemiology, M
Ann Ziebarth, Design, Housing, and Apparel, M
Curriculum—This minor is available to both master’s and doctoral students. The family policy minor provides a multidisciplinary academic foundation in the analysis of policies for their impact on families. Students completing the family policy minor are knowledgeable about major public and private policies affecting families, and understand how these policies came to be adopted, including social, economic, and political past and current influences. Participating students develop a framework in which to analyze policies for their impact on families, and an understanding of the differential impact on diverse families.

Students may choose relevant courses from a variety of disciplines, including applied economics, family social science, housing, law, political science, public health, public policy, social work, and sociology. By integrating their knowledge across disciplines, students develop a comprehensive understanding of how families are affected by public and private policies.

Prerequisites for Admission—Admission is contingent upon prior admission to a master or doctoral degree-granting program within the Graduate School. Any graduate student currently in good standing in the Graduate School may elect to complete the minor.

Special Application Requirements—Students formally apply to the minor by completing the Application for Family Policy Minor and submitting to the director of graduate studies. The PDF form is available at www.cehd.umn.edu/fsos/Graduate.

Courses—Contact the minor program office at www.cehd.umn.edu/fsos/Graduate for information on relevant courses.

Use of 4xxx Courses—4xxx courses are not allowed in the minor.

Minor Only Requirements

The master’s minor is nine credits. FPOL 8000—Family Policy Perspectives is required plus 6 credits from one of the departments or professional schools’ elective courses on the course list. The doctoral minor is twelve credits. FPOL 8000—Family Policy Perspectives is required plus 9 additional credits from elective courses that make a coherent plan. The dissertation must include a family policy application.

Family Social Science

Contact Information—Department of Family Social Science, University of Minnesota, 290 McNeal Hall, 1985 Buford Avenue, Saint Paul, MN 55108 (612-625-3116 or 612-625-1900; fax 612-625-4227; fsosgrad@umn.edu; http://cehd.umn.edu/fsos/Graduate.

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Jean W. Bauer, SM
Pauline E. Boss, (emeritus), ASM
Rose M. Brewer, African American and African Studies, AM2
Sharon M. Danes, SM
Daniel F. Detzner, ASM
William J. Doherty, SM
Ann W. Garwick, Nursing, AM2
M. Janice Hogan, (emeritus), ASM
James W. Maddock, (emeritus), ASM
B. Jan McCullough, SM
Kathryn D. Rettig, SM
Paul C. Rosenblatt, SM
Marlene S. Stum, SM
William L. Turner, SM

Associate Professor
Jodi B. Dworkin, SM
Joan M. Patterson, Psychiatry, ASM
Beatrice E. Robinson, Family Medicine and Community Health, AM2
Martha A. Buetter, SM
Catherine A. Solheim, SM
Elizabeth Wieling, SM
Bong Xiong, M2
Virginia S. Zuiker, SM

Assistant Professor
Shonda M. Craft, M2
Abigail Gewirtz, M2
Tai J. Mendenhall, Family Medicine and Community Health, AM2

Lecturer
William J. Goodman, M2
Cynthia J. Meyer, M2

Research Associate
Gretchen E. Wrobel, AM2

Other
Sara Axtell, Community-Campus Health Outreach Liaison, M2
Patricia Olson, Minnesota Extension Director, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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.

Prerequisites for Admission—A strong applicant to the master’s program will have two family courses; at least one course in economics, political science, government, or public policy; one course in sociology or anthropology; one psychology course; one course in statistics or research methods; experience working with families through paid employment or volunteer work; and interest in developing competence in research. A strong applicant to the doctoral program will have all requirements for the master’s program plus three additional social or behavioral science courses and two additional statistics or research methods courses. It is important that students, especially those applying for the Ph.D. program, present evidence of interest in research and that they have experience working with families through paid employment or volunteer work. Occasionally, the graduate faculty admits a student who lacks one or more required courses with the understanding that the missing course(s) will be made up prior to entering the program or in the first year of graduate work.

The marriage and family therapy program is accredited by the Commission on Accreditation for Marriage and Family Therapy Education. Admission to the program is available only to doctoral students with a clinical master’s degree. Students cannot earn a clinical master’s degree in the Department of Family Social Science.

Students may apply for admission to the Ph.D. program 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.

Special Application Requirements—Consult the Family Social Science Admissions and Orientation Web page or the director of graduate studies. The Graduate Program Handbook and application requirements and procedures may be found at http://cehd.umn.edu/fsos/Graduate/admissionOrient.asp.

Applicants for the doctoral program and Plan A master’s program are reviewed only once per year. The application deadline is December 15 for admission fall semester of the following year. Applications for the Plan B master’s program are considered once they are complete, and students may begin graduate study the semester after the application is approved.
Courses—Refer to Family Social Science (FSOS) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Students from other majors may take courses with instructor approval and include them on their degree programs subject to their own program's approval. 4xxx courses counted on graduate programs must be taught by a member of the graduate faculty and must include assignments that are at the graduate level.

M.A. Degree Requirements
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. It 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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires at least 12 credits of 8xxx courses in family social science. All courses for the minor must be taken A-F and completed with a GPA of at least 3.00.

Family, Youth, and Community
See Education, Curriculum, and Instruction.

Feminist Studies

Contact Information—Feminist Studies Graduate Program, Department of Gender, Women, and Sexuality Studies, University of Minnesota, 425 Ford Hall, 224 Church Street S.E., Minneapolis, MN 55455; (612-626-0332; fax 612-624-3573; gwss.umn.edu; www.gwss.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

 Regents Professor
Elaine Tyler May, American Studies, AM2

Professor
Rose M. Brewer, African American and African Studies, ASM
Karlyn K. Campbell, Communication Studies, AM2
Anna Clark, History, AM2
Raymond DuVall, Political Science, AM2
Mary L. Fellows, Law School, AM2
Donna Gabaccia, History, MA
Shirley N. Garner, English, AM2
Jane F. Gilgun, Social Work, AM2
Ruth-Ellen B. Joor es, German, Scandinavian, and Dutch, ASM
Indira Y. Junghare, Linguistics, ESL, and Slavic Languages and Literatures, AM2
Amy K. Kaminsky, Gender, Women, and Sexuality Studies, SM
Mary Jo Kane, Kinesiology, AM2
Russ Karras, History, AM2
Sally J. Kenney, Public Affairs, AM2
Sally G. Kohlsedt, Geology and Geophysics, AM2
Regina Kunzel, Gender, Women, and Sexuality Studies, SM
Helga Leitner, Geography, AM2
Mary J. Maynes, History, AM2
Richard W. McCormick, German, Scandinavian, and Dutch, AM2
Ellen Messer-Davidow, English, ASM
Richa Nagar, Gender, Women, and Sexuality Studies, SM
Riv-Ellen Prell, American Studies, AM2
Paula Rabinowitz, English, ASM
Glória Goodwin Rakeja, Anthropology, AM2
Rebecca Ropers-Huilman, Educational Policy and Administration, AM2
Naomi B. Scheman, Philosophy, SM
Edward Schiappa, Communication Studies, AM2
Mary Lay Schuster, Writing Studies, AM2
Amy L. Sheldon, Communication Studies, AM2
Billie J. Wahlstrom, Writing Studies, AM2
Ann B. Waltner, History, AM2
Barbara Y. Welke, History, AM2

Associate Professor
Lisa Albrecht, Social Work, ASM
Walter Bockting, Medical School, AM2
Maria M. Brewer, French and Italian, AM2
Sarah Chambers, History, AM2
Susan Craddock, Gender, Women, and Sexuality Studies, SM
Maria Damon, English, AM2
Jigna Desai, Gender, Women, and Sexuality Studies, M2
Roderick Ferguson, American Studies, AM2
Susanna Ferlito, French and Italian, AM2
Kathleen Hull, Sociology, AM2
Amy Lee, Postsecondary Teaching and Learning, AM2
Josephine Lee, English, AM2
Kevin Murphy, History, AM2
Lisa A. Norling, History, AM2
Joanna O’Connell, Spanish and Portuguese Studies, AM2
Jennifer L. Pierce, American Studies, AM2
Eileen B. Sivert, French and Italian, AM2
Dara Stоловitch, Political Science, AM2
Karen Tausig, Anthropology, AM2
Gary Thomas, Cultural Studies and Comparative Literature, AM2
Karen E. Till, Geography, AM2
Edén Torres, Gender, Women, and Sexuality Studies, SM
Mary Vavrus, Communication Studies, AM2
Michelle M. Wright, English, ASM
Monika Zagar, German, Scandinavian, and Dutch, AM2
Jacquelyn N. Zita, Gender, Women, and Sexuality Studies, SM

Assistant Professor
Bianet Castellanos, American Studies, MA
Omi’se’eko Natasha Tinsley, English, AM
Diane Willow, Art, AM

Other
Karen Brown-Thompson, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The M.A. is available only to students admitted to the Ph.D. program who wish to secure this credential for ABD employment purposes or who must exit the program. It is similar to the Ph.D. but with no dissertation.

The Ph.D. program is an interdisciplinary, multicultural, and international study of women and gender in which students develop competence in interdisciplinary and disciplinary feminist theories, research methods, and pedagogy. The program pays attention to all aspects of women’s diversity, nationally and globally. Students may select a disciplinary focus from among feminist theory, critical sexuality studies, literary studies, historical studies, social sciences and public policy, and gender in a global
program within the Graduate School.

Prerequisites for Admission—The graduate minor program is available only to students who have prior admission to a master’s or doctoral degree-granting program within the Graduate School.

Special Application Requirements—Applicants for the Ph.D. program must submit scores from the General (Aptitude) Test of the GRE, three letters of recommendation sent directly to the department, a writing sample, a current curriculum vitae, and a clearly written statement of career interests, goals, and objectives. Graduate study in the program begins in the fall semester. The application deadline is Friday of the first week in December; all applications are evaluated once each year in December. Students interested in the graduate minor program should submit a completed application by April 15 to be considered for admission in fall semester. Applications received after April 15 are considered as space allows. It is expected that no more than 12 students will be admitted into the minor each year. Admission to the minor program does not require an undergraduate major or minor in women’s studies. However, applicants are expected to show general knowledge of feminist scholarship, as evidenced, for example, in some combination of previous coursework, research, writing, or organizational experience.

Courses—Refer to Gender, Women, and Sexuality Studies (GWSS) in the course section of this catalog or in the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx feminism studies courses on Degree Program Forms of feminist studies majors or minors for the Ph.D. degree is discouraged; such courses are considered only in exceptional circumstances, subject to adviser and director of graduate studies approval.

M.A. Plan B Degree Requirements

Students are not admitted to the master’s program; it is available only to students admitted to the Ph.D. program who wish to secure this credential for ABD employment purposes or who must exit the program. The courses required for the M.A. are the same as those required for the Ph.D.; see below. In addition, three Plan B papers and a final oral exam on these papers are required

Language Requirements—None, but a second language is strongly encouraged.

Final Exam—The final exam is written and oral and is effectively identical to the Ph. D. preliminary written and oral exams.

Ph.D. Degree Requirement

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 55 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.

Language Requirements—None, but a second language is strongly encouraged.

Preliminary Exams—Ph.D. students are expected to take a three-paper preliminary written exam, a preliminary oral exam on those papers, and an informal oral exam on their dissertation proposal.

Final Exam—The final Ph.D. exam on the dissertation is oral.

Minor Requirements for Students Majoring in Other Fields—The graduate minor focuses on skills and competencies in four areas: interdisciplinary knowledge of women and gender, feminist theories and methods, feminist research in a specific field, and feminist practice through teaching or internships. 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 gender, women, and sexuality studies and at most one feminist studies-approved graduate course from their home department. Students must apply for admission into the graduate minor program.

Financial Mathematics

Contact Information—Masters of Financial Mathematics Degree Program, School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church Street S.E., Minneapolis, MN 55455 (612-625-1306; fax 612-624-6702; mfmgrad@umn.edu; www.math.umn.edu/finmath).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Scot Robert Adams, M2
John Robert Baxter, M2
Bernardo Cockburn, M2
Lawrence F. Gray, M2

Assistant Professor

Carlos Tolmasky, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—This 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 and a practitioner’s course offering hands-on practice to learn financial software tools. There is also a programming course focusing on C# and MATLAB. Courses are offered in the evenings to accommodate working professionals. The program is designed with a possibility for full-time students to complete all requirements in one year.

Prerequisites for Admission—A primary criterion for admission is a strong knowledge of undergraduate mathematics (particularly multivariable calculus, some ODEs and linear algebra) and/or significant work experience in finance. Those who are admitted, but who either do not have a strong mathematics background or who may need a “refresher” may be requested to take the course sequence: FM 5001/FM 5002—Preparation for Financial Mathematics.

Special Application Requirements—Recent college graduates are requested to submit GRE Mathematics Subject Test scores only. Generally speaking, admission is restricted to those with GRE Mathematics Subject scores above the
50th percentile. Students should submit test scores, transcripts, and three letters of recommendation by February 28 for early admission notification, and no later than June 5. Students are admitted for fall semester only.

**Courses** — Refer to Financial Mathematics (FM) in the course section of this catalog or to [Twin Cities Courses](http://fscn.cfans.umn.edu/education/foodsciencegraduate) on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses** — Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

**M.F.M. Degree Requirements**
The M.F.M. requires 30 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. 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—Programming and Presentation in Finance. In addition to the 30 required credits, students who either do not have a strong mathematics background or need a “refresher” may be asked to take FM 5001/5002—Preparation for Financial Mathematics.

**Final Exam** — None.

**Language Requirements** — None.

**Fisheries**
See [Conservation Biology](http://fscn.cfans.umn.edu/education/conservationbiology).

**Food Science**

**Contact Information** — Graduate Program in Food Science, Department of Food Science and Nutrition, University of Minnesota, 225 Food Science and Nutrition Building, 1334 Eckles Avenue, Saint Paul, MN 55108 (612-624-1290; fax 612-625-5272; fsgrad@umn.edu; http://fscn.cfans.umn.edu/education/foodsciencegraduate/index.htm).

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.grad.umn.edu/faculty_rosters/faculty.html).

**Professor**
Mrinal Bhattacharya, SM
Linda J. Brady, SM
A. Saari Csallany, SM
Theodore P. Labuza, SM
Allen S. Levine, SM
Daniel J. O’Sullivan, SM
Gary A. Reineccius, SM
Roger R. Ruan, SM
Joanne L. Slavin, AM2
David E. Smith, SM
Zata M. Vickers, SM

**Adjunct Professor**
Bernhard van Lengerich, AM2

**Associate Professor**
Mirko Bunzel, SM
Francisco Diez-Gonzalez, SM
Joellen M. Feirtag, SM
Craig A. Hassel, AM2
Leonard F. Marquart, SM
Lloyd Metzger, SM

**Adjunct Associate Professor**
Katherine M. Swanson, AM2

**Assistant Professor**
Baraem Ismail, SM

**Adjunct Assistant Professor**
Mary K. Schmidl, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum** — 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.

**Prerequisites for Admission** — Applicants with an undergraduate major in any physical or biological science usually have completed the necessary prerequisites. 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.

**Special Application Requirements** — GRE scores and three letters of reference are required.

**Courses** — Refer to Food Science and Nutrition (FSCN) in the course section of this catalog or to [Twin Cities Courses](http://fscn.cfans.umn.edu/education/foodsciencegraduate) on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses** — Inclusion of 4xxx food science courses on the Degree Program Form is permitted with adviser and director of graduate studies approval.

**M.S. Degree Requirements**
The M.S. offers both Plan A (with thesis) and Plan B (without thesis) options. Both options require at least 14 course credits in the major and 6 course credits in the minor or related field. 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.

**Language Requirements** — None.

**Final Exam** — The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields** — 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.

**Ph.D. Degree Requirements**
The number of credits required varies depending on preparation and the research undertaken. Most students take a total of about 60 credits. 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 a teaching assistant during their graduate career.

**Language Requirements** — None.

**Minor Requirements for Students Majoring in Other Fields** — For a Ph.D. minor, students must take FSCN 4111 and 4121, and BAE 4744, plus one additional food science graduate level course totally 12 credits. The minor must be approved by the food science director of graduate studies.

**Forestry**
See [Natural Resources Science and Management](http://fscn.cfans.umn.edu/education/naturalresources).
French

Contact Information—A department general information bulletin and a projection of graduate-level courses to be offered is available from the Department of French and Italian, University of Minnesota, 260 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4308; fax 612-624-6021; frit@umn.edu; www.frit.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
F. R. P. Akehurst, SM
Daniel Brewer, SM
Susan Noakes, SM, Italian, M

Associate Professor
Mária M. Brewer, SM
Bruno Chaouat, M2
Juliette Cherbuliez, M2
Susanna Ferlito, SM, Italian, M
Betsy Kerr, SM
Judith Preckshot, SM
Peter H. Robinson, SM
Eileen B. Sivert, SM

Assistant Professor
Hakim Abderrezak, M2
Mary F. Brown, M2
Christophe M. Wall-Romana, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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.

Prerequisites for 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. For the Ph.D. program, an M.A. in French (or equivalent) is required.

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, a sample of their academic writing, an audiotape of their spoken French, and a written statement of career 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 December 15 ensures consideration for Graduate School Fellowships; submission by 1 January 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.

Affiliated Research Centers—Students explore interdisciplinary approaches through outside coursework or participation in one of several academic centers with which the programs are affiliated. These centers include, in the College of Liberal Arts, the Center for Advanced Research in Language Acquisition, the Center for German and European Studies, the Center for Medieval Studies, the Institute for Advanced Study, as well as the University’s Immigration History Research Center. Students specializing in francophone literatures and cultures may pursue these interests through the African American and African studies program or the Interdisciplinary Center for the Study of Global Change.

Courses—Refer to French (FREN) and French and Italian (FRIT) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site.

Use of 4xxx Courses—4xxx courses in French, or other programs may be used for graduate credit only in exceptional cases. Students should consult the director of graduate studies and adviser before registering.

M.A. Degree Requirements—Students may pursue Plan A (with thesis) or Plan B (with two papers). Plan A requires at least 24 credits, Plan B at least 33 credits. Both plans require at least 18 credits in the major and 6 credits in related fields or, in a minor, the number of credits required by the minor program (usually 6 cr). Plan A also requires at least 10 thesis credits. (Detailed information is available through the program office.)

Final Exam—The final exams are both written and oral.

Language Requirements—For the M.A. degree, students must demonstrate proficiency in one foreign language besides English and French.

Minor Requirements for Students Majoring in Other Fields—A master’s minor in French requires at least 9 credits.

Ph.D. Degree Requirements

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.

Language Requirements—For the Ph.D., students must demonstrate proficiency in one foreign language besides English and French, at a level higher than for the M.A. and suitable for use in research. Doctoral students specializing in the Middle Ages, Renaissance, or Early Modern period (roughly to 1666) must also demonstrate knowledge of Latin.

Minor Requirements for Students Majoring in Other Fields—A Ph.D. minor requires at least 12 credits

French Studies

Postbaccalaureate Certificate

Contact Information—French Studies Certificate, Department of French and Italian, 260 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4308; fax 612-624-6021; frit@umn.edu; www.frit.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
F. R. P. Akehurst, M
Daniel Brewer, M
Susan Noakes, M

Associate Professor
Mária M. Brewer, M
Bruno Chaouat, M2
Juliette Cherbuliez, M2
Susanna Ferlito, M
Betsy Kerr, M
Judith Preckshot, M
Peter H. Robinson, M
Eileen B. Sivert, M

Assistant Professor
Hakim Abderrezak, M2
Mary F. Brown, M2
Christophe M. Wall-Romana, M2

French Studies

Postbaccalaureate Certificate

Contact Information—French Studies Certificate, Department of French and Italian, 260 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4308; fax 612-624-6021; frit@umn.edu; www.frit.umn.edu).

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Professor
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Judith Preckshot, M
Peter H. Robinson, M
Eileen B. Sivert, M

Assistant Professor
Hakim Abderrezak, M2
Mary F. Brown, M2
Christophe M. Wall-Romana, M2

Curriculum—This 15-credit graduate program is addressed primarily to secondary teachers of French but welcomes

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
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.

Prerequisites for 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 3.00. Applicants with considerable teaching experience or other relevant professional experience (publications, translations, work experience in France, or a francophone country), who have a GPA below 3.00, are encouraged to make inquiries to the director of graduate studies.

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 (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.

Certificate Requirements—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 be taken at the 5xxx and 8xxx levels and no more than two courses (6 cr) at the 4xxx level. 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.

Genetics
See Molecular, Cellular, Developmental Biology, and Genetics.

Geographic Information Science

Contact Information—Master of Geographic Information Science Program, Department of Geography, University of Minnesota, 414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-625-6080; fax 612-624-1044; mgis@umn.edu; www.mgis.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

Professor
Marvin E. Bauer, Forest Resources, M2
James Bell, Soil, Water, and Climate, M2
Paul V. Bolstad, Forest Resources, M2
Robert B. McMaster, M2
Shashi Shekhar, Computer Science, M2
Associate Professor
Francis Harvey, M2
Steven Manson, M2
Roger Miller, M2
Roderick H. Squires, M2
Assistant Professor
Robert Edsall, M2

Other
William J. Craig, M2
Mark Lindberg, M2
Susanna McMasterr, M2

Teaching Specialist
Stephen Lime, AM2
Timothy Loesch, AM2
Robert Maki, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The 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 focus 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.

Prerequisites for Admission—Admission to the program requires a bachelor’s degree with a preferred GPA of 3.00. Prospective students also should have completed a college-level mathematics course, statistics course, and computer programming course.

Special Application Requirements—Applicants must submit a M.G.I.S. program application form; transcripts; a clearly written 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.

Courses—Refer to Geography (GEOG) and Geographic Information Science (GIS) in the course descriptions or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program. Also refer to Forest Resources (FR) and Environmental Sciences, Policy and Management (ESPM) in the course descriptions for additional courses.

Use of 4xxx Courses—No more than two 4xxx courses may be included in the program without consent of the adviser and director of graduate studies.

M.G.I.S. Plan B Degree Requirements
The degree is offered under Plan B (without thesis) and requires 35 credits of coursework, three Plan B projects, and a final examination. 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, GEOG 5563, GIS 5571, GIS 5572, an approved 8xxx geography seminar, and GIS 8501. At least 6 credits must be taken outside the geography department (GEOG and GIS designators) but may include core GIS courses (e.g., FR and ESPM designators). Students must submit three Plan B projects that are typically performed as part of, or extensions to, assignments completed during their coursework. Report content and medium must be approved by the director of graduate studies in consultation with each student’s adviser. Students may, with permission of the director of graduate studies and their adviser, substitute a single project for the three Plan B projects. Finally, students must complete a final oral examination with three faculty members.

Language Requirements—None

Final Exam—The final exam is oral.
Minor Requirements for Students Majoring in Other Fields — A master’s minor is developed in consultation with a faculty adviser. Consult the M.G.I.S. director of graduate studies about selecting an adviser. The minor requires at least 9 credits (three courses).

Geography

Contact Information — Department of Geography, University of Minnesota, 414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-625-6080; fax 612-624-1044; willio46@umn.edu; www.geog.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Eric S. Sheppard, SM

Professor
Philip J. Gersemehl, SM
John Fraser Hart, SM
Lawrence M. Knopp Jr., Geography, Duluth, AM2
Helga Leitner, SM
Ann R. Markusen, Public Affairs, AM2
Judith A. Martin, SM
Robert B. McMaster, SM
Richa Nagar, Gender, Women, and Sexuality Studies, AM2
Abdi I. Samatar, SM

Associate Professor
Bruce P. Braun, SM
Susan L. Craddock, Gender, Women, and Sexuality Studies, AM2
Jeffrey R. Crump, Design, Housing, and Apparel, AM2
Pat Farrell, Geography, Duluth, AM
Scott Freundshuh, Geography, Duluth, AM
Vinay K. Gidwani, SM
Timothy J. Griffiths, Soil, Water, and Climate, AM2
Francis J. Harvey, SM
George L. Henderson, SM
Katherine Klink, SM
Steven M. Manson, SM
Roger P. Miller, SM
Roderick H. Squires, SM
Karen E. Till, SM
Connie H. Weil, SM

Assistant Professor
Rob Eedsall, M2
Brenda Kayzar, M2
Kurt F. Kipfmueller, M2
Arun Saldanha, M2
Susy S. Ziegler, M2

Other
William J. Craig, Associate Director, Center for Urban and Regional Affairs, AM2
Mark B. Lindberg, Director, University of Minnesota Cartography Lab, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum — The geography graduate program at Minnesota is designed to maintain 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 required courses. Students work with their advisers to design individual programs suited to their educational and professional goals.

Prerequisites for Admission — Prospective students should have completed the equivalent of introductory courses in physical and human geography and at least seven upper division courses in systematic and/or regional geography. Students who were not undergraduate geography majors are encouraged to apply but may be required to make up deficiencies.

Special Application Requirements — Applicants must provide three letters of recommendation from persons familiar with their scholarship and potential. Scores from the General (Aptitude) Test of the GRE that are less than five years old are required of students with baccalaureate degrees from U.S. institutions. Graduate study in the program begins in the fall semester. The application deadline is December 15 for entrance the following September. All applications are evaluated once each year in early January.

Courses — Refer to Geography (GEOG) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses — No more than two 4xxx courses may be included on the Degree Program Form without consent of the adviser and director of graduate studies.

M.A. Degree Requirements

The M.A. is offered under Plan A (with thesis) and Plan B (without thesis). Plan A requires at least 21 course credits plus 10 thesis credits; Plan B requires at least 31 course credits and three Plan B papers. Each student is required to take GEOG 8001, 8002, and 8405, plus two additional GEOG 81xx and/or GEOG 82xx courses. GEOG 8970 and 8980 may be used for GEOG 81xx or 82xx coursework with permission of the adviser. The M.A. program usually is completed within two years. Further details on degree requirements may be found on the department Web page.

Language Requirements — M.A. students are expected to acquire competency in the foreign language/research methodology necessary for their graduate research. This requirement is set by the advising committee, which is also responsible for certifying that the requirement has been met before the final exam.

Final Exam — The final exam is oral.

Minor Requirements for Students Majoring in Other Fields — A master’s minor must be developed in consultation with a faculty adviser. Consult the director of graduate studies about selecting an adviser. The minor requires at least 6 credits (two courses).

Ph.D. Degree Requirements

Each student is required to take GEOG 8001, 8002, and 8405, two additional GEOG 81xx and/or 82xx courses, and a third GEOG 82xx course. GEOG 8970 and 8980 may be used for GEOG 81xx or 82xx coursework with permission of the adviser. Students are also required to take 24 thesis credits and 12 or more graduate credits outside of the department. Course credits from the M.A. program may be transferred to the Ph.D. program. Further details on degree requirements may be found on the department Web page.

Language Requirements — Ph.D. students are expected to acquire competency in the foreign language/research methodology necessary for their graduate research. This requirement is set by the advising committee, which is also responsible for certifying that the requirement has been met before the final exam.

Minor Requirements for Students Majoring in Other Fields — A doctoral minor program must be developed in consultation with an appropriate faculty adviser. Consult the director of graduate studies about selecting an adviser. The minor requires at least 9 credits (three courses).
Geological Engineering

Contact Information—Geological Engineering Program, University of Minnesota, Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax 612-626-7750; civesgs@umn.edu; www.ce.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Roberto Ballarini, SM
Steven L. Crouch, SM
Peter A. Cundall, ASM
Gary A. Davis, M2
Emmanuel M. Detournay, SM
Andrew Dresscher, SM
Efi Foufoula-Georgiou, SM
Catherine E. French, SM
Bojan B. Guzina, SM
Miki Honda, M2
Joseph F. Labuz, SM
Arturo E. Schultz, M
Carol K. Shield, SM
Henryk K. Stolarski, SM
Otto D. L. Strack, M
Vaughan R. Voller, SM

Associate Professor
William A. Arnold, M2
Randal J. Barnes, SM
Raymond M. Hozalski, SM
Lev Khazanovich, SM
Timothy M. LaPara, SM
David M. Levinson, M
Mihai O. Marasteanu, M
Paige J. Novak, M
Fernando Porté-Agel, M2

Assistant Professor
Kimberly Hill, SM
Henry X. Liu, SM
Steven F. Wojtkiewicz, SM

Adjunct Professor
Marc Bonnet, AM2

Senior Research Associate
Sofia G. Mogilevskaya, AM2
Eugene Skok, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 graduate program in geological engineering is administered in the Department of Civil Engineering. Students interested in pursuing doctoral studies should see the Ph.D. program in civil engineering.

Prerequisites for Admission—A bachelor’s degree in engineering, basic science, or mathematics is preferred. Admission depends primarily on the applicant’s academic record and letters of recommendation. Applicants who lack geological engineering 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. For the M.Geo.E. program, an ABET-accredited bachelor’s degree in geological engineering is required.

Special Application Requirements—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 31 before the year their studies are expected to begin.

Final Exam—The final exam is oral except for plan C. 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. The degree typically takes 12 to 18 months, full-time, to complete.

The M.Geo.E. requires at least 30 credits and is offered under two plans. One requires at least 20 course credits and preparation of a design project (10 cr); the design project must be carried out by the student in consultation with a faculty adviser. The other plan is a coursework-only degree program and requires at least 30 course credits. At least 6 of the course credits must be taken outside the department for either plan.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—for a master's minor, two or more 4xxx to 8xxx courses from the same area of geological engineering are required, for a total of 6 or more credits.

M.S. Degree Requirements
The master of science (M.S.) degree balances education in engineering fundamentals and design with research and development. The M.S. degree is for students wishing to pursue a career in industry or to continue toward a Ph.D. degree. Students follow a program selected with the help of a faculty adviser and approved by the director of graduate studies. A program typically takes 18 to 24 months to complete.

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 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 at least 27 course credits and Plan C requires 30 course credits. At least 6 credits of coursework must be from outside the department for all plans.

Language Requirements—None.

Final Exam—The final exam is oral except for plan C.
Minor Requirements for Students Majoring in Other Fields—For a master’s minor, two or more 5xxx to 8xxx courses from geological engineering are required, for a total of 6 or more credits.

Geology

Contact Information—Department of Geology and Geophysics, University of Minnesota, 310 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-1333; fax 612-625-3819; geology@umn.edu; www.geo.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

Regents Professor

Thomas C. Johnson, Geological Sciences, Duluth, ASM
Herbert E. Wright Jr., (emeritus), ASM

Professor

E. Calvin Alexander Jr., SM
Subir K. Banerjee, M2
Erik Brown, Geological Sciences, Duluth, ASM
Steve Colman, Geological Sciences, Duluth, ASM
R. Lawrence Edwards, SM
Jonathan Foley, Institute on the Environment, ASM
John W. Goode, Geological Sciences, Duluth, ASM
Vicki L. Hansen, Geological Sciences, Duluth, ASM
Marc Hirschmann, SM
Peter J. Hudleston, SM
Emi Itô, SM
David L. Kohlstedt, M2
Howard D. Mooers, Geological Sciences, Duluth, ASM
Ronald L. Morton, Geological Sciences, Duluth, ASM
Christopher Paola, SM
Hans-Olaf Pfannkuch, SM
William E. Seyfried, SM
James H. Stout, SM
Christian P. Teyssier, SM
Harvey Thorleifson, SM
Donna L. Whitney, SM

Associate Professor

David Fox, SM
Christina Gallup, Geological Sciences, Duluth, ASM
Karen L. Kleinsephn, SM
Lee Penn, Chemistry, ASM
Bryan Shuman, Geography, AM2
John Swenson, Geological Sciences, Duluth, ASM
Nigel J. Watrus, Geological Sciences, Duluth, ASM
Josef P. Werne, Chemistry and Biochemistry, Duluth, ASM

Assistant Professor

James Almendinger, Fisheries, Wildlife, and Conservation Biology, AM2
Annia K. Fayon, AM2
Joshua H. Feinberg, SM
Karen B. Gran, Geological Sciences, Duluth, AM2
Kent C. Kirky, AM
Katsumi Matsumoto, SM
James D. Miller, Geological Sciences, Duluth, AM2
Lesley Perg, SM
Martin Saar, SM

Adjunct Assistant Professor

Mark Edfund, AM2
Carrie Jennings, AM2

Senior Research Associate

Kang Ding, AM
Daniel R. Engstrom, AM2
Paul H. Glaser, AM2
Michael J. Jackson, AM2
Mark Zimmerman, AM2

Other

Val W. Chandler, Minnesota Geological Survey, AM2
Kristina Curry, Bell Museum of Natural History, AM2
Raymond Rogers, AM2
Anthony C. Runkel, Minnesota Geological Survey, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The geology major includes the areas of structural geology, tectonics, metamorphic geology, Quaternary studies, climate and environmental change, limnology, paleontology, groundwater geology, hydrogeology, geofluids, surface processes, geomorphology, stratigraphy, sedimentology, mineralogy, experimental and theoretical petrology, experimental geochemistry, biogeochemistry, isotopic and aqueous geochemistry. Students may accommodate other areas of interest such as earth resources, engineering geology, environmental geology, materials science, soil science, and paleoecology by choosing a minor or supporting field from outside the department.

Prerequisites for Admission—Most candidates for advanced degrees have completed a bachelor’s degree in geology, geophysics or in the broad field of earth and material sciences. However, applications from students in fields such as chemistry, physics, or biology are encouraged. At least one year of study in calculus, chemistry, and physics are required. In general, an outstanding academic record is expected.

Special Application Requirements—A department application, the student’s statement of purpose, three letters of recommendation, and official GRE scores are required for admission and financial aid consideration. Applications for admission are considered at any time, although applications for financial aid should be submitted to the department by January 8 to ensure consideration. Studies may begin in any semester or summer session, although fall semester is preferable. IMPORTANT: Refer to the Graduate Programs section of the department Web site for a listing of all required applications materials and preferred method of submission (www.geo.umn.edu.dept/programs/gradprosp.html).

Interdisciplinary Collaborations—In addition to the department’s long history of collaboration with the engineering, physical science, and math departments in the Institute of Technology, there are many organizations within and without the University with which the faculty collaborate in order to promote a wide range of interdisciplinary studies: Antarctic Geospatial Information Center; Bell Museum of Natural History; Department of Ecology, Evolution, and Behavior; Department of Geological Sciences, Duluth campus; History of Science and Technology; Institute for Rock Magnetism; Institute on the Environment; Institute of Technology Characterization Facility; Large Lakes Observatory, Duluth; Limnological Research Center; Macalester College; Minnesota Geological Survey, Minnesota Supercomputing Institute; National Center for Earth-surface Dynamics; Postsecondary Teaching and Learning; Quaternary Paleoecology Minor Program; Red Lake Peatland Observatory; Science Museum of Minnesota; St. Croix Watershed Research Station; Water Resource Science Program. Check the department’s Web site for a current listing of research facilities within the department of geology and geophysics.

Courses—Refer to Geology and Geophysics (GEO) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program. All courses must be taken at 4xxx and 5xxx, with several formal courses to be included at 8xxx.

Use of 4xxx Courses—For both the M.S. and Ph.D., typically no more than 30 percent of the total course credits are 4xxx.

M.S. Plan A, Plan B, and Plan C Degree Requirements

The M.S. is offered Plan A (with thesis), Plan B (with project), and Plan C (coursework only with emphasis in hydrogeology and environmental geoscience). Plan A requires a minimum of 30 course credits consisting of at least 14 course credits in the major, 6 course credits in the related field, and 10 thesis credits. Plan B requires a minimum of 30 course credits consisting of at least 14 credits in the major and 8 credits in the
related field. Plan C is the coursework-only option, which requires a minimum of 30 course credits consisting of at least 14 credits in the major and 8 credits in the related field or a minor. Courses in the minor and related field are normally taken from outside the department, although they may be taken from within in special cases.

Language Requirements—None.

Final Exam—Plan A students must pass the final oral examination in defense of their thesis. Plan B students must pass the final oral and/or written examination.

Minor Requirements for Students Majoring in Other Fields—The master’s minor is established individually with approval by the graduate studies committee. Typically no more than 50 percent of the total course credits are 4xxx.

Ph.D. Degree Requirements
The Ph.D. requires a minimum of 36 course credits consisting of at least 12 course credits in the minor or supporting field. In some cases, fewer than 24 credits in the major field are acceptable provided the total is at least 36. Courses in the minor and supporting program are normally taken from outside the department, although they may be taken from within in special cases.

Language Requirements—None.

Final Exam—Ph.D. students must pass a final oral examination in defense of their thesis.

Minor Requirements for Students Majoring in Other Fields—The Ph.D. minor is established individually with approval by the graduate studies committee. Typically, no more than 50 percent of the total course credits are 4xxx.

Geophysics

Contact Information—Department of Geology and Geophysics, University of Minnesota, 310 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-1333; fax 612-625-3819; geology@umn.edu; www.geo.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Subir K. Banerjee, SM
Marc Hirschmann, M2
David L. Kohlstedt, SM
Bruce M. Moskowitz, SM
Christopher Paola, M2
Justin Revenaugh, SM
James H. Stout, SM

Christian P. Teyssier, M2
Renata M. Wentzczovitch, Chemical Engineering and Materials Science, ASM
David A. Yuen, SM

Associate Professor
Karen L. Kleinspehn, M2

Assistant Professor
Joshua M. Feinberg, SM
Katsumi Matsumoto, SM
Martin Saar, SM

Senior Research Associate
Michael J. Jackson, AM2
Mark Zimmerman, AM2

Other
Val Chandler, Minnesota Geological Survey, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The geophysics major includes the areas of applied and theoretical geophysics, paleomagnetism and rock magnetism, mineral and rock physics, seismology and geostatistics. Students may accommodate other areas of interest such as earth resources, engineering geology, environmental geology, materials science, soil science, and paleoecology by choosing a minor or supporting field from outside the department.

Prerequisites for Admission—Most candidates for advanced degrees have completed a bachelor’s degree in geology, geophysics, or earth and material sciences. However, applications from students in fields such as chemistry, physics, or biology are encouraged. At least one year of calculus, chemistry, and physics are required. In general, an outstanding academic record is expected.

Special Application Requirements—A department application, the student’s statement of purpose, three letters of recommendation, and official GRE scores are required for admission and financial aid consideration. Applications for admission are considered at any time, although applications for financial aid should be submitted to the department by January 8 to ensure consideration. Studies may begin in any semester or summer session, although fall semester is preferable. IMPORTANT: Refer to the Graduate Programs section of the department Web site for a listing of all required applications materials and preferred method of submission (www.geo.umn.edu.dept/programs/gradprosp.html).

Interdisciplinary Collaborations—In addition to the department’s long history of collaboration with the engineering, physical science, and math departments in the Institute of Technology, there are many organizations both within and without the University in which our faculty members collaborate in order to promote a wide range of interdisciplinary studies: Antarctic Geospatial Information Center; Bell Museum of Natural History; Department of Ecology, Evolution and Behavior; Department of Geological Sciences, Duluth Campus; History of Science and Technology; Institute for Rock Magnetism; Institute on the Environment; Institute of Technology Characterization Facility; Large Lakes Observatory, Duluth; Limnological Research Center; Macalester College; Minnesota Geological Survey; Minnesota Supercomputing Institute; National Center for Earth-surface Dynamics; Post Secondary Teaching and Learning; Quaternary Paleoecology Minor Program; Red Lake Peatland Observatory; Science Museum of Minnesota; St. Croix Watershed Research Station; Water Resource Science Program. Check the department’s Web site for a current listing of research facilities within the department of geology and geophysics.

Courses—Refer to Geology and Geophysics (Geo) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program. All courses must be taken at 4xxx and 5xxx, with several formal courses to be included at 8xxx.

Use of 4xxx Courses—For both the M.S. and Ph.D., typically no more than 30 percent of the total course credits are 4xxx.

M.S. Degree Requirements
The M.S. is offered Plan A (with thesis) and Plan B (with project). Plan A requires a minimum of 30 course credits consisting of at least 14 course credits in the major, 6 course credits in the related field, and 10 thesis credits. Plan B requires a minimum of 30 course credits consisting of at least 14 credits in the major and 8 credits in the related field. Plan C is the coursework-only option which requires a minimum of 30 course credits consisting of at least 14 credits in the major and 9 credits in the related field or a minor. Courses in the minor and related field are normally taken from outside the department, although they may be taken from within in special cases.

Language Requirements—None.
**Final Exam**—Plan A students must pass the final oral examination in defense of their thesis. Plan B students must pass the final oral and/or written examination.

**Minor Requirements for Students Majoring in Other Fields**—The master’s minor is established individually with approval by the graduate studies committee. Typically no more than 50 percent of the total course credits are 4xxx.

**Ph.D. Degree Requirements**

The Ph.D. requires a minimum of 36 course credits consisting of at least 12 course credits in the minor or supporting field. In some cases, fewer than 24 credits in the major field are acceptable provided the total is at least 36. Courses in the minor and supporting program are normally taken from outside the department, although they may be taken from within in special cases.

**Language Requirements**—None.

**Final Exam**—Ph.D. students must pass the final oral examination in defense of their thesis.

**Minor Requirements for Students Majoring in Other Fields**—The Ph.D. minor is established individually with approval by the graduate studies committee. Typically, no more than 50 percent of the total course credits are 4xxx.

**Germanic Studies**

**Contact Information**—Department of German, Scandinavian and Dutch, University of Minnesota, 205 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-625-2080; fax 612-624-8297; gradgsd@umn.edu; www.gsd.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**

- Evelyn S. Firchow, German, Germanic Medieval, SM
- Pouli Houe, Scandinavian, SM
- Ruth-Ellen B. Joeres, German, SM
- Ruth M. Karras, History, Scandinavian, AM
- Anatoly Liberman, German, Germanic Medieval, Scandinavian, SM
- Richard W. McCormick, German, SM
- James A. Parente Jr., German, Scandinavian, Germanic Medieval, SM
- Jochen Schulte-Sasse, German, SM
- Goran K. N. Stockenstrom, Scandinavian, SM
- Arlene A. Teraoka, German, SM

**Associate Professor**

- Kaaren E. Grimstad, Scandinavian, Germanic Medieval, SM
- Rembert Hueser, German, SM
- Charlotte A. Melin, German, SM
- Leslie Morris, German, SM

**Ray M. Wakefield**, German, Germanic Medieval, SM

**Monika Zagar**, Scandinavian, SM

Along with the program- and track-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—The Germanic studies graduate program includes five tracks: German (M.A. and Ph.D.), Scandinavian Studies (M.A.), Teaching (M.A.), Germanic Medieval Studies (M.A. and Ph.D.), and German and Scandinavian Studies (Ph.D.).

**Prerequisites for Admission**—A B.A. or M.A. or equivalent in German, Scandinavian, or related field (depending on the track to which one applies) is required. Students with bachelor’s degrees who apply for the German track or the Germanic Medieval Studies track usually are admitted into the Ph.D. program with the understanding that the M.A. will be attained first. Students with bachelor’s degrees who are interested in the German and Scandinavian studies Ph.D. must first complete an M.A. in the German track or the Scandinavian track and should have either near-native fluency in German plus an advanced level of proficiency in a Scandinavian language or near-native fluency in a Scandinavian language plus an advanced level of proficiency in German. Applicants to the Scandinavian studies M.A. must have a strong competency in a Scandinavian language, and they should have taken at least four Scandinavian literature courses or the equivalent. Applicants to the Germanic Medieval Studies M.A. should have a strong command of German; knowledge of another Germanic language and/or a reading knowledge of Latin is preferred. Applicants for any track whose preparatory work evidence gaps may be asked to complete supplemental work before admission.

**Special Application Requirements**—The following may be submitted through the online application or be sent directly to the department: the department’s Supplemental Application Information form; a copy of one or more papers representative of the applicant’s level of scholarly development; and three letters of recommendation. A complete set of transcripts (in addition to transcripts sent to the Graduate School) must be sent to the department. For master’s program applicants, and for all students who wish to be considered for the Graduate School Fellowship, the General (Apitude) Test of the GRE is required; the GRE is optional for applicants whose native language is not English. Students are admitted in the fall semester only. All application materials must be received by December 15.

**Use of 4xxx Courses**—A limited number of 4xxx courses may be included in degree programs of Germanic Studies majors or minors, subject to the approval of the adviser and the director of graduate studies. 4xxx courses counted on graduate programs must be taught by a member of the graduate faculty and must include graduate-level work.

**Minor Requirements for Students Majoring in Other Fields**—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).

**German Track**

**M.A. Degree Requirements**

The M.A. offers students the opportunity to do advanced work in German studies and prepares them with the theoretical and practical tools to enter a Ph.D. program. The M.A. requires at least 33 credits, including four core courses in literature and theory; a Germanic medieval studies course; three electives in German literature/culture; a pedagogy course; two courses outside the German track; demonstration of oral and written proficiency in German and one Plan B paper.

**Courses**—Refer to German (GER); German, Scandinavian, and Dutch (GSD); and Dutch (DTCH) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to this track.

**Language Requirements**—Students who intend to continue in the Ph.D. program are strongly encouraged to acquire a reading proficiency in one other foreign language during their M.A. program (refer to requirements for the Ph.D.).

**Final Exam**—The final exam is oral.

**German Track**

**Ph.D. Degree Requirements**

The Ph.D. offers students the opportunity to do advanced work in German studies and prepares them with theoretical and practical tools to serve as researchers, scholars, and teachers.
The Ph.D. requires at least 30 credits, including four courses in German literature/culture beyond the M.A.; a course in Germanic medieval studies; a dissertation seminar; and four courses outside the German track. A pedagogy course and three core courses are also required if they have not been taken for the Germanic Studies M.A. A minimum of 24 thesis credits are required.

**Courses**—Refer to German (GER); German, Scandinavian, and Dutch (GSD); and Dutch (DTCH) in the course section of this catalog for courses pertaining to this track.

**Language Requirements**—The program requires reading competence in at least two languages or a high degree of proficiency in one language other than German or English.

### Scandinavian Studies Track M.A. Degree Requirements

The M.A. offers students the opportunity to do advanced work and prepares them with the theoretical and practical tools to enter the Ph.D. track in German and Scandinavian at the University of Minnesota, to enter a Ph.D. program in Scandinavian at another university, or to embark on a career that requires specialized knowledge of Scandinavia. Students enrolled in the M.A. in the Scandinavian track emphasize one of the three Scandinavian languages and literatures while acquiring a general knowledge of the other two.

The M.A. requires at least 33 credits, including two introductory courses in literature and theory; five courses in different periods of Scandinavian literature/culture; a course in Old Norse or Scandinavian linguistics; a pedagogy course; two courses outside the Scandinavian track; and one Plan B paper.

**Courses**—Refer to German (GER); German, Scandinavian, and Dutch (GSD); and Scandinavian (SCAN) in the course section of this catalog for courses pertaining to this track.

**Language Requirements**—The track requires advanced competency in at least one Scandinavian language or Finnish, and reading knowledge of two other Scandinavian languages.

**Final Exam**—The final exam is written and oral.

### Teaching Track M.A. Degree Requirements

The M.A. in teaching combines a disciplinary focus in Germanic studies with a concentration in foreign language teaching and second language acquisition. The track does not lead to teacher licensure. Students interested in teacher licensure should contact the College of Education and Human Development.

The M.A. requires at least 33 credits, including a pedagogy course; three courses on the history and structure of the German language; LING 5505—Introduction to Second Language Acquisition; CI 5662—Issues in Second Language Curriculum Design; two German literature and culture courses; two or more courses in language teaching, curriculum and instruction or teaching English as a second language or linguistics; one elective; demonstration of oral and written proficiency in German, and one Plan B paper.

**Courses**—Refer to German (GER); Linguistics (LING); Curriculum and Instruction (CI); Language, Teaching, and Technology (LGT); and Teaching English as a Second Language (TESL) in the course section of this catalog or in **Twin Cities Courses** on the University Catalog Web site for courses pertaining to this track.

**Final Exam**—The final exam is oral.

### Germanic Medieval Studies Track M.A. Degree Requirements

The M.A. offers students the opportunity to do advanced work in Germanic medieval studies and prepares them with theoretical and practical tools to serve as researchers, scholars, and teachers.

The M.A. requires at least 33 credits, including four courses in Germanic Medieval studies; two courses in a third medieval Germanic language (supplementing the two languages for the M.A.); a dissertation seminar, and four courses in a designated minor or supporting field. A pedagogy course and GSD 8001—Approaches to Textual Analysis are also required if they have not been taken for the M.A.). A minimum of 24 thesis credits are required.

**Courses**—Refer to English (ENGL); Dutch (DTCH); German (GER); German, Scandinavian, and Dutch (GSD); and Scandinavian (SCAN) in the course section of this catalog or in **Twin Cities Courses** on the University Catalog Web site for courses pertaining to this track.

**Language Requirements**—Reading competence in Latin and one modern Germanic language other than German or English (e.g., Dutch or one of the Scandinavian languages).

### German and Scandinavian Studies Track Ph.D. Degree Requirements

The Ph.D. offers students the opportunity to do advanced work in German and Scandinavian studies and prepares students with theoretical and practical tools to serve as researchers, scholars, and teachers in either German or Scandinavian studies, with a basic foundation in the other field as well.

The Ph.D. requires at least 36 credits. Students choose to emphasize either German or Scandinavian. The German emphasis requires at least four GER 8xxx literature or theory courses and three Scandinavian courses: one Old Norse course, one 19th-century Scandinavian literature course and one 20th-century Scandinavian literature course. The Scandinavian emphasis requires one Old Norse course, one 19th-century Scandinavian literature course and one
20th-century Scandinavian literature course plus an additional Scandinavian course and three GER 8xxx literature or theory courses. Students in both emphases are required to take a dissertation seminar and 4 courses in a designated minor or supporting program. Also required if not already taken for the M.A.: a pedagogy course and GSD 8001—Approaches to Textual Analysis. A minimum of 24 thesis credits are required.

Courses—Refer to German (GER); German, Scandinavian, and Dutch (GSD); and Scandinavian (SCAN) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to this track.

Language Requirements—Reading competence in one language other than German, English, or a Scandinavian language.

Gerontology

Minor Only

Contact Information—Graduate Minor Program in Gerontology, Center on Aging / MAGEC, University of Minnesota, MMC 197, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-624-1185; coa@umn.edu; www.hpm.umn.edu/cao/ed_opp /gerontologyminorattheumn.html).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Matt McGuie, Psychology, M

Professor
Donna Z. Bliss, Nursing, M
David O. Born, Primary Dental Care-Health Ecology, M
James C. Cloyd, Pharmacy Practice, M
Jim Curtisinger, Ecology, Evolution, and Behavior, M
Daniel F. Detzner, Family Social Science, M
Richard P. DiFabio, Physical Medicine and Rehabilitation, M
William Durfee, Mechanical Engineering, M
Maurice W. Dysken, Psychiatry, M
Nancy N. Eutulis, Public Affairs, M
Judith M. Gerrard, Public Health, M
Cynthia R. Gross, Pharmacy Practice, M
David R. Guay, Pharmacy Practice, M
Lois J. Heller, Medicine, Duluth, M
Robert L. Kane, Public Health, M
Rosalie A. Kane, Public Health, M
Helen Q. Kivnick, Social Work, M
Thomas E. Lackner, Pharmacy, M
Alice Larson, Veterinary and Biomedical Sciences, M
Tom A. Larson, Pharmacy Practice, M
Chap Le, Biostatistics, M
Steven H. Miles, Medicine, M
Phyllis Moen, Sociology, M
Jeylan T. Mortimer, Sociology, M
Jean K. Quam, Social Work, M
Jon Schommer, Pharmaceutical Care and Health Systems, M
Stephen Schondelmeyer, Pharmacy Practice, M
Virginia Seybold, Cell Biology and Neuroanatomy, M
Marlene S. Stum, Family Social Science, M
Marc Swiontkowski, Orthopedic Surgery, M
David Thomas, Biochemistry, M
LaDora V. Thompson, Physical Medicine and Rehabilitation, M
Michael Wade, Kinesiology, M
Jean Wyman, Nursing, M

Associate Professor
Lynn Blevett, Public Health, M
Debra Ferrington, Ophthalmology, M
James Gambucci, Preventive Sciences, M
Joseph E. Gaugler, Nursing, M
Priscilla A. Gibson, Social Work, M
Leslie A. Grant, Carlson School of Management, M
Merrie J. Kaas, Nursing, M
Kathleen Krichbaum, Nursing, M
Elizabeth Lightfoot, Social Work, M
Terry Lum, Social Work, M
Christine A. Mueller, E, Nursing, M
James T. Pacala, Family Medicine and Community Health, M
Rosemarie J. Park, Work and Human Resource Education, M
James R. Reinardy, Social Work, M
Robert C. Serfass, Kinesiology, M
Stephen K. Shuman, Preventive Sciences, M
Carla E. S. Tabourne, Kinesiology, M

Assistant Professor
Michael K Davern, Public Health, M
Jeremy L. Holtzman, Medicine, M
Hee Lee, Social Work, M
Dawn Annette Lowe, Biochemistry, M
David B. Luke, English, M
Teresa C. McCarthy, Family Medicine and Community Health, M
David M Radosевич, Surgery, M
Huber R. Warner, Biological Science, M

Research Associate
Lois Cutler, Public Health, M
Celia W. Gershenson, Psychology, M

Other
Ursula Bea Kreinke, Epidemiology, M

Curriculum—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.

Prerequisites for Admission—Students must have gained admission to a master’s or doctoral degree-granting program within the Graduate School, and have prepared a minor program of coursework approved by the director of graduate studies in gerontology.

Courses—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.

Use of 4xxx Courses—4xxx courses may not be included on Degree Program Forms.

Minor Only Requirements

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, ordinarily including NURS 8320—Multidisciplinary Seminar on Social Perspectives of Aging (3 cr). Other courses may be substituted with the approval of the director of graduate studies.

Greek
See Classical and Near Eastern Studies.

Health Informatics

Contact Information—Director of Graduate Studies in Health Informatics, Institute for Health Informatics MMC B116, 330 Diehl Hall, 505 E. 21st Street S.E., Minneapolis, MN 55455 (612-624-8900; fax 612-625-7166; www.ihi.umn.edu)

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Donald P. Connelly, SM
Shawn Curley, Information and Decision Sciences, SM
Connie W. Delaney, Nursing, SM
Lynda B. Ellis, SM
David P. Fan, Genetics and Cell Biology, SM
Stanley M. Finkelstein, SM
John R. Finnegan Jr., Epidemiology, SM
James R. Fricton, Diagnostic/Surgical Sciences, SM
Laël C. Gatewood, SM
Julie Jacko, Nursing, Public Health, SM
Paul E. Johnson, Information and Decision Sciences, SM
George G. Klee, Mayo Clinic, M2
Stuart M. Speedie, SM

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
**Twin Cities Degree Programs and Faculty**

**Adjunct Professor**
Christopher G. Chute, SM

**Associate Professor**
George Karypis, Computer Science and Engineering, M2
Stephen T. Parente, Health Care Management, M2
Sandra J. Pothoff, Health Care Management, SM
Edward Ratner, Medicine, M2

**Assistant Professor**
Terrence Adam, Pharmacy, M2
Genevieve Melton-Meaux, Surgery, M2
Serguei Pakhomov, Pharmacy, M2
 Bonnie Westra, Nursing, M2

**Adjunct Assistant Professor**
John Faughnan, M2
Marcelline Harris, M2
Jeffrey Hertzberg, M2
Martin LaVenture, M2
George Vasmalizis, M2

**Other**
Linda A. Watson, Health Sciences Library, AM2
Brian J. Westrich, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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, wellbeing, 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, telemedicine, bioinformatics, user interface design, system impact evaluation, database construction and analysis, clinical decision-making, evaluation of health programs, image and signal processing, and physiological monitoring and control.

**Prerequisites for Admission**—Applicants are expected to have at least a bachelor of science or equivalent degree from a recognized institution of higher education. Although students are accepted into the program with different backgrounds and varying degrees of experience, some prerequisites are required, usually in the form of college coursework. Acceptance into the program is not precluded by minor deficiencies in background; rather it is conditional on these being made up before or during the first year of study. See the prerequisites listed for each program below for areas of study that must be completed before admission to the program. Courses used to fulfill prerequisites are not given graduate credit. Courses in the curriculum assume that these prerequisite courses have been taken.

**Note:** These prerequisites are subject to change. Check the Web site at www.ihi.umn.edu for current information about the program.

**Special Application Requirements**—The GRE or similar professional examination (e.g., MCAT, GMAT, PCAT) is required. Three letters of recommendation and a statement of purpose must be submitted with the application. Students are advised to apply for admission for fall semester, since spring semester admission may entail the student taking longer to complete the program.

**Courses**—Refer to Health Informatics (HINF) in the course section of this catalog or in **Twin Cities Courses** on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—4xxx courses in computer science may be used to satisfy the elective requirements for the master of health informatics (M.H.I.), M.S., and Ph.D. degrees if the student has not previously taken a computer science course in the same sub area (e.g., database design) at a higher level. Acceptance of 4xxx courses from other departments or programs requires the approval of the adviser and the director of graduate studies.

**M.H.I. Degree Requirements**

The master of health informatics (M.H.I.) emphasizes the role of informatics-trained professionals as liaisons who bring both a background of medicine and knowledge of information technology to the task of solving health care problems. The curriculum consists of 32 credits of coursework that include: 8 credits of health informatics, 4 credits of technology-focused health administration, 3 credits of statistics and research design, 6 credits of coursework in the student’s chosen area of specialization, 6 credits of electives, 2 credits of seminar, and a 3-credit capstone course in which the student completes a project directly applicable to their own work environment. The program is designed to accommodate working professionals and can be completed in one calendar year by a full-time student and in up to three years on a part-time basis. Prerequisites include one course or demonstrated experience with a modern programming language (e.g., Java, Visual Basic, C++)., an undergraduate GPA of 3.00 or higher, and a degree in a health profession. This last prerequisite can be waived for those without a health professions degree but will require six additional credits of coursework in the health sciences.

**M.S. Degree Requirements**

The research-oriented Plan A master’s degree is available to advanced applicants, such as those with a professional degree in a health sciences discipline. It requires 32 course credits and 10 thesis credits. The Plan B option requires 42 course credits, including 6–7 credits from a technical area and 6–7 credits from the health sciences. Both plans require seven core courses, a sequence in statistics or biostatistics, and registration in the health informatics seminar (HINF 5436) for the first year and for at least two semesters after that (1 credit each semester). For most students, the program requires two academic years and one summer. Prerequisites include six semester credits in the medical, life, or biological sciences; the equivalent of one calculus course at the college level; and one course or demonstrated experience with a modern programming language (e.g., Java, Visual Basic, C++).

**Ph.D. Degree Requirements**

The Ph.D. program is for students who want to obtain advanced training and conduct research. Students are expected to complete the same requirements as those for the Plan B master’s program (a survey of health informatics, biostatistics, selected health science areas, and advanced training in selected informatics areas), as well as advanced coursework in health informatics and an area of concentration complementary to health informatics. The work is completed with an original research project reported in the doctoral dissertation. Students are expected to have earned the equivalent of at least 70 credits, including 24 thesis credits. Prerequisites include six semester credits in the medical life or biological sciences; the equivalent of one calculus course and one linear algebra course at the college level; and one course or demonstrated experience with a modern programming language (e.g., Java, Visual Basic, C++).

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—Master’s students must successfully complete the introductory sequence in health informatics (HINF 5430 and HINF 5431). Ph.D. students must take the introductory sequence and one 8xxx course in health informatics.
Health Journalism and Communication

Contact Information—Health Journalism and Communication M.A. Program, School of Journalism and Mass Communication, University of Minnesota, 111 Murphy Hall, 206 Church Street S.E., Minneapolis MN 55455 (612-626-1851; fax 612-625-9525; hjournal@umn.edu; www.healthjournalism.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
John R. Finnegan Jr., Epidemiology, M2
Russell V. Luepker, Epidemiology, M2
Mary T. Story, Epidemiology, M2
Daniel J. Sullivan, M2

Associate Professor
Kenneth O. Doyle Jr., M2
Ian A. Greaves, Environmental and Occupational Health, M2
Christopher J. Ison, M2
Gary J. Schwitter, M2
Brian G. Southwell, M2

Assistant Professor
Marco Yzer, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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.

Prerequisites for Admission—The minimum requirement for admission is a B.A. or equivalent. The program is designed for journalists and communications professionals with at least two years of professional experience. It is also designed for health professionals with at least two years of public health or other professional health experience.

Special Application Requirements—Applicants must submit an application to the University of Minnesota Graduate School and a department application to the School of Journalism and Mass Communication. The department application includes a clearly written statement of career interests, goals, and objectives; three letters of recommendation; a complete set of transcripts; professional work samples; IELTS or TOEFL scores (for every applicant whose previous degree was obtained from a non-English speaking country and whose native language is not English); and scores from the GRE. The director of graduate studies may waive the GRE requirement for students who have at least five years of professional experience and a strong academic record or have recently completed another graduate degree program. This program uses a rolling admission process: the sooner a complete application is received (this includes both the completed Graduate School and department applications), the sooner the applicant receives a decision. Applications received by January 15 receive first consideration. For fall enrollment, the final deadline for applications is May 15.

Courses—Refer to Journalism and Mass Communications (JOUR) and Public Health ( PUBH) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to this program.

Use of 4xxx Courses—Use of 4xxx courses is discouraged.

M.A. Degree Requirements
A minimum of 33 credits and a capstone project are required. Students select one of two program tracks: health journalism or health communication. All coursework must be taken A-F.

Language Requirements—Foreign language study is recommended for students who plan to work internationally.

Health Services Research, Policy, and Administration

Contact Information—Division of Health Policy and Management (HPM), School of Public Health, University of Minnesota, MMC 729 Mayo Building, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-3500; fax 612-624-4498; sphp-ssc@umn.edu; www.sph.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
James W. Begun, Public Health, SM
Jon B. Christianson, Public Health, SM
Bryan E. Dowd, Public Health, SM
Roger D. Feldman, Public Health, SM
Judith M. Garrard, Public Health, SM
Dwaker Gupta, IT Mechanical Engineering Administration, ASM
Robert L. Kane, Public Health, M
Rosalie A. Kane, Public Health, SM
John E. Kralevski, (emeritus), Public Health, SM
Karen M. Kuntz, Public Health, M
A. Marshall McBean, Public Health, SM
Ira S. Moscovice, Public Health, SM
John A. Nyman, Public Health, SM
Francois Sainfort, Public Health, SM
Vernon E. Weckwerth, Public Health, SM
Douglas R. Wholey, Public Health, SM

Associate Professor
Lynn A. Blewett, Public Health, SM
Kathleen T. Call, Public Health, SM
Leslie A. Grant, Public Health, SM
Donna D. McAlpine, Public Health, M2
Gordon M. Mosser, Public Health, M
Stephen T. Parente, Health Care Management, M2
Sandra J. Potthoff, Public Health, SM
William J. Riley, Public Health, M2
Todd H. Rockwood, Public Health, SM
Robert J. Town, Public Health, SM
Beth A. Virnig, Public Health, SM

Adjunct Associate Professor
Robert A. Connor, Health Care Management, SM
Michael D. Finch, Public Health, SM

Assistant Professor
Jean M. Abraham, Public Health, M2
Michael E. Davern, Public Health, AM
Pinar Karaca-Mandic, M
Jeffrey McCullough, M2

Adjunct Assistant Professor
Jeremy L. Holtzman, Medicine, M
Yvonne Jonk, Public Health, M2
David M. Radojevic, Surgery, M

Other
Kirk C. Allison, M2
Pamela Jo Johnson, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Health services research focuses on the organization and delivery of cost-effective health services. It deals with policy issues related to costs, access, and quality of health services and equitable distribution of health resources. Master’s students develop analytical capabilities that may be applied to health care management, health services research, or health policy work. The program emphasizes a population health orientation, research and policy perspective, and analytic methods. Health services research at the Ph.D. level is for
those interested in affecting public policy related to health care systems. 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. The program 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 supported by the student’s involvement with faculty on research projects. The program provides further interchange with faculty through research seminars and doctoral colloquia.

Prerequisites for Admission—The M.S. program does not have specific course prerequisites, but some college-level math is recommended. The Ph.D. program requires 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—A 3.00 GPA for previous coursework is preferred. The GRE general exam is required. GRE exam scores required for M.S. program applicants: 1000 (500 verbal, 500 quantitative) and 3.5 analytical writing. Ph.D. applicants: 1200 (600 verbal, 600 quantitative) and 5.0 analytical writing. Unless exempt, international students must complete the TOEFL exam with preferred scores of 600 (paper), 250 (computer), or 100 (Internet), or the IELTS exam with a preferred score of 7.0. The TOEFL or IELTS is not required for students from English speaking countries, or those who have completed 16 semester credits or 24 quarter credits within the past 24 months at a recognized institution of higher learning in the United States. The M.S. and Ph.D. programs in HSRP&A reside in the School of Public Health and all accepted students are required to obtain certain immunizations as a condition of enrollment.

All applicants must submit the following: official grade transcripts from all previous academic institutions; a statement indicating reasons for seeking the M.S. or Ph.D. in health services research, policy, and administration, and elaborating on the applicant’s research interests; three letters of reference attesting to the applicant’s academic ability and potential for a career in health services research or academia, and a résumé, or C.V. Students are admitted fall semester only. The programs are full time.

For an online application and information about application requirements, see the School of Public Health Web site at www.sph.umn.edu/students/application/home.html.

Courses—Refer to Public Health (PUBH), particularly numbers 65xx, 67xx, 68xx, and 88xx, in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements requires the approval of the director of graduate study.

M.S. Degree Requirements
The M.S. offered under Plan A is in outcomes research. Plan B requires a thesis (publishable research paper), and a final oral exam. Plan B requires a written project and final oral exam. Both Plan A and Plan B are full-time, two-year programs. The Plan B MS degree also includes a part-time, three year option.

Plan A requires 49–52 credits, including 33–36 core credits, 6 elective credits in one or more related fields outside the major, and 10 thesis credits. Plan B requires 46 credits, including 37 core credits and 9 elective credits in one of the structured Areas of Interest or other related fields outside the major.

Ph.D. Degree Requirements
The Ph.D. requires at least 74 credits, including 30–31 core credits in the major, and 21–26 credits in a chosen area of emphasis, and 24 thesis credits. The structured areas of emphasis include: multidisciplinary social sciences, sociology of health and illness, health decision science, health organizations and management science, clinical outcomes research, Health policy analysis, and health economics.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—The minor is developed uniquely for each student with the advice and counsel of the director of graduate studies.

Hispanic and Luso-Brazilian Literature and Linguistics

Contact Information—Department of Spanish and Portuguese Studies, University of Minnesota, 51 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-625-5858; fax 612-625-3549; sptgrad@umn.edu; www.spanport.umn.edu). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Ana Paula Ferreira, SM
Amy K. Kaminsky, Gender, Women, and Sexuality Studies, ASM
Carol A. Klee, SM
Nicholas Spadaccini, SM

Associate Professor
Fernando Arenas, SM
Timothy Face, SM
Ofelia Ferrán, SM
Ana Forcinito, SM
Francisco A. Ocampo, SM
Joanna O’Connell, SM
Luis Ramos-García, SM

Assistant Professor
Jaime Hanneken, M2
Raul Marrero-Fente, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The department offers one M.A. program—Hispanic and Lusophone Literatures, Cultures, and Linguistics—with three formal tracks: Hispanic Literatures and Cultures, Lusophone Literatures and Cultures, and Hispanic Linguistics. The department also offers the doctor of philosophy degree in Hispanic and Luso-Brazilian literatures and linguistics. For the Ph.D., students study one of four areas of emphasis: Spanish, Spanish American, and Lusophone literatures and cultures, and Hispanic linguistics. The four specialized area components are fully integrated in these degree programs. The close integration of these areas makes this department unique in the United States.

The department has a strong tradition of fostering sociohistorical perspectives on literatures and cultures. The faculty is committed to comparative and interdisciplinary study and they engage a variety of contemporary theoretical approaches, with strengths in postcolonial theory, feminisms, critical race theory, queer theory, hermeneutics of human rights, and theories of globalization. Members of the
Hispanic linguistics faculty are specialists in the fields of sociolinguistics, second language acquisition, syntax, pragmatics, phonetics, and phonology. The program in Lusophone literatures and cultures is one of the few in the nation that focuses on the Portuguese-speaking world as a whole and its parts. Graduate students may also take courses in related departments such as Gender, Women, and Sexuality Studies; Cultural Studies and Comparative Literature; Linguistics; History; African American and African Studies; French and Italian; Chicano Studies; Anthropology; and Geography, among others.

**Prerequisites for Admission**—Preferred undergraduate GPA of at least 3.00 and a preferred graduate GPA of at least 3.50. 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**—Check the department Web site for application information: [http://spanport.umn.edu/grad/apply.php](http://spanport.umn.edu/grad/apply.php). The deadline for application for admission is January 5th. Applicants are considered for admission for fall semester only.

For an online application or for more information about Graduate School admissions, see the General Information section in this catalog, or visit the Graduate School Web site.

**Courses**—Refer to Portuguese (PORT), Spanish (SPAN), and Spanish-Portuguese (SPPT) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

**Ph.D. Degree Requirements**
The Ph.D. requires a minimum of 54 course credits (17 courses) beyond the B.A., including SPPT 5999, 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.

**Language Requirements**—Students are required to be fluent in Spanish and/or Portuguese and acquire literacy in at least one other foreign language (see the department’s Graduate Handbook).

**Minor Requirements for Students Majoring in Other Fields**—The doctoral minor requires at least 18 credits of 5xxx or 8xxx courses (six courses), to be determined in consultation with the director of graduate studies.

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**Hispanic and Lusophone Literatures, Cultures, and Linguistics**

**Contact Information**—Department of Spanish and Portuguese Studies, University of Minnesota, Twin Cities, 111 Folwell Avenue, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-625-5858; fax 612-625-3549; spptgrad@umn.edu; [www.spanport.umn.edu](http://www.spanport.umn.edu)).

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.grad.umn.edu/faculty_rosters/faculty.html).

**Professor**
Ana Paula Ferreira, M2
Amy K. Kaminsky, Gender, Women, and Sexuality Studies, AM2
Carol A. Klee, M2
Nicholas Spadaccini, M2

**Associate Professor**
Fernando Arenas, M2
Timothy Face, M2
Ofelia Ferrán, M2
Ana Forcinito, M2
Francisco A. Ocampo, M2
Joanna O’Connell, M2
Luis Ramos-García, M2

**Assistant Professor**
Jaime Hanneken, M2
Raul Marrero-Fente, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—The department offers an M.A. program, Hispanic and Lusophone Literatures, Cultures, and Linguistics and a Ph.D. program in Hispanic and Luso-Brazilian Literature and Linguistics. The M.A. program offers three formal tracks that students select upon entrance to the program, which is recorded on the transcript. The tracks each offer distinct training as follows.

**Hispanic Literatures and Cultures**—Students receive a solid experience in Peninsular and Spanish-American Literatures and Cultures. Works and literary movements are studied in their historical, social, and cultural contexts, combining the approaches of literary criticism with those of sociology, the history of ideas, anthropology, and feminism, among others.

**Lusophone Literatures and Cultures**—This track prepares students in Portuguese studies, understood as an interdisciplinary critical formation through which the literatures and cultures of Portugal, Brazil, and Lusophone Africa are approached. Students are trained in the main periods, movements, and issues pertaining to Portuguese-language literatures and cultures both nationally and internationally, within relevant comparative frameworks.

**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.

**Prerequisites for Admission**—Preferred undergraduate GPA of at least 3.00 and a preferred graduate GPA of at least 3.50. 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**—Check the department Web site for application information: [http://spanport.umn.edu/grad/apply.php](http://spanport.umn.edu/grad/apply.php). The deadline for application for admission is January 5th. Applicants are considered for admission for fall semester only.

For an online application or for more information about Graduate School admissions, see the General Information section in this catalog, or visit the Graduate School Web site.

**Courses**—Refer to Portuguese (PORT), Spanish (SPAN), and Spanish-Portuguese (SPPT) in the course section of this catalog.
or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

M.A. Degree Requirements
The M.A. is offered under both Plan A and Plan B. Plan A requires a minimum of 37 credits, including SPPT 5999, 18 credits in the major field taken from among designated 5xxx level core courses, 6 credits in a minor or related field, and 10 thesis credits. Plan B requires a minimum of 33 course credits—including SPPT 5999, 24 credits in the major field taken from among designated 5xxx core courses, 6 credits in a minor or related field, and two Plan B papers. Most students pursue Plan B.

Language Requirements—Students are required to be fluent in Spanish and/or Portuguese and acquire literacy in at least one other foreign language (see the department’s Graduate Handbook).

Final Exam—There is a written and an oral final exam that students take in their last semester of coursework, usually the fourth semester.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires at least 6 credits to be determined in consultation with the director of graduate studies.

Hispanic Linguistics
See Hispanic and Lusophone Literatures, Cultures, and Linguistics.

Hispanic Literatures
See Hispanic and Lusophone Literatures, Cultures, and Linguistics.

History
Contact Information—Department of History, University of Minnesota, 1110 Heller Hall, 271 19th Ave South, Minneapolis, MN 55455 (612-624-5840; fax 612-624-7096; histdgs@umn.edu; www.hist.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Allen F. Isaacman, SM
Elaine Tyler May, American Studies, SM
Steve Ruggles, SM

Professor
Catherine Asher, Art History, AM2
Frederich Asher, Art History, AM2
Bernard S. Bachrach, SM
Iraj Bashiri, SM
Anna K. Clark, SM
Gary Cohen, SM
Gail Dubrow, Landscape Architecture, SM
John K. Evans, SM
John M. Eyler, History of Medicine, ASM
Edward L. Farmer, SM
Donna Gabaccia, SM
David F. Good, SM
Ruth M. Karraas, SM
Sally G. Kohlsstedt, History of Science and Technology, ASM
Regina Kunzel, SM
Nabil Matar, English, ASM
Lary May, American Studies, SM
Mary Jo Maynes, SM
Robert E. McCaa, SM
Russell R. Menard, SM
John K. Munholland, SM
David W. Noble, American Studies, ASM
Carla R. Phillips, SM
William D. Phillips Jr., SM
Jeffrey Pilcher, SM
Kathryn L. Reyerson, SM
Steven Ruggles, SM
Joel B. Samaha, Sociology, SM
Daniel Schroeter, SM
Theofanis G. Stavrou, SM
James D. Tracy, SM
Ann B. Waltner, SM
Eric D. Weitz, SM
Barbara Y. Welke, SM

Associate Professor
Jennifer Alexander, History of Science and Technology, AM2
Klelsteo E. Atkins, African American and African Studies, AM2
Susannah Blumenthal, AM
Sarah C. Chambers, SM
Brenda Child, American Studies, AM2
Kirsten Fischer, SM
Tamara L. Giles-Vernick, SM
George D. Green, SM
Christopher M. Isett, M2
Susan D. Jones, Ecology, Evolution, and Behavior, AM2
Erika Lee, SM
Patricia Lorcin, SM
Michael Lower, SM
Patrick J. McNamara, SM
Kevin P. Murphy, SM
Lisa A. Norling, SM
Jean M. O’Brien-Kehoe, SM
J. B. Shank, SM
Ajay Skaria, SM
Eva Von Dassow, Classical and Near Eastern Studies, AM2
Liping Wang, SM
Thomas C. Wolfe, SM

Assistant Professor
Giancarlos Casale, M2
David Chang, M2
Victoria B. Coifman, African American and African Studies, AM2
Tracey Deutsch, M2
Andrea Gallia, M2
Carol Hakim, M2
Mai Na Lee, M2
Malinda Lindquist, M2
Sarah-Jane Mathieu, M2
Hiromi Mizuno, M2
Kevin Murphy, M2
Helena Pohlant-McCormick, M2

Lecturer
Marguerite Ragnow, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Areas of concentration 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.

Prerequisites for Admission—The only prerequisite for admission is a bachelor’s degree. The program admits only to the Ph.D. and most students will have majored in history as an undergraduate. Preparation in at least two broad areas of history and training in at least one foreign language are strongly encouraged.

Special Application Requirements—The department requires the following: completion of the history department application online, three letters of recommendation, a writing sample, statement of purpose, transcripts, GRE scores, and, for international students, TOEFL scores. The application deadline is December 1. The department application and instructions may be found on the department’s Web site at www.hist.umn.edu.

Courses—Refer to History (HIST) in the course section of this catalog or Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—4xxx history courses are not included on Degree Program Forms for the history graduate major or minor.

M.A. Degree Requirements
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. The Plan A requires six history courses (including HIST 8015), two non-history courses, 10
M.A. thesis credits, and submission of a defendable thesis. The Plan B requires eight history courses (including HIST 8015), two non-history courses, and three Plan B papers (see department Web site for details).

Language Requirements—A reading knowledge of at least one foreign language is required before admission to the master’s exam.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—The M.A. 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). Normally, there is a representative from the history department on the student’s oral examining committee.

Ph.D. Degree Requirements
The Ph.D. requires ten history courses (including HIST 8015) (roughly 30 cr), four non-history courses (roughly 12 cr), and 24 Ph.D. thesis credits to total 72 credits.

Language Requirements—Reading knowledge of at least two foreign languages is required before admission to the preliminary exam. Some areas of concentration may require additional foreign languages. In some cases, quantitative methods may be considered a foreign language.

Minor Requirements for Students Majoring in Other Fields—The Ph.D. minor in history typically involves four to five history courses (including HIST 8015), and a written examination or substantial written project. The topic chosen must be logically related to the student’s major work (must prepare for a written examination or substantial written project either in one general area and an associated sub area, or in two sub areas). One or two representatives from history must serve on the student’s preliminary oral examining and thesis committees. The preliminary oral exam also serves as the exam for the minor.

History of Science, Technology, and Medicine

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; HSTM@physics.umn.edu; www.hstm.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
John M. Eyler, History of Medicine, SM
Sally Gregory Kohlstedt, Geology and Geophysics, SM
Thomas J. Misa, History of Science and Technology, SM
Robert W. Seidel, Chemical Engineering, SM
Alan E. Shapiro, Physics, SM
Roger H. Stuewer, (emeritus), Physics, ASM
C. Kenneth Waters, Philosophy, AM2

Associate Professor
Jennifer Karns Alexander, Mechanical Engineering, SM
Tamara L. Giles-Vernick, History, AM2
Jennifer Gunn, History of Medicine, SM
Michel Janssen, Physics, SM
Susan D. Jones, Ecology, Evolution, and Behavior, SM

Assistant Professor
Megan K. Barnhart, History of Science and Technology, M
Mark E. Borrello, Ecology, Evolution, and Behavior, SM

Adjunct Assistant Professor
Jon Harkness, History, AM2
David Hrenis, Surgery, AM2
Jole Richard Shakelford, Medicine, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The program offers opportunities for advanced research and study in the history of science and technology (with particular expertise in the history of the physical sciences, history of the biological sciences, history of technology, and history of American science and technology) and in the history of medicine.

Prerequisites for Admission—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—In addition to the application sent to the Graduate School, applicants are encouraged to submit three letters of recommendation, a writing sample and GRE scores directly to the program. Check the HSTM Web site for the program application form.

Courses—Refer to History of Science and Technology (HSCI) and the History of Medicine (HMED) course lists in this catalog or in Twin Cities Courses on the University Catalog Web site for graduate classes pertaining to the two tracks in our combined program.

Use of 4xxx Courses—Use of 4xxx courses on degree programs is subject to approval by the director of graduate studies.

M.A. Degree Requirements
The M.A. is offered under Plan A and Plan B. Plan A requires a minimum of 20 course credits and 10 thesis credits; Plan B requires a minimum of 30 course credits. Following the guidelines in the Graduate Student Handbook for the program (www.hstm.umn.edu), M.A. students select one of two tracks, in the history of science and technology or in the history of medicine, with some provisions for both breadth and depth. In addition, each student must take the two-semester sequence of historiography and research preparation (HSCI/HMED 8112 and HSCI/HMED 8113). Each student must also take two courses (6 cr) in a minor or related field. Under the Plan A option, students must also take 10 thesis credits. All of the courses selected for the requirements must be passed with a grade of B or better. HSCI 4xxx courses may be included as appropriate for the area and period requirements and with permission of the director of graduate studies.

Language Requirements—M.A. students must demonstrate reading proficiency in one foreign language, normally French or German.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—The master’s minor requires 6 credits and is structured for the student’s interests.

Ph.D. Degree Requirements
The Ph.D. is for those planning professional careers that require a high degree of scholarly competence, including teaching and research. Following the guidelines in the Graduate Student Handbook for the program (www.hstm.umn.edu), Ph.D. students select

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
one of two tracks, in the history of science and technology or in the history of medicine, with some provisions for both breadth and depth. In addition, each student must take the two-semester sequence of historiography and research preparation (HSCI/HMED 8112 and HSCI/HMED 8113) and a minor or supporting program consisting of four courses (12 cr). Students must also take 24 thesis credits. All of the courses selected for the requirements must be passed with a grade of B or better.

Language Requirements—Before taking the preliminary exams, students must demonstrate reading proficiency in two foreign languages, normally French and German.

Minor Requirements for Students Majoring in Other Fields—The doctoral minor requires 12 credits and is structured for each student’s interests in discussion with the director of graduate studies.

Housing Studies

Postbaccalaureate Certificate


For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professors
William Angell, Design, Housing, and Apparel, M
Becky Yust, Design, Housing, and Apparel, M

Associate Professors
Marilyn Bruin, Design, Housing, and Apparel, M
Jeff Crump, Design, Housing, and Apparel, M
Ann Ziebarth, Design, Housing, and Apparel, M

Curriculum—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.

Prerequisites for Admission—Students must have a bachelor’s degree from an accredited U.S. university or its foreign equivalent. An undergraduate GPA of 3.00 is preferred. (Students who do not have a 3.00 GPA should describe relevant nonacademic experience as well as explain any other relevant factors for the Graduate School’s and program faculty’s consideration.) Students must apply for admission to the certificate with the Graduate School after completing no more than one course.

Courses—Required course: DHA 5471—Special Topics: Seminar for Certificate Students in Housing Studies (2 cr). Elective courses: DHA 4461, 4465, 5463, 5467, 5469, 5481, 5484, 8463, and 8467.

Classes are offered on a rotating basis; students need to check the Class Schedule at www.onestop.umn.edu/onestop/registration.html or contact the department for schedules.

Certificate Requirements

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.

The 4xxx courses listed under course options have been approved for inclusion in a Housing Studies Certificate Program. Students should review their plan of study with the academic adviser.

Early in the program, students should file a certificate program plan with Graduate School indicating the courses they plan to take, subject to faculty approval. All courses must be completed with a grade of B- or better and an overall GPA of 2.80 or higher.

Human Factors/ Ergonomics

Minor Only

Contact Information—Professor Caroline Hayes, Graduate Minor Program in Human Factors/Ergonomics, Department of Mechanical Engineering, Institute of Technology, University of Minnesota, Mechanical Engineering Building, 111 Church Street, S.E. Minneapolis, MN 55455 (612-626-8391; www.humanfactors.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
John C. Carmody, AM
Arthur G. Erdman, Mechanical Engineering, AM
Laël C. Gatwood, Laboratory Medicine and Pathology, AM
Susan G. Gerberich, Environmental/ Occupational Health, AM
Maria Gini, Computer Science, M

Denise A. Guer, Design, Housing, and Apparel, AM
Caroline C. Hayes, Department of Mechanical Engineering, M
Matts Heimdal, Computer Science, M
Paul Johnson, Carlson School of Management, M
Joseph A. Konstan, Computer Science, M
Karen L. LaBatt, AM
Gordon E. Legge, Psychology, M
Shashi Shekhar, Computer Science, AM
John Shutkske, Biosystems and Agricultural Engineering, M
Thomas Stoffregen, Kinesiology, M
Donald Yesley, M
Michael Wade, Kinesiology, M

Adjunct Professor
Victor Koscheyev, Kinesiology, M

Associate Professor
Lee Ann Breuch, Rhetoric, M
Elizabeth Bye, Design, Housing, and Apparel, M
Jonathan Chaplin, Biosystems and Agricultural Engineering, M
Victoria Interrante, Computer Science, M
Loren Terveen, Computer Science, M

Lecturer
Christopher Miller, AM

Senior Research Fellow
Thomas Smith, Kinesiology, M

Research Associate
Kathleen Harder, College of Design, M
Michael Manser, Mechanical Engineering, M

Curriculum—Human Factors and Ergonomics (HF/E) is the study of how to make technological systems safe, effective, and easy and enjoyable to use. The program offers interdisciplinary coursework that address human performance and how it can be enhanced through design of tools, systems, working environments, processes, and organizations. HF/E has applications ranging from clothing and living spaces to business processes, computer interfaces, and spacecraft cockpits. Companies value graduates with HF/E training because it is essential to creating effective products that can compete in a global market. The minor is available to master’s and doctoral students.

Prerequisites for Admission—Admission to the minor is contingent upon prior admission to a graduate degree-granting program within the Graduate School. Admission is only by permission of the director of graduate studies in the human factors/ergonomics minor.

Courses—Refer to Human Factors/ Ergonomics (HUMF) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to this program.

Use of 4xxx Courses—Use of 4xxx courses is permitted based on adviser and director of graduate studies approval.
Human Resources and Industrial Relations

Curriculum—Human resources and industrial relations (HRIR) studies 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 doctoral degree is a research degree for individuals interested in academic careers.

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. Research methods and quantitative analysis of employment problems and issues are also included. Specialization in two areas is required for Ph.D. candidates, while M.A. candidates are encouraged to choose electives to support a generalist orientation with key business knowledge.

Prerequisites for Admission—An undergraduate course in microeconomics must be completed with a grade of at least C before enrolling.

**Minor Only Requirements**
A master's minor requires 7 graduate credits, including 6 credits of courses from an approved list (which can be found on the Human Factors and Ergonomics Web page) and 1 seminar credit approved by the director of graduate studies. In addition to these 7 credits, master's students must also take a course in statistical analysis methods. The statistics course may be at the graduate or undergraduate level, and must be approved by the director of graduate studies.

A doctoral minor requires 13 credits, including 12 credits from the approved list of courses, and 1 seminar credit approved by the director of graduate studies. In addition to these 13 credits, doctoral students must also take courses in statistical analysis methods and design of experiments. The statistics courses may be at the undergraduate or graduate level, and must be approved by the director of graduate studies.

**Courses**—All students in the minor must take a basic graduate level human genetics course (such as GCD8073—Advanced Human Genetics). Additional courses to fulfill the requirements for the minor are selected from courses that are appropriate for advanced study in human genetics. Representative courses are listed in genetics, epidemiology/public health, psychology, and law. All courses for the minor cannot be from the same department/program, and students are encouraged to take at least one course that is outside of their major course area (such as taking a non-GCD course for a MCDBG student). Contact the program for specific courses for the minor program.

**Human Resources and Industrial Relations**

**Contact Information**—Center for Human Resources and Labor Studies, University of Minnesota, 3-300 Carlson School of Management, 321 19th Avenue South, Minneapolis, MN 55455 (612-624-8360; fax 612-624-8360; hrirgrad@umn.edu; www.csom.umn.edu/Page5888.aspx).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Assistant Professor**
Na Li, Biostatistics, M
Michael B. Miller, Epidemiology, M

**Curriculum**—The courses for the human genetics minor require a basic understanding of human and molecular genetics and some statistics.

**Prerequisites for Admission**—No specific course prerequisites are required for admission to the minor in human genetics. The following courses serve as prerequisites for the core courses that can be included in the minor: BIOL 4003—Genetics (3 cr), GCD 4143—Human Genetics (3 cr), GCD 4034—Molecular Genetics (3 cr) or GCD 8121/BIOC 8002—Advanced Molecular Genetics (3 cr), STAT 3011—Introduction to Statistical Analysis (3 cr), PUBH 5414—Biostatistical Methods I (3 cr), and basic introductory courses to prokaryotic and eukaryotic molecular genetics. If a student has an insufficient background in a particular area the Steering Committee may recommend specific courses prior to starting the human genetics minor program. These courses do not count toward the minor requirements.

**Courses**—All students in the minor must take a basic graduate level human genetics course (such as GCD8073—Advanced Human Genetics). Additional courses to fulfill the requirements for the minor are selected from courses that are appropriate for advanced study in human genetics. Representative courses are listed in genetics, epidemiology/public health, psychology, and law. All courses for the minor cannot be from the same department/program, and students are encouraged to take at least one course that is outside of their major course area (such as taking a non-GCD course for a MCDBG student). Contact the program for specific courses for the minor program.

**Minor Only Requirements**
A master's minor in human genetics requires 9 credits, and a doctoral minor requires 12 credits.

**Human Resources and Industrial Relations**

**Contact Information**—Center for Human Resources and Labor Studies, University of Minnesota, 3-300 Carlson School of Management, 321 19th Avenue South, Minneapolis, MN 55455 (612-624-8360; fax 612-624-8360; hrirgrad@umn.edu; www.csom.umn.edu/Page5888.aspx).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**
Avner Ben-Ner, SM
Mario F. Bognanno, (emeritus), ASM
John W. Budd, SM
John P. Campbell, Psychology, ASM
John A. Fossom, (emeritus), ASM
Jo-Ida C. Hansen, Psychology, ASM
Morris M. Kleiner, Public Affairs, ASM
Jeylan T. Mortimer, Sociology, ASM
Denis S. Ones, Psychology, ASM
John Remington, SM
Paul R. Sackett, Psychology, ASM
James G. Scoville, (emeritus), ASM
Jason Shaw, SM
Connie R. Wanberg, SM
Yijiang Wang, SM
Mahmood A. Zaidi, (emeritus), ASM

**Associate Professor**
Ross E. Azevedo, SM
Joyce E. Bono, SM
Michelle K. Duffy, SM
Theresa M. Glomb, SM
Maria J. Hanraety, Public Affairs, ASM

**Assistant Professor**
Lisa M. Leslie, M2
Colleen F. Manchester, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—Human resources and industrial relations (HRIR) studies 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 doctoral degree is a research degree for individuals interested in academic careers.

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. Research methods and quantitative analysis of employment problems and issues are also included. Specialization in two areas is required for Ph.D. candidates, while M.A. candidates are encouraged to choose electives to support a generalist orientation with key business knowledge.

**Prerequisites for Admission**—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, GRE scores, and all materials and statements required by the graduate school. Master’s degree applicants may substitute the GMAT for the GRE. Applicants whose native language is not English must also submit score results from the TOEFL or IELTS.

Students may enter both the day and evening M.A. programs in the fall or spring semester. The application deadlines are June 15 and October 15. The M.A. financial aid deadline for fall semester is February 1. Applicants may enter the Ph.D. program only in the fall; the application deadline is January 1. Applicants for all programs are encouraged to apply early, particularly for fall semester.

Courses—Refer to Human Resources and Industrial Relations (HRIR) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—4xxx courses are not permitted toward M.A. or Ph.D. degree requirements.

M.A. Degree Requirements

The M.A. is offered under Plan A (thesis) and coursework only in day (full-time) and evening (part-time) programs. Most students complete the M.A. under the coursework option, which requires at least 48 credits. Major coursework includes 8001, 8011, 8031, 8141/8241, 8051, and 8071, and elective credits in HRIR. At least 8 credits must be earned in related fields. Plan A requires at least 38 course credits and 10 thesis credits. Major coursework includes 8011; three courses from among 8031, 8141/8241, 8051, and 8071; and 12–16 additional HRIR credits. Also required are 6–10 credits in an approved field or fields of study related to human resources and industrial relations. Plan A is generally limited to students who have considerable related graduate coursework.

Commonly selected related fields include accounting, finance, operations management, managerial communications, economics, human resource development, law, psychology, public affairs, sociology, and research methods.

Language Requirements—None.

Final Exam—The final exam is oral.

Ph.D. Degree Requirements

Students must complete at least 12 credits of research methods (most complete 18 or more credits); at least 6 credits of human resources and industrial relations doctoral seminars in each of two areas of specialization and other credits in these areas as needed; at least 3 credits in each of the other three subfields; and at least 12 credits in a minor or supporting program in one or more of the following social and behavioral sciences—applied economics, business administration, economics, history, political science, psychology, and sociology. Research methods courses taken outside the program may be applied toward the minor or supporting program requirement. Specific coursework is planned in consultation with the student’s adviser, the Ph.D. coordinator, and the director of graduate studies. Students must pass preliminary exams in each of their subfields and research methods.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Students majoring in business administration, education, hospital and health care administration, or the social and behavioral sciences may select a doctoral minor or supporting program. The minor must consist of at least 21 credits, including five courses in at least four subfields, plus a doctoral seminar.

Human Rights

Minor Only

Contact Information—Graduate Minor in Human Rights, Institute for Global Studies, University of Minnesota, 232 Social Science Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-626-1879; fax 612-626-2242; hrminor@umn.edu; www.hrp.cla.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Kathryn Sikkink, Political Science, M
David Weissbrodt, Law, M

Professor
Ragui Assaad, Humphrey Institute of Public Affairs, M
Katherine Fennelly, Humphrey Institute of Public Affairs, M
Sally J. Kenney, Humphrey Institute of Public Affairs, M
Helga Leitner, Geography, M
Dario Menanteau, Social Work, M
Eric Weitz, History, M

Associate Professor
Elizabeth Heger Boyle, Sociology, Law, M

Assistant Professor
Barbara A. Frey, Institute for Global Studies, M

Other
Karen Brown, Institute for Global Studies, M
John R. Vreyens, Agricultural, Food, and Environmental Sciences, M
Mahmood A. Zaidi, Human Resources and Industrial Relations, M

Curriculum—The human rights minor, available to master’s (M.A. and M.S.) and doctoral students, provides an interdisciplinary foundation in human rights studies and practical experience in human rights work. To satisfy the core requirements, students must complete two of the four core courses, each of which is 3 credits (LAW 6886—International Human Rights Law, POL 8660—Theoretical Approaches to Human Rights, POL 5485—Human Rights and Democracy in the World, and GLOS 5900/LAW 6058—Topics in Global Studies), and one 200-hour internship. M.A. and M.S. 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.

Prerequisites for Admission—Admission to a master’s or doctoral degree-granting program within the Graduate School. Admission is limited and only by permission of the director of graduate studies in human rights. A GPA of 3.00 is required.

Special Application Requirements—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.

Courses—Elective courses are taken from a designated course list at www.hrp.cla.umn.edu/gradCourses.html.

Use of 4xxx Courses—4xxx courses may not be included on Degree Program Forms for the minor.

Minor Only Requirements

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 doctoral minor requires 12 credits: two core courses, at least two elective courses, and one six-week internship approved by the program director.
Special Application Requirements—GRE General Test scores are required for admission to the Ph.D. and the M.S.I.Sy.E.—Industrial Engineering (IE) track programs. GRE scores are also used in making departmental financial support decisions. For the Ph.D. program and the M.S.I.Sy.E.—Systems Engineering (SE) track program, three letters of recommendation are required. Students are admitted in fall and spring semesters only; department deadlines are December 15 and October 15, respectively.

Courses—Refer to Industrial Engineering (IE) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—No 4xxx courses may be applied toward an ISYEE graduate degree.

M.S.I.Sy.E. Degree Requirements
The master of science in industrial and systems engineering (M.S.I.Sy.E.) requires at least 30 credits. Students can choose one of two tracks. The industrial engineering (IE) track has two options: Plan A (thesis) option and Plan B (non-thesis) option. The IE track requires at least 12 course credits in the major if Plan A is chosen, and 16 course credits in the major if Plan B is chosen. At least 6 course credits in a minor or related field and at least 1 credit of graduate seminar must be included in the 30 credits. Additional program requirements for each plan in the IE track are as follows.

Plan A (thesis) option: required courses include IE 5531, IE 8532, and one of the following courses—IE 5541, 5551, or 8541. Students may replace a required course by a qualifying replacement course if they have taken the equivalent of the required course elsewhere. A list of qualifying replacements is available on the ISYEE program Web page.

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 by a qualifying replacement course if they have taken the equivalent of the required course elsewhere. A list of qualifying replacements is available on the ISYEE program Web page.

Students must also take 10 thesis credits.

Industrial Relations
See Human Resources and Industrial Relations.
Infrastructure Systems Engineering

Contact Information—Center for the Development of Technological Leadership, University of Minnesota, 1300 Second Street, Suite 510, Minneapolis, MN 55454 (612-624-5474; fax 612-624-7510; degrees@cdtl.umn.edu; www.cdtl.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Massoud Amin, Electrical and Computer Engineering, M2
Gary A. Davis, M2
Andrew Drescher, M2
Catherine E. French, M2
John S. Gulliver, M2
Joseph F. Labuz, M2
Panos G. Michalopoulou, M2
Arturo E. Schultz, M2
Carol K. Shield, M2
Karl A. Smith, M2
Heinz G. Stefan, M2
Vaughn R. Voller, M2

Associate Professor
Randal J. Barnes, M2
Raymond M. Hozalski, M2
Mihai Marasteanu, M2

Lecturer
Bradford Henry, AM2
Peter Hilger, AM2
Steven Olson, AM2
Howard Preston, AM2
Eugene Skok, AM2
Raymond Spack, AM2
Craig A. Waldron, AM2
Peter R. Willenbring, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The master of science in the infrastructure systems engineering (M.S.I.S.E.) program focuses on developing management and engineering tools that address the issues in local, county, and state infrastructure. It is an interdisciplinary program offered through the Institute of Technology’s Center for the Development of Technological Leadership and the Department of Civil Engineering. The two-year, professional-format program integrates the fields of water systems, pavement, structures, mechanics modeling, traffic engineering, transportation policy, and environmental issues, among others.

Prerequisites for Admission—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.

Special Application Requirements—None.

Courses—Refer to Infrastructure Systems Engineering (ISE) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Applying 4xxx courses toward degree requirements is extremely limited. Such requests will be reviewed on a case-by-case basis and will require director of graduate studies approval.

M.S.I.S.E. Plan B Degree Requirements
The M.S.I.S.E. requires 30 credits with 23 credits in required core courses and 7 credits in related fields, such as geography and public administration. In addition students must complete a capstone project to address an on-the-job issue or problem.

Language Requirements—None.

Final Exam—An oral presentation and defense of the capstone project is required.

Integrative Biology and Physiology

See Cellular and Integrative Physiology.

International Education

Minor Only


For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Patricia G. Avery, Curriculum and Instruction, M
William M. Bart, Educational Psychology, M
David Chapman, Educational Policy and Administration, M
Gerald W. Fry, Educational Policy and Administration, M
R. Michael Paige, Educational Policy and Administration, M

Associate Professor
Peter W. Demerath, Educational Policy and Administration, M
Fred Finley, Curriculum and Instruction, M
Rosemarie J. Park, Work and Human Resource Education, M

Assistant Professor
Joan DeJaeghere, Educational Policy and Administration, M
Frances Vavrus, Educational Policy and Administration, M

Adjunct Assistant Professor
Kay A. Thomas, Educational Psychology, M

Lecturer
Deanne L. Magnusson, Educational Policy and Administration, AM

Curriculum—The interdisciplinary minor in international education is for students enrolled in any M.A. 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 Policy and Administration; Educational Psychology; Human Resource Education; School of Kinesiology; and the Institute of Child Development.

Prerequisites for Admission—Admission to the international education minor is contingent upon prior admission to the Graduate School and to an M.A., M.S., M.S.W., S.C., Ph.D., or Ed.D. program at the University of Minnesota. For an application form visit the international education minor Web site at: http://education.umn.edu/EdPA/CIDE/Minor.html or consult with the director of graduate studies for more information.

Courses—Contact the minor program office for information on relevant coursework.

Use of 4xxx Courses—Inclusion of 4xxx courses toward degree programs is subject to adviser and director of graduate studies approval.

Minor Only Requirements
At least 9 graduate credits at the master’s level, 12 at the doctoral level. 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 EDPA 5103—Comparative Education and 5124—Critical Issues in International Education (one for master’s, both for doctoral); research (EDPA 5121; for doctoral students only); and area-specific coursework (at least one course for master’s and doctoral: AFEE 5351; CI
Interpersonal Relationships Research

Minor Only

Contact Information—Doctoral Minor Program in Interpersonal Relationships Research, Department of Psychology, University of Minnesota, S354 Elliott Hall, 75 East River Road, Minneapolis, MN 55455-0344 (612-626-0025; simpst108@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Ellen S. Berscheid, Psychology, M

Professor
W. Andrew Collins, Child Development, M
Nicki R. Crick, Child Development, M
Byron Egeland, Child Development, M
Patricia A. Frazier, Psychology, M
Dean E. Hewes, Communication Studies, M
Anthony D. Pellegrini, Educational Psychology, M
Jeffry A. Simpson, Psychology, M
Mark Snyder, Psychology, M
L. Alan Sroufe, Child Development, M
Ruth G. Thomas, Work and Human Resource Education, M

Associate Professor
Susanne Jones, Communication Studies, M
Ascan F. Koerner, Communication Studies, M
Richard M. Lee, Psychology, M
Martha A. Rueter, Family Social Science, M
Kathleen Vohs, Management, M

Assistant Professor
Vlad Griskevicius, Management, M
Ann Meier, Sociology, M

Curriculum—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.

Prerequisites for Admission—Admission to the interpersonal relationships research graduate minor is contingent upon prior admission to the Graduate School and 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.

Courses—Refer to Interpersonal Relationships Research (IREL) in the course section of this catalog or in the Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—4xxx courses are permitted based on director of graduate studies approval.

Minor Only Requirements
The doctoral minor requires at least 14 graduate credits, including three required core courses and additional elective courses selected from an approved list. The required courses are IREL 8001 (1 cr each of 2 semesters), IREL 8021 (3 cr), and either PSY 5204 (3 cr) or PSY 8202 (3 cr).

Italian Studies

Minor Only
Contact the program for additional details about this minor.

Contact Information—Department of French and Italian, University of Minnesota, 9 Pleasant Street S.E., 260 Folwell Hall, Minneapolis, MN 55455 (612-624-4308; fax 612-624-6021).

Professor
John K. Evans, History, M
Rick McCormick, German, Scandinavian, and Dutch, M
Susan Noakes, French and Italian, M
Leon Satkowski, Architecture, M
Nicholas Spadaccini, Spanish and Portuguese
John Watkins, English, M
Eric Weitz, History, M

Associate Professor
Susanna Ferlito, French and Italian, M
Maria Fitzgerald, English, M
Michael Gaudio, Art History, M
Kelley Harness, School of Music, M
Peter Mercer-Taylor, School of Music, M
J.B. Shank, History, M

Assistant Professor
Giancarlo Casale, History, M
Siobhan Craig, English, M

Curriculum—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 courses at the 4xxx, 5xxx, 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.

Prerequisites for 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. A minimum GPA of 2.80 is required.

Use of 4xxx Courses—One course bearing a 4xxx designator may be accepted for the minor upon the approval of the director of graduate studies.

Courses—Contact the director of graduate studies for the most current information on relevant coursework pertaining to this program.

Minor Requirements—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.

Language 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.

Japanese
See Asian Literatures, Cultures, and Media.

Journalism
See Mass Communication.

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
Kinesiology

Contact Information—Marta Fahrenz, Coordinator of Graduate Studies, School of Kinesiology, University of Minnesota, 223B Cooke Hall, 1900 University Avenue S.E., Minneapolis, MN 55455 (612-625-5300; fax 612-626-7700; kin@umn.edu; http://cehd.umn.edu/kin).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

James R. Carey, Physical Medicine and Rehabilitation, AM2
Richard P. DiFabio, Physical Medicine and Rehabilitation, AM2
Arthur G. Erdman, Mechanical Engineering, AM2
Mary Jo Kane, SM
Jürgen Konczak, SM
Victor S. Koscheyev, Integrative Biology and Physiology, SM
Arthur S. Leon, SM
Herbert L. Pick Jr., Child Development, AM2
Thomas Stoffregen, SM
Michael G. Wade, SM
Maureen Weiss, SM
Albert Yonas, Child Development, AM2

Associate Professor

Donald Denge, SM
Paula M. Ludewig, Physical Medicine and Rehabilitation, AM2
Virgil G. Mathiowetz, Allied-Occupational Therapy, AM2
Trish Painter, School of Nursing, AM2
Moira A. Petit, SM
Robert C. Serfass, SM
Diane M. Wiese-Bjornstal, SM

Adjunct Research Professor

Catherine M. Kotz, Food Science and Nutrition, AM2

Assistant Professor

Daheia Barr-Anderson, M2
Yingjie Chen, Medicine, AM2
Aaron Scott Kelly, Pediatrics, AM2
Lisa A. Kihl, M2
Beth Lewis, M2
Dawn A. Lowe, Physical Medicine and Rehabilitation, AM2
Stephen D. Ross, SM
Steven D. Stovitz, Family Medicine, AM2

Lecturer

Rayla Allison, M2
Jo Ann Buysse, M2
Stacy Ingraham, M2
Christopher Kaufman, AM2
Nicole LaVoi, M2
Richard Rodgerston, M2
Aynsley M. Smith, AM2
Thomas J. Smith, M2

Research Associate

George Blitz, AM2
Ulf Bronas, School of Nursing, AM2
Carol A. Leitschub, M2

Other

Anthony Brown, Recreational Sports, AM2
James C. Turman, Recreational Sports, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Emphasis areas in the master’s and doctoral programs are biomechanics/neural control, exercise physiology, human factors/ergonomics, motor learning/development, sport management, sport and exercise psychology, or sport sociology.

Prerequisites for Admission—Although prospective master’s students generally have an undergraduate degree in kinesiology, physical education, or sport and exercise science, 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. Prospective doctoral students have generally completed a master’s degree in a field related to kinesiology. Admitted students may be required by their adviser to complete background preparation in undergraduate and graduate kinesiology and related coursework.

Special Application Requirements—Applicants must submit a University of Minnesota Graduate School Application Form; a completed School of Kinesiology Application Form; a written statement of academic interests, goals, and objectives; scores from the General Test of the GRE (verbal and quantitative) that are less than five years old; three letters of recommendation from persons familiar with their scholarship and research potential; a scholarly paper; and photocopies of official 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 can be admitted any term. Students are encouraged to submit all application materials by December 15 to ensure priority consideration for teaching and research assistantships.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

M.A. Degree Requirements

M.A. students select an emphasis in biomechanics/neural control, exercise physiology, human factors/ergonomics, motor learning/development, sport management, sport and exercise psychology, or sport sociology.

The M.A. 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, and 10 thesis credits (8777). Plan B also requires 30 credits, including at least 14 course credits in kinesiology, 6 course credits in a minor or related field, 4 credits of a research project (8995), and 6 additional credits in any of these areas. For both Plan A and Plan B, students must take KIN 5981 (3 cr), KIN 8980 (1 cr), and in the related field or minor, EPSY 5261 (3 cr) or EPSY 8261 (3 cr) or equivalent. A GPA of at least 3.00 is required to maintain good standing and to graduate.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires at least 6 credits of graduate-level kinesiology courses.

Ph.D. Degree Requirements

Ph.D. students pursue an individualized program with an emphasis in biomechanics/neural control, exercise physiology, human factors/ergonomics, motor learning/development, sport management, sport and exercise psychology, or sport sociology.

The Ph.D. requires at least 48 course credits and 24 thesis credits, for a total of 72 credits. Course credits include 24 credits in kinesiology, 9 credits in statistical methods, 12 credits in a supporting program or minor (statistical methods courses may be included), and an additional 3 credits in any of these areas. Kinesiology course credits must include 5171 and 5981 (achieving a grade of A or B in each), 2 to 6 credits of 8980, and at least 12 credits of 8xxx. Statistical methods courses must include EPSY 8261 or equivalent and EPSY 8262 or equivalent (achieving a grade of A or B in
A GPA of at least 3.00 is required to maintain good standing and to graduate.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—A doctoral minor requires at least 12 credits of graduate-level kinesiology courses, including 5171 (3 cr) and 8980 (1 cr).

**Landscape Architecture**

**Contact Information**—Department of Landscape Architecture, University of Minnesota, 144 Ralph Rapson Hall, 89 Church Street S.E., Minneapolis, MN 55455 (612-625-6860; fax 612-625-0710; gsland.umn.edu; http://landarch.design.umn.edu/index.php).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**
- Gail Dubrow, M2
- Lance M. Neckar, M2
- Peter J. Olin, (emeritus), Horticultural Science, M2
- David G. Pitt, M2

**Associate Professor**
- Clinton Hewitt, M2
- John A. Koepe, M2
- Rebecca J. Krinke, M2
- Kristine F. Miller, M2
- Laura R. Musacchio, M2
- Robert D. Sykes, M2

**Adjunct Assistant Professor**
- Vince deBritto, AM
- Joseph R. Favour, AM
- Robert Gunderson, AM
- Richard T. Murphy, AM
- Patrick Nunnally, AM2
- Nikki Schlepp, AM2
- Carissa S. Slotterback, AM
- Andrea Wedul, AM

**Senior Research Fellow**
- Stephen J. Roos, AM2

**Research Fellow**
- Carlos J. Fernandez, AM2

**Lecturer**
- Dean F. Abbott, M2
- Brad Agee
- L. Peter Macdonagh, AM
- Fred J. Rozumalski, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—Students develop professional design skills through a curriculum of carefully integrated courses that address the increasingly complex relationships between art, ecology, and community that influence and inform design on the land. Design inquiry in a studio setting defines the integrative core of this curriculum. 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. The department offers an accredited professional degree, the master of landscape architecture (M.L.A.), and an academic degree, the master of science (M.S.) in landscape architecture. The department also offers a dual master’s degree program with urban and regional planning (M.L.A./M.U.R.P.) in cooperation with the Humphrey Institute of Public Affairs.

**Prerequisites for 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, and a résumé. All of these additional items should be submitted by uploading them to the Graduate School’s electronic application system. International students must submit scores from the TOEFL, IELTS or the MELAB. The department also requires M.S. applicants to submit GRE scores. An 8.5” x 11” portfolio containing examples of creative work is strongly recommended for all M.S. applications. Portfolios should be sent directly to the department. Applicants for the M.S. must also have an agreement from a specific member of the graduate faculty in landscape architecture to act as principal adviser in the student’s area of study. Prospective students are encouraged to contact the director of graduate studies to discuss areas of focus and potential advisers. Students may be admitted to the M.S. program for any academic term.

More detailed information about the above requirements and procedures, including downloadable checklists in PDF format, can be found at the department Web site, http://landarch.cdes.umn.edu/prog/admissions.php.

**Courses**—Refer to Landscape Architecture (LA) in the course section of this catalog.
M.L.A. Plan B, Coursework Only Degree Requirements
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 important.

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.

Language Requirements—None.
Final Exam—The final examination is a design portfolio.

M.L.A./M.U.R.P. Plan B Dual Degree Requirements
This option allows students to earn both a master of landscape architecture (M.L.A.) and a master of urban and regional planning (M.U.R.P.) by careful coordination of coursework. Typically, students will be able to achieve both professional degrees in three-and-a-half to four years by cross-counting specified courses. The specific M.U.R.P. specializations for which this option is most appropriate are land use/urban design, housing and community development, and environmental planning.

Students may elect the Plan A option as part of the dual degree, but doing so will require slightly more time to complete both degrees. Consult with the director of graduate studies for details.

To meet LAAB standards, 88 graduate credits are required to earn an M.L.A., including 36 credits of landscape architecture studio courses, 3 credits of research issues and methods, 9 elective credits (which may be chosen from a list of selected M.U.R.P. program courses), and 40 credits of history, theory, and technology courses. A maximum of 18 credits taken to fulfill M.U.R.P. degree requirements may also be counted toward fulfillment of the M.L.A. degree requirements. Refer to the urban and regional planning program for M.U.R.P. degree requirements.

M.S. Plan A Degree Requirements
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.

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.

Language Requirements—None.
Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—Minor requirements are determined in consultation with the director of graduate studies.

Latin
See Classical and Near Eastern Studies.

Law
Minor Only
Contact Information—Brett McDonnell, Associate Dean, Law School, University of Minnesota, 424 Law Building, 229 19th Avenue South, Minneapolis, MN 55455 (612-625-1373; fax 612-626-2011; bhm@umn.edu; www.law.umn.edu).
For latest faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
David Weissbrodt, M

Professor
Edward S. Adams, M
Stephen F. Befort, M
Brian H. Bix, M
Ann Burkhart, M
Dale Carpenter, M
Carol Chomsky, M
Laura Cooper, M
Thomas Cotter, M
Barry C. Feld, M
Richard S. Frase, M
Thomas P. Gallanis, M
Daniel J. Gifford, M
Michele B. Goodwin, M
Oren Gross, M
Jill Hasday, M
Claire Hill, M
Joan S. Howland, M
Brad Karkkainen, M
John H. Matheson, M
Brett McDonnell, M
Fred L. Morrison, M
Fionnuala Ni Aolain, M
Ruth L. Okediji, M
Richard W. Painter, M
Francesco Parisi, M
Kevin Reitz, M
Gregory Shaffer, M
Robert Stein, M
E. Thomas Sullivan, M
Michael Tonry, M
Barbara Y. Welke, M
David Wippman, M
Susan Wolf, M
Judith T. Younger, M

Associate Professor
Susanna L. Blumenthal, AM
Allan Erbsen, AM
Kristin E. Hickman, AM
Heidi Kitrosser, AM
Alexandra Klass, AM
William McGeveran AM
Myron W. Orfield, AM
Daniel Schwarz, AM
David Stras, AM

Clinical Professor
Mary Alton, AM
Brad Clary, AM
Nancy Cook, AM
Prentiss Cox, AM
Stephen Meili, AM
Perry Moriearty, AM
Jean Sanderson, AM
Kathryn J. Sedo, AM
Stephen M. Simon, AM
Lisa Stratton, AM
Carl M. Warren, AM

Curriculum—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.

Prerequisites for Admission—Admission to the law graduate minor is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. Enrollment in Law School courses is on a space-available basis, with preference given to law-degree-seeking candidates.

Courses—Contact the minor program office for information on relevant coursework.

Minor Only Requirements
A master’s minor requires at least 6 graduate credits; a doctoral minor requires at least 12 graduate credits.
Learning Technologies
See Education, Curriculum, and Instruction.

Liberal Studies

Contact Information—College of Continuing Education, University of Minnesota, 202 Westbrook Hall, 77 Pleasant Street S.E., Minneapolis, MN 55455 (612-626-6724; fax 612-626-0077; mls@cce.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Fred Amram, General College, M2
Rose Brewer, Studies in Africa and the African Diaspora, M2
Daniel Detzner, Postsecondary Teaching and Learning, M2
Judith A. Martin, Geography, M2
Randy Moore, Postsecondary Teaching and Learning, M2
David Schuelke, (emeritus), Writing Studies, M2
Karen Seashore, Education and Human Development, M2
John Wallace, Philosophy, M2
Jack Zipes, Germanic Studies, M2

Clinical Professor
William Dikel, Psychiatry, M2
Associate Professor
Barbara Crosby, Public Affairs and Public Policy, M2
Arthur M. Harkins, Educational Policy and Administration, M2
John Logie, Writing Studies, M2
Bernadette Longo, Writing Studies, M2
Carol A. Miller, American Studies, M2
Roger Miller, Geography, M2
Lisa Norling, History, M2
Gail Peterson, M2
Jacquelyn N. Zita, Feminist Studies, M2

Other
Gerald Allan, M2
Michael M. Andregg, M2
Donna Bennett, M2
Kathleen Bernard, M2
Kurt Burch, M2
Jennifer Caruso, M2
Patricia Casello, M2
Stephen L. Daniel, M2
Steven L. Derfler, M2
Sarah Dennison, M2
Margot Galt, M2
Anita Gonzalez, M2
Donna Mae J. Gustafson, M2
Janet Hagberg, M2
John Hasselberg, M2
Janet Hively, M2
David Husom, M2
Jeremy F. Iggers, M2
Jack Johnson, M2
Judith Katz, M2
Teresa Ann Kupin Escobar, M2
Roseann Lloyd, M2
John Moravec, M2
Kathleen O’Donovan, M2
Nicholas Pease, M2
Pary Pezechkian-Weinberg, M2
David A. Shupe, M2
Bonnie Shock, M2
John Tomsyck, M2
Roslye Ultan, M2
Howard Vogel, M2
Sherry Wagner-Henry, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The graduate major in liberal studies offers an interdisciplinary curriculum that includes an introductory seminar, a choice of liberal studies seminars, a choice of electives from disciplines throughout the Graduate School, and a final project seminar. Although seminars for the 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.

Prerequisites for Admission—A bachelor’s degree is required. The faculty committee reviewing each application looks for indications that the student can succeed in graduate study, there is a good “fit” between the M.L.S. program and the student’s stated educational objectives, and 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—A statement of purpose, letters of support, all undergraduate transcripts, transcripts from any postbaccalaureate degree or coursework, and examples of written work should accompany the application. GRE scores may also be submitted, but are not required. International students are required to achieve a passing score on the TOEFL.

Courses—Refer to Liberal Studies (LS) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Contact the M.L.S. office prior to taking a 4xxx course.

M.L.S. Degree Requirements

The M.L.S. is a specific variation of the master’s Plan B option. The program requires at least 30 credits. Introduction to Interdisciplinary Inquiry (3 cr) and the Final Project (3 cr) seminars are required. Students must take at least 9 credits of liberal studies seminars. The remaining 15 credits are composed of electives from disciplines throughout the Graduate School, or directed study, directed research, advanced interdisciplinary inquiry, online coursework, or additional liberal studies seminars. Courses are selected with the help of the student’s graduate faculty adviser.

Language Requirements—None.

Final Exam—The final project must be prepared as part of 8002 and must be approved by at least two faculty members and the director of graduate studies.

Linguistics

Contact Information—Director of Graduate Studies, Linguistics, University of Minnesota, 215 Nolte Center, 315 Pillsbury Drive, S.E., Minneapolis, MN 55455 (612-624-3331; fax 612-624-4579; ILES@umn.edu; www.linguistics.umn.edu/grad/index.htm).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Genevieve J. Escure, English, AM2
Jeanette K. Gundel, SM
Michael B. Kac, Philosophy, SM
Carol A. Klec, Spanish and Portuguese Studies, AM2
Michael P. Maratos, Child Development, AM2
John D. Nichols, American Indian Studies, AM2
Maria D. Sera, Child Development, AM2
Amy L. Sheldon, Communication Studies, SM
Nancy J. Stenson, SM
Polly E. Sztatrowski, AM2

Associate Professor
Bruce T. Downing, (emeritus), SM
Timothy Face, AM
Charles R. Fletcher, Psychology, AM2
Betsy K. Kerr, French and Italian, AM2
Benjamin Munson, AM
Hooi Ling Soh, SM

Assistant Professor
Jean-Phillipe Marcotte, AM2
Marianne Milligan, AM2
Serguei V. Pakhomov, AM

Lecturer
Daniel Karvonen, AM2

Among with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
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 a completed Graduate School application, scores from the GRE, three letters of recommendation, and a supplementary questionnaire detailing background, interests, and accomplishments. Applicants wishing to be considered for financial support should apply no later than January 15 of the preceding academic year. Entry is usually in fall semester but may be permitted in other semesters in exceptional cases.

Courses—Refer to Linguistics (LING) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses in degree programs is subject to adviser and director of graduate studies approval. Students from other majors may include such courses subject to their own program’s approval.

M.A. Degree Requirements

The requirements for the M.A. degree (both Plan A and Plan B) include eight required courses in the major: five courses covering core areas of language structure (phonology, syntax, semantics/pragmatics); one course in field methods; one research paper course; and one elective. The total number of credits, assuming no prior coursework in linguistics, is 32 (26 credits in the major and 6 credits in related fields). Subject to approval by the director of graduate studies, students who have already taken required courses or their equivalents as undergraduates (or as graduates in another program), may be able to substitute electives in the major or in related fields, in accordance with M.A. requirements set by the Graduate School. In addition to course requirements, Plan A requires a thesis and thesis credits; Plan B requires a Plan B paper.

Language Requirements—The M.A. program requires knowledge of one language not native to the student. Mechanisms for demonstrating knowledge are described in the program’s Graduate Student Handbook.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—Courses required for a master’s minor in linguistics are LING 5001 (4 cr), 4002 (3 cr), and either 5201 (3 cr) or 5302 (4 cr). Students who have had these courses or their equivalents as undergraduates can substitute other linguistics courses. The M.A. minor requires at least 9 credits.

Ph.D. Degree Requirements

The Ph.D. program focuses on theoretical issues in core areas of language structure (phonology, syntax, semantics/pragmatics), language processing (cognitive processes that underlie language use), and language acquisition. The program especially emphasizes research that integrates core areas of theoretical linguistics with language processing or acquisition.

For the Ph.D., no minimum number of credits is required besides the 12 credits in related fields and 24 thesis credits. However, all Ph.D. students are expected to have completed M.A. course requirements (30 credits or less, depending on prior coursework in linguistics), a second-semester course in field methods (3 cr), and an individualized plan of study (including at least three 8xxx courses) to be determined in consultation with the student’s committee. Upon completion of required coursework, students must pass a preliminary written exam in phonology, syntax, and their primary and secondary areas of concentration. Two research papers judged to be of near publishable quality by the student’s committee can be substituted for exam questions in any of these areas. 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.

Language Requirements—The Ph.D. degree requires knowledge of two languages not native to the student. Mechanisms for demonstrating such knowledge are described in the program’s Graduate Student Handbook.

Minor Requirements for Students Majoring in Other Fields—The doctoral minor requires at least 15 credits (five courses). Students who have had no prior coursework in linguistics must take six courses. Students who have had required courses in related fields and 24 thesis credits. Students who have had these courses or their equivalents as undergraduates do not have to substitute another course.

Literacy and Rhetorical Studies

Minor Only

Contact Information—Center for Writing, University of Minnesota, 10 Nicholson Hall, 216 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-626-7583; fax 612-626-7580; writing@umn.edu; www.writing.umn.edu/lrs/index.htm).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Richard W. Beach, Curriculum and Instruction, M
Carol Berkenkotter, Writing Studies, M
Karyn K. Campbell, Communication Studies, M
Andrew D. Cohen, English as a Second Language, M
Hazel Dicken-Garcia, Journalism and Mass Communication, M
Edward M. Griffin, English, M
Alan G. Gross, Communication Studies, M
Laura J. Gurak, Writing Studies, M
Michael Hancher, English, M
Cynthia Lewis, Curriculum and Instruction, M
Donald Ross Jr., Writing Studies, M
Edward Schiappa, Communication Studies, M
Amy L. Sheldon, Communication Studies, M
Geoffrey Sirc, English, M
Thom Swiss, Curriculum and Instruction, M
Elaine E. Tarone, English as a Second Language, M
Arthur E. Walzer, Communication Studies, M

Associate Professor

Lee-Ann K. Breuch, Writing Studies, M
Patrick Bruch, Writing Studies, M
Richard J. Graff, Writing Studies, M
Amy M. Lee, Postsecondary Teaching and Learning, M
John Logie, Writing Studies, M
Rosemarie J. Park, Work and Human Resource Education, M
Thomas J. Reynolds, Writing Studies, M
Diane J. Tedick, Curriculum and Instruction, M
Kirt H. Wilson, Communication Studies, M

Other

Pamela Flash, Center for Writing, AM
Kirsten Jamsen, Center for Writing, AM

Curriculum—The minor in literacy and rhetorical studies (LRS) was created to provide a forum for students and faculty interested in various facets of writing and communication. By crafting an individualized program of study including literacy theory and practice, research methods, and historical inquiry, students can complement their disciplinary degree and thereby open up new perspectives for their teaching and research. Students develop an interdisciplinary program of study in consultation with their major adviser, the director of graduate studies in their major, and the director of graduate studies in LRS.
Prerequisites for Admission—Admission is contingent upon enrollment in good standing in a relevant doctoral or master’s program within the Graduate School of the University.

Special Application Requirements—Entrance to the minor is granted by permission of the director of graduate studies in LRS and the faculty selection committee. Application materials include a completed program application form (available online at www.writing.umn.edu/lrs/admission.htm), statement of purpose, curriculum vitae, relevant postsecondary transcripts, and two letters of recommendation. Applications are reviewed on a rolling basis.

Courses—Contact the minor program office for information on relevant coursework pertaining to the program, or view recent course recommendations at www.writing.umn.edu/lrs/courses.htm.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted with approval from the director of graduate studies.

Minor Only Requirements
A master’s minor requires three graduate courses or seminars (9 credits minimum), including one course from each of the following categories: 1) literacy theory or practice, including pedagogy; 2) research methods and practices in literacy or rhetorical studies; 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.

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 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.

Language Requirements—None.

Literacy Education
See Education, Curriculum, and Instruction.

Luso-Brazilian Literature
See Hispanic and Lusophone Literatures, Cultures, and Linguistics.

Lusophone Literatures and Cultures
See Hispanic and Lusophone Literatures, Cultures, and Linguistics.

Management of Technology
Contact Information—Management of Technology Graduate Program, Center for the Development of Technological Leadership, University of Minnesota, 510 West Bank Office Building, 1300 South Second Street, Minneapolis, MN 55454 (612-624-5747; fax 612-624-7510; MOT@cdtl.umn.edu; www.cdtl.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Massoud Amin, Electrical and Computer Engineering, M2
Norman L. Chervany, Information and Decision Sciences, M2
William K. Durfee, Mechanical Engineering, M2
Arthur V. Hill, Operations and Management Science, M2
George John, Marketing and Logistics Management, M2
Edward J. Joyce, Accounting and Business Law, M2
Kenneth H. Keller, Public Affairs, M2
Francis A. Kulacki, Mechanical Engineering, M2
Ian H. Maitland, Strategic Management and Organization, M2
Alfred Marcus, Strategic Management and Organization, M2
Mary Nichols, Strategic Management and Organization, AM2
Dennis L. Polla, Electrical Engineering, M2
Kenneth J. Roering, Marketing and Logistics Management, M2
Kanti Kingshuk Sinha, Operations and Management Science, M2
Karl A. Smith, Civil Engineering, M2

Associate Professor
Douglas Ernie, Electrical and Computer Engineering, M2
Kevin W. Linderman, Operations and Management Science, M2

Assistant Professor
Frederick J. Riggins, Information and Decision Sciences, M2

Other
Lockwood Carlson, Management of Technology, M2

Dileep R. Rao, Strategic Management and Organization, M2
Frederick J. Riggins, Center for Development of Technological Leadership, M2
Tarun Soni, Center for Development of Technological Leadership, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The master of science in the management of technology (M.S.MOT.) program is administered by the Institute of Technology’s Center for the Development of Technological Leadership. 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 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.

Prerequisites for Admission—A bachelor’s degree in an engineering, science, or other technology related field from an accredited program. Applicants should also have completed coursework (or show proficiency) in economics, mathematical modeling, statistics, and computer literacy.

Special Application Requirements—At least five 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 résumé, and a statement of purpose. GRE or Graduate Management Admission Test (GMAT) scores are not generally required. The professional track...
For latest graduate faculty listings, see grad.umn.edu/faculty_rosters/faculty.html.

Assistant Professor
Associate Professor
—Graduate Student
Contact Information
See Industrial and Systems Engineering.
Systems Engineering
Manufacturing and
—None.
Language Requirements
hours of effort.
report for the capstone project (MOT 8234),
The M.S.MOT. requires 36 credits. In
M.S.MOT. Plan B Degree
Requirements
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), which consists of an independent, original investigation requiring between 110 and 130 hours of effort.
Language Requirements—None.
Final Exam—An oral presentation of the capstone project is required.

Manufacturing and Systems Engineering
See Industrial and Systems Engineering.

Mass Communication
Contact Information—Graduate Student Services, School of Journalism and Mass Communication (SJMC), University of Minnesota, 110 Murphy Hall, 206 Church Street S.E., Minneapolis, MN 55455 (612-625-4054, fax 612-626-8251; sjmcgrad@tc.umn.edu; www.sjmc.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Tsao-Kuo Chang, SM
John Eighmey, SM
Ronald J. Faber, SM
David P. Fan, Genetics and Cell Biology, ASM
John R. Finnigan Jr., ASM
Kathleen A. Hansen, SM
Jane E. Kirtley, SM
Mark Snyder, Psychology, ASM
Daniel J. Sullivan, SM
Daniel B. Wackman, SM

Associate Professor
Kenneth O. Doyle, SM
Mark H. Pedelty, SM
Donna B. Schwartz, SM
Gary Schwitzer, M2
Brian Southwell, SM
Catherine Squires, SM
Albert R. Tims Jr., SM
Thomas Wolfe, History, AM2

Assistant Professor
Kathryn R. Forde, M2
Jisu Huh, SM
Amy Sanders, M2
Shayla Thiel-Stern, M2
Marco Yzer, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The M.A. 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 M.A. program is not designed to provide professional skills training in journalism.

Individuals who have extensive professional experience in mass communication or a B.A. degree in journalism are encouraged to enter the M.A. program. Individuals with strong social science or liberal arts backgrounds in areas such as political science, psychology, sociology, history, philosophy, and English also are encouraged to apply.

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, and history; international communication; and media management. All programs are suffused with the study of new media communication.

Prerequisites for Admission—The minimum requirement for admission is a B.A. degree or equivalent.

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; and scores from the General Test of the GRE. 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 30.

The mass communication M.A. and Ph.D. programs include the Minnesota Journalism Center, the Silha Center for the Study of Media Ethics and Law, the Institute for New Media Studies, the Digital Information Resource Center (which houses the Eric Sevareid Library), and the SJMC Research Division.

Courses—Refer to Mass Communication (JOUR) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to this program.

M.A. Plan A Degree
Requirements
A minimum of 27 course credits and 10 thesis credits are required. Coursework must include 12 credits in required core courses and 15 other credits (6–9 credits in other journalism and mass communication seminars or courses, and 6–9 credits in other departments). All coursework must be taken A-F.

Language Requirements—No foreign language is required.

Final Exam—The final exam is oral.

Minor Requirements for Students
Majoring in Other Fields—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.

Ph.D. Degree Requirements
A minimum of 54 course credits and 24 thesis credits are required. Coursework must include 12 credits in required core courses, and at least 42 other graduate credits. Of these credits, at least 21 credits must come from SJMC courses and at least 18 credits from outside the SJMC. All courses included on the Ph.D. Degree Program Form must be graduate level (5xxx or 8xxx) and taken A-F.

Language Requirements—No foreign language is required.

Minor Requirements for Students
Majoring in Other Fields—A Ph.D. minor program consists of a minimum of 14 credits in a coherent disciplinary area. Students completing a minor in mass communication are required to take a preliminary written exam covering their coursework.
Materials Science and Engineering
See Chemical Engineering and Materials Science and Engineering.

Mathematics
Contact Information—School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church Street S.E., Minneapolis, MN 55455 (612-624-6702; gradprog@math.umn.edu; www.math.umn.edu/grad).
For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Scott Robert Adams, SM
Greg William Anderson, SM
Douglas Norman Arnold, SM
John Robert Baxter, SM
Sergey Germanovich Bobkov, SM
Maury Daniel Bramson, SM
Carne Calderer, SM
Bernardo Cockburn, SM
Mark F. Feshbach, SM
Bert E. Fristedt, SM
Paul B. Garrett, SM
Lawrence F. Gray, SM
Robert D. Gulliver, SM
Dennis A. Hejhal, SM
Naresh C. Jain, SM
Dihua Jiang, SM
Donald William Kahn, SM
Markus Keel, SM
Harvey Bayard Keynes, SM
Nicolas Vladimer Krylov, SM
Tian-Jun Li, SM
Walter Littman, SM
Mitchell B. Luskin, SM
Gennady Lyubenzik, SM
Albert Marden, SM
Richard P. McGehee, SM
William Messing, SM
Norman G. Meyers, SM
Willard Miller, SM
Richard B. Moeckel, SM
Claudia Neuhausser, Ecology, Evolution, and Behavior, SM
Wei-Ming Ni, SM
Andrew Odlyzko, SM
Peter John Olver, SM
Hans George Othmer, SM
Peter Polacki, SM
Karel L. Prkryl, SM
Victor Schorr Reiner, SM
Fernando Leiva Reitich, SM
Peter A. Rejto, SM
Joel L. Roberts, SM
Mikhail V. Safonov, SM
Fadil Santosa, SM
Arnd Scheel, SM
George R. Sell, SM
Steven I. Sperber, SM
Dennis W. Stanton, SM
Vladimir Sverak, SM
Alexander A. Voronov, SM
Jiapeng Wang, SM
Peter Joseph Webb, SM
Dennis E. White, SM
Ofer Zeitouni, SM

Associate Professor
Ioanu Ciocan-Fontanine, SM
Jack Frederi Conn, SM
David L. Frank, SM
Ezra Miller, SM
Chester L. Miracle, SM
Wayne H. Richter, SM

Assistant Professor
Adrian Diaconu, SM
Tayler Lawson, SM
Gilad Lerman, SM
Marta Lewicka, SM
Yoichiro Mori, SM
Duane N. Nykamp, SM
Daniel Spirn, SM
Panos Stinis, SM
Carlos Tolmasky, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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. The M.S. Plan A requires an emphasis in applied and industrial mathematics. The M.S. Plan B includes an emphasis in mathematics education and an emphasis in actuarial science industrial mathematics. See also Control Science and Dynamical Systems, and Fluid Mechanics in this catalog for Ph.D. programs that rely heavily on mathematics.

Prerequisites for Admission—A solid background in undergraduate-level mathematics is expected. For students whose goal is the Ph.D. degree, background should include full-year courses in analysis, abstract algebra, and a semester of topology (roughly equivalent to MATH 5615H–5616H, 5285H–5286H, and 5345).

Special Application Requirements—All applicants are expected to submit three letters of recommendation, a score from the GRE Subject (Advanced) Test in mathematics, and a supplementary application form available from the mathematics department. Applicants who desire financial assistance should submit their applications, including the departmental form, GRE scores, and letters of recommendation, to the director of graduate studies no later than January 15 to be considered for a fellowship, and no later than February 15 to be considered for a teaching assistantship. Students normally are admitted fall semester only.

Courses—Refer to Mathematics (MATH) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—In exceptional cases, 4xxx courses may be permitted as part of degree programs subject to director of graduate studies approval.

M.S. Degree Requirements
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. For more information, see the Graduate Studies in Mathematics brochure.

The M.S. is offered under Plan A and Plan B. Plan A requires at least 20 course credits and 10 thesis credits. Plan B allows more breadth; students complete at least 30 course credits, half of which may be in areas outside of mathematics.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—The master’s minor requires a two-semester 8xxx or 5xxx sequence.

Ph.D. Degree Requirements
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.

The Ph.D. preliminary written examination, given twice each year, covers real analysis, complex analysis, algebra, and manifolds and topology. Students are expected pass the exam by the end of their second year. After passing the exam and completing the coursework, students may take the preliminary oral exam, which they are expected pass by the end of their fourth year. If a supporting program is chosen, it may consist partly or entirely of mathematics courses.

For more information, see the program’s Web site at www.math.umn.edu/grad.
Language Requirements—Two foreign languages are required from among the following: French, German, Russian, and Italian.

Minor Requirements for Students Majoring in Other Fields—Two year-long sequences of 5xxx or 8xxx courses. Consult the director of graduate studies in mathematics.

Mathematics Education
See Education, Curriculum, and Instruction.

Mechanical Engineering
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; gradinfo@me.umn.edu; www.me.umn.edu). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Richard J. Goldstein, SM
Benjamin Y. H. Liu, (emeritus), ASM

Professor
Roger E. Arndt, Civil Engineering, ASM
Victor H. Barocas, Biomedical Engineering, ASM
Saifallah Benjaafar, SM
Mrinal Bhattacharya, Biosystems and Agricultural Engineering, ASM
John C. Bischof, SM
Thomas R. Chase, SM
Jane H. Davidson, SM
Max Donath, SM
William K. Durfee, SM
Arthur G. Erdman, SM
Edward A. Fletcher, (emeritus), ASM
Steven L. Girshick, SM
Caroline C. Hayes, SM
Joachim V. R. Heberlein, SM
Warren E. Ibele, (emeritus), ASM
David B. Kittelson, SM
Barney E. Klamecki, SM
Uwe R. Kortshagen, SM
Thomas H. Kuehn, SM
Francis A. Kulacki, SM
Jack L. Lewis, Orthopaedic Surgery, ASM
Perry Y. Li, SM
Susan C. Mantell, SM
Virgil A. Marple, SM
Peter H. McMurry, SM
Katsuhiko Ogata, (emeritus), ASM
Emil Pfender, (emeritus), ASM
David Y. H. Pui, SM
Rajesh Rajamani, SM
Subbiah Ramalingam, SM
Sridharan Ramaswamy, Bioproducts and Biosystems Engineering, ASM
James W. Ramsey, SM
Jeffrey T. Roberts, Chemistry, ASM
Terrence W. Simon, SM
Fotis Sotiropoulos, ASM
Ephraim M. Sparrow, SM
Patrick J. Starr, SM
Kim A. Stelson, SM
Paul J. Strykowski, SM
Kumar K. Tamma, SM
Robert T. Tranquillo, Biomedical Engineering, ASM
Vaughn R. Voller, Civil Engineering, ASM

Adjunct Professor
Paul laizzo, ASM

Associate Professor
Jennifer Alexander, AM
Joan Bechtold, Orthopaedic Surgery, ASM
Tianhong Cui, SM
Sean C. Garrick, SM
Allison Hubel, SM
Heinrich O. Jacobs, Electrical and Computer Engineering, ASM

Assistant Professor
Alptekin Aksan, SM
Traian Dumitrica, SM
Julian Marshall, ASM
Zongxuan Sun, SM

Associate Program Director
Craig R. Shankwitz, AM

Research Associate
Michael Manser, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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.

Prerequisites for Admission—An undergraduate degree in engineering or in a closely related scientific field such as physics, chemistry, or mathematics is required. Unusually well-qualified students may be admitted directly to the Ph.D. program with a baccalaureate degree.

Special Application Requirements—GRE General Test scores are required for admission and also are used in evaluating requests for financial aid. For the Ph.D. program, three letters of recommendation from faculty members at the previous educational institution are required. Students are admitted in the fall and spring semesters only, the departmental deadlines for which are December 15 and October 15, respectively, of the previous year.

Courses—Refer to Mechanical Engineering (ME) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Selected 4xxx courses from other departments may be applied toward the degree in consultation with the student’s adviser and the director of graduate studies. No 4xxx ME courses may be applied toward the degree.

M.S.M.E. Degree Requirements
The M.S.M.E. requires at least 30 credits, including at least 14 course credits in the major and 6 course credits in a minor or related field. At least 1 credit of graduate seminar and one mathematics/numerical methods course from an approved list must be included in the 30 credits. Also, of the 30 credits, Plan A (thesis) students must enroll for 10 thesis credits. For Plan B (without thesis), students must either take the Plan B course, ME 8951/8953, or must complete one to three Plan B papers, determined in consultation with the adviser.

Language Requirements—None.
Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—At least 6 credits in mechanical engineering are required for a master’s minor.

Ph.D. Degree Requirements
The Ph.D. 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, along with at least one mathematical/numerical methods course from an approved list; 24 thesis credits are also required.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—At least 12 credits in mechanical engineering is required for a doctoral minor.
Mechanics
See Aerospace Engineering and Mechanics.

Medical Physics
See Biophysical Sciences and Medical Physics.

Medicinal Chemistry
Contact Information—Department of Medicinal Chemistry, University of Minnesota, 8-101 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-624-9919; fax 612-624-0139; medchem@umn.edu; www.pharmacy.umn.edu/medchem).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Yusuf J. Abul-Hajj, SM
David M. Ferguson, SM
Gunda I. Georg, SM
Patrick R. Henna, SM
Stephen S. Hecht, Laboratory Medicine and Pathology, SM
Thomas R. Hoye, Chemistry, A SM
Rodney L. Johnson, SM
Lisa A. Peterson, Environmental and Occupational Health, SM
Philip S. Portoghese, SM
Rory P. Remmel, SM
W. Thomas Shier, SM
Marilyn K. Speedie, AM
Robert Vince, SM
Carston R. Wagner, SM
Associate Professor
Courtney Aldrich, ASM
Mark D. Distefano, Chemistry, ASM
Robert A. Fecik, SM
Natalia Y. Tretyakova, SM

Assistant Professor
Elizabeth A. Amin, SM
Shana J. Sturla, SM
Chengguo Xing, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The 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.

Prerequisites for 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 also is a prerequisite, but under certain circumstances such coursework may be taken during the first year. Students usually are admitted fall semester only and admissions are for the Ph.D. program 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 mid January to ensure priority consideration for fellowship, teaching, and research assistantships awarded for the next academic year.

Courses—Refer to Medicinal Chemistry (MEDC) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—With the exception of BIOC 4331, use of 4xxx courses is not permitted toward degree requirements.

M.S. Plan A Degree Requirements
The medicinal chemistry program does not offer admission for a master’s degree. Students must complete a core curriculum of advanced courses in organic chemistry (4 cr) and medicinal chemistry (10 cr), and 6 credits in a minor or related field.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A minimum of 6 credits is required for a master’s minor.

Ph.D. Degree Requirements
All students must complete a core curriculum of advanced courses in organic chemistry (7 cr), biochemistry (8 cr), and medicinal chemistry (12 cr). Students must also participate in the department seminar curriculum, successfully complete a cumulative exam requirement that serves as the preliminary written exam, and prepare and defend an original research proposal which serves as the preliminary oral exam.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 credits is required for the doctoral minor, including introductory courses (MEDC 5700 and 5710), advanced medicinal chemistry courses, and other courses in the medicinal chemistry core curriculum.

Medieval Studies
Minor Only

Contact Information—Center for Medieval Studies, University of Minnesota, 302 Nolte Center, 315 Pillsbury Dr. S.E., Minneapolis, MN 55455 (612-626-0805; fax 612-626-7735; cmedst@umn.edu; www.cmedst.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
F. R. P. Akehurst, French and Italian, M
Bernard S. Bachrach, History, M
Mary Louise Fellows, Law, M
Evelyn S. Firchow, German, Scandinavian, and Dutch, M
Thomas Gallanis, Law, M
Ruth Mazo Karas, History, M
Michal A. Kobialka, Theatre Arts, M
Anatoly Liberman, German, Scandinavian, and Dutch, M
Nabil I. Matar, English, M
Sheila J. McNally, Art History/Classical and Near Eastern Studies, M
Susan J. Noakes, French and Italian, M
James A. Parente Jr., German, Scandinavian, and Dutch, M
William D. Phillips Jr., History, M
Kathryn L. Reyerson, History, M
John A. Watkins, English, M
Barbara Weissberger, (emeritus), Spanish, M
Peter Wells, Anthropology, M

Associate Professor
Janet Erickson, English, Morris, M
Lianna Farber, English, M
Kaaren E. Grimstad, German, Scandinavian, and Dutch, M
Nita Krevans, Classical and Near Eastern Studies, M
Rebecca L. Krug, English, M
Michael T. Lower, History, M
Oliver Nicholson, Classical and Near Eastern Studies, M
Andrew Scheil, English, M
Rosemary Stanfield-Johnson, History, Duluth, M
John W. Steyaert, Art History, M
Krista Twu, English, Duluth, M
Ray M. Wakefield, German, Scandinavian, and Dutch, M

Assistant Professor
Mary F. Brown, French and Italian, M
Jennifer Deane, History, Morris, M
Gabriela Il ничти Currie, Music, M
James Schryver, Art History, Morris, M
Jole R. Shackelford, History of Medicine, M
**Curriculum**—The medieval studies minor is available to master’s (M.A. and M.F.A.) 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.

**Prerequisites for Admission**—Admission to a medieval studies graduate minor is contingent upon prior admission to a master’s or doctoral degree-granting program in the Graduate School.

**Courses**—Refer to Medieval Studies (MEST) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Use of 4xxx courses toward degree requirements is permitted based on approval by the director of graduate study.

**Minor Only Requirements**

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.

**Research Opportunities**—The Center for Medieval Studies facilitates interdisciplinary collaboration among students and faculty in all areas of medieval studies. Research groups include the Medieval Research Group, the Old Norse Reading Group, and the Conlegium Gaviarium. Other opportunities for research collaboration exist through the Minnesota Manuscript Research Laboratory, and through affiliations with the Hill Museum and Manuscript Library and the Newberry Library Consortium.

**Microbial Ecology**

**Minor Only**

**Contact Information**—Michael Sadowsky, Microbial Ecology Minor Program, University of Minnesota, 439 Borlaug Hall, 991 Upper Buford Circle, Saint Paul, MN 55105 (612-624-2706; micecol@umn.edu; or sadowsky@umn.edu).

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.grad.umn.edu/faculty_rosters/faculty.html).

**Regents Professor**

G. David Tilman, Ecology, Evolution, and Behavior, M

**Professor**

Iris D. Charvat, Plant Biology, M

Randall E. Hicks, Biology, Duluth, M

Linda L. Kinkel, Plant Pathology, M

Timothy J. Kurtti, Entomology, M

David J. McLoughlin, Plant Biology, M

Michael J. Sadowsky, Soil, Water, and Climate, M

Lawrence P. Wackett, Biochemistry, M

**Curriculum**—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 to 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.

**Minor Only Requirements**

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 in microbial ecology.

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, 8542, 8551, EEB 4601, 4609, PLPA 8102, 8103, SOIL 5515, 5611.

**Microbial Engineering**

**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; micecol@umn.edu; [www.bti.umn.edu/MicE](http://www.bti.umn.edu/MicE)).

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.grad.umn.edu/faculty_rosters/faculty.html).

**Professor**

Robert J. Brooker, Genetics and Cell Biology, M2

Paul P. Cleary, Microbiology, M2

Lynda B. Ellis, Laboratory Medicine and Pathology, M2

Wei-Shou Hu, Chemical Engineering and Materials Science, M2

Romas Kazlauskas, Biochemistry, M2
background in a field such as basic chemical engineering, biology, physical chemistry, or genetics. Background deficiencies can be made up during the first year of graduate work. Most students enter the program with a GPA of 3.00 or higher.

Special Application Requirements—Three letters of recommendation, scores from the General Test of the GRE, the TOEFL score for international applicants, transcripts, Curriculum Vitae and an autobiographical statement including occupational goals must be submitted to the director of graduate studies. Applications are accepted for fall semester only. To receive full consideration for financial aid, students must apply for fall semester admission by March 1.

Courses—Refer to Microbial Engineering (MICE) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—A limited number of 4xxx courses are permitted toward degree requirements based on director of graduate studies approval.

M.S. Degree Requirements

The M.S. requires 32 credits. Plan A students carry out a research project (10 cr) resulting in a M.S. thesis presented to the graduate faculty. Plan B students complete a summer (about 2 ½ months) preceptorship (4 cr) 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 5001 Material and Energy Balances, and 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 cr) from specified fields, including biochemistry, food science, pharmacognosy, 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.

Language Requirements—Students must demonstrate competence in a computer programming language.

Final Exam—An oral examination is required for both Plan A and Plan B students. The thesis or Plan B project paper will be presented to the examining committee for approval two weeks prior to the oral examination.

Minor Requirements for Students Majoring in Other Fields—A minor in microbial engineering is offered at the doctoral level only. Students must complete at least 12 credits, selected in consultation with the director of graduate studies for microbial engineering.

Microbiology, Immunology, and Cancer Biology

Contact Information—Microbiology, Immunology, and Cancer Biology Program, University of Minnesota, MMC 196, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-624-5947; fax 612-626-0623; micab@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor

Bruce R. Blazar, Pediatric Hematology/Oncology/Bone Marrow Transplantation, SM
Ashley T. Haase, Microbiology, SM

Professor

Khalid I. Ahmed, Laboratory Medicine and Pathology SM
Dwight L. Anderson, Diagnostic and Biological Sciences, SM (emeritus)
Judith G. Berman, Genetics, Cell Biology and Development, SM
Peter B. Bitterman, Medicine, SM
Paul P. Cleary, Microbiology, SM
Denis R. Clohisy, Orthopaedic Surgery, SM
Anath Das, Biochemistry, Molecular Biology, and Biophysics, SM
Gary M. Dunny, Microbiology, SM
Lynda B. Ellis, Laboratory Medicine and Pathology, SM
Dale S. Gregerson, Ophthalmology, SM
Kristin A. Hoggquist, Laboratory Medicine and Pathology, SM
Stephen C. Jameson, Laboratory Medicine and Pathology, SM
Ronald R. Jemerson, Microbiology, SM
Marc K. Jenkins, Microbiology, SM
David A. Largaespada, Genetics, Cell Biology and Development, SM
Tucker W. LeBien, Laboratory Medicine and Pathology, SM
Walter C. Low, Neurosurgery, SM
Twin Cities Degree Programs and Faculty

Louis M. Mansky, Diagnostic and Biological Sciences, SM
James B. McCarthy, Laboratory Medicine and Pathology, SM
R. Scott McVor, Laboratory Medicine and Pathology, SM
Matthew F. Mescher, Laboratory Medicine and Pathology, SM
Jeffrey S. Miller, Medicine, SM
Jaime Modiano, Veterinary Clinical Sciences, SM
Daniel L. Mueller, Medicine, SM
Vitaly Polonovski, Medicine, SM
Sundaram Ramakrishnan, Pharmacology, SM
Michael J. Sadowsky, Soil, Water, and Climate, SM
Ashok Saluja, Surgery, SM
Michel M. Sanders, Biochemistry, Molecular Biology, and Biophysics, SM
Leslie A. Schiff, Microbiology, SM
Patrick M. Schievvert, Microbiology, SM
Janet L. Schottel, Biochemistry, Molecular Biology, and Biophysics, SM
Yoji Shimizu, Laboratory Medicine and Pathology, SM
Amy P. Skubitz, Laboratory Medicine and Pathology, SM
Daniel A. Valleria, Therapeutic Radiology, SM
Brian G. Van Ness, Genetics, Cell Biology and Development, SM
Gregory M. Vercellotti, Medicine, SM
Lawrence P. Wackett, Molecular Biology, and Biophysics, SM
Carol L. Wells, Laboratory Medicine and Pathology, SM
Douglas Yee, Medicine, SM

Associate Professor

Sandra K. Armstrong, Microbiology, SM
Vivian J. Bardwell, Genetics, Cell Biology and Development, SM
Paul Bohjanen, Microbiology, SM
Wade A. Bresnahan, Microbiology, SM
Kathleen F. Conklin, Genetics, Cell Biology and Development, SM
Dana Davis, Microbiology, SM
Michael A. Farrar, Laboratory Medicine and Pathology, SM
Reuben S. Harris, Biochemistry, Molecular Biology, and Biophysics, SM
Yinduo Ji, Veterinary Pathology, SM
Dan S. Kaufman, Medicine, SM
Arkady B. Khodursky, Biochemistry, Molecular Biology, and Biophysics, SM
Alexander Khoruts, Medicine, SM
Carol A. Lange, Medicine, SM
Stephen J. McSorley, Medicine, SM
Christopher A. Pennell, Laboratory Medicine and Pathology, SM
David A. Potter, Medicine, SM
Stephen A. Rice, Microbiology, SM
Peter Southern, Microbiology, SM
Bruce K. Walcheck, Veterinary and Biomedical Sciences, SM

Assistant Professor

Bryce Binstadt, Pediatrics, SM
Daniel R. Bond, BioTechnology Institute, SM
Mark Cannon, Medicine, SM
Brian Fife, Medicine, SM
Emily Gillespie, Medicine, SM
Jeffrey A. Gralnick, BioTechnology Institute, SM
Timothy Hallstrom, Pediatrics, SM
Haojie Huang, Laboratory Medicine and Pathology, SM
Koh Jizuka, Medicine Hematology, SM
Dan Kaplan, Dermatology, SM
Ameeta Kelekar, Laboratory Medicine and Pathology, SM
Nobuki Kikyo, Medicine, SM
Kim C. Mansky, Developmental and Surgical Sciences, SM
David Masopust, Microbiology, SM
Christian D. Mohr, Microbiology, SM
Kirsten Nielsen, Microbiology, SM
John Ollfest, Pediatrics, SM
Erik J. Peterson, Medicine, SM
Nicola Philpott, Medicine, SM
Kathryn Schwertfeger, Laboratory Medicine and Pathology, SM
Naoko Shima, Genetics, Cell Biology and Development, SM
Pamela J. Skinner, Veterinary Biosciences, SM
Catherine St. Hill, Veterinary Clinical Sciences, SM
Sing Sing Way, Pediatrics, SM
Xianzheng Zhou, Pediatrics, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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, superantigens, and vascular biology and inflammation.

Prerequisites for Admission—Applicants must have a bachelor’s degree that includes coursework in 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.

Special Application Requirements—The following must be submitted to the program: three letters of recommendation; scores from the General (Aptitude) Test of the GRE; official transcripts; a copy of the Graduate School application; and a brief description of reasons for seeking an advanced degree, areas of research interest, (and reasons for these interests), and career objectives. A minimum TOEFL score of 600 (paper), 250 (computer), or 100 (Internet) is required of applicants whose native language is not English. The MICaB program is a fall semester start only. Applications should be submitted by December 15; those received after that date are considered only if space is available in the desired program.

Courses—Refer to Microbiology, Immunology, and Cancer Biology (MICA) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses on Degree Program Forms is permitted based on director of graduate study approval.

M.S. Plan A Degree Requirements

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.

Language Requirements—None.

Final Exam—The final exam is oral.

Ph.D. Degree Requirements

The Ph.D. requires a minimum of 22 course credits in the major, 12 course credits in a minor or supporting program, and 24 thesis credits.

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. All students take courses on the structure, function, and metabolism of microorganisms; molecular immunology; and cancer biology, as well as in their chosen concentration 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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires two of the following: MICA 8002, MICA 8003, MICA 8004; and any other MICA 8000-level, 3- or 4-credit course to total 12–18 credits.
Molecular, Cellular, Developmental Biology and Genetics

Contact Information—Director of Graduate Studies, Molecular, Cellular, Developmental Biology and Genetics, University of Minnesota, 6-160 Jackson Hall, 321 Church Street S.E., Minneapolis, MN 55455 (612-624-7470; fax 612-626-6140; mcdbg@umn.edu; http://mcdbg.umn.edu).

Inquiries about graduate program activities, courses, and research opportunities should be directed to the director of graduate studies at the same address and phone number.

For latest graduate faculty listings, see www.umn.edu/grad.studies/grad.courses/rosters/faculty.html.

Regents Professor
Bruce R. Blazar, Pediatric Hematology/Oncology/Bone Marrow Transplantation, SM
Ronald L. Phillips, Agronomy and Plant Genetics, SM

Professor
Judith G. Berman, SM
Susan A. Berry, Pediatrics, SM
Robert M. Brambl, Plant Biology, SM
Robert J. Brooker, SM
Robert P. Elde, Neuroscience, SM
Stuart F. Goldstein, SM
David Greenstein, SM
Perry B. Hackett, SM
Thomas S. Hays, SM
Kristin A. Hogquist, Laboratory Medicine and Pathology, SM
Stephen C. Jameson, Laboratory Medicine and Pathology, SM
Ryoko Kuriyama, SM
David A. Largaespada, SM
Paul A. Lefebvre, Plant Biology, SM
Paul C. Letourneau, Neuroscience, SM
Richard W. Linck, SM
Dennis M. Livingston, Biochemistry, Molecular Biology, and Biophysics, SM
Louis M. Mansky, Dentistry, SM
M. David Marks, Plant Biology, SM
James B. McCarthy, Laboratory Medicine and Pathology, SM
R. Scott McVor, SM
Linda McLoon, Ophthalmology, SM
Steven C. McLoon, Neuroscience, SM
Matthew F. Mescher, Laboratory Medicine and Pathology, SM
David J. Odde, SM
Michael B. O’Connor, SM
Neil E. Olszewski, Plant Biology, SM
Harry T. Orr, Laboratory Medicine and Pathology, SM
Mary E. Porter, SM
Laura P. W. Ranum, SM
Ann E. Rougvie, SM
Janet L. Schottel, Biochemistry, Molecular Biology, and Biophysics, SM
Yoji Shimizu, Laboratory Medicine and Pathology, SM
Carolyn D. Silllows, Plant Biology, SM

Michael J. Simmons, SM
Jeffrey A. Simon, SM
Amy P. Skubitz, Laboratory Medicine and Pathology, SM
Jonathan M. Slack, SM
Robert L. Sorensen, SM
Clifford J. Steer, Medicine, SM
Margaret A. Titus, SM
Howard C. Towle, Biochemistry, Molecular Biology, and Biophysics, SM
Brian G. Van Ness, SM
Catherine M. Verfaillie, Medicine, SM
Daniel F. Voytas, SM
Chester B. Whitley, Pediatrics, SM
Susan M. Wick, Plant Biology, SM
Robin L. Wright, SM
David A. Zarkower, SM

Associate Professor
Vivian J. Bardwell, SM
Lihsia Chen, SM
Duncan Clarke, SM
Kathleen F. Conklin, SM
Dana Davis, Microbiology, M2
Michael A. Farrar, Laboratory Medicine and Pathology, SM
Cheryl A. Gale, M2
William M. Gray, Plant Biology, M2
Reuben Harris, SM
Betsy A. Hirsch, Laboratory Medicine and Pathology, SM
Victoria Iwanji, SM
Dan S. Kaufman, M2
David T. Kirkpatrick, SM
Deanna Kreepp, SM
Michael D. Koob, Medicine, M2
Bonnie S. LeRoy, SM
York H. Marahrens, SM
Hiroshi Nakato, M2
Thomas P. Neufeld, SM
Anna Petryk, M2
Lisa A. Schimmenti, Pediatrics, SM
Joceyln E. Shaw, SM
Nikunj Somia, SM

Assistant Professor
Anindya Bagchi, M2
Sean D. Conner, M2
Laura S. Gammill, M2
Nobuaki J. Kikyo, Medicine, M2
Lorene M. Lanier, Neuroscience, M2
Nancy J. Mendelsohn, AM
Yasushi Nakagawa, M2
Sue V. Petzel, Obstetrics/Gynecology, AM
Naoko Shima, M2

Other
Mary J. Ahrens, AM
Janice Baker, AM
Shari R. Baldinger, AM
Matt Bower, AM
Maryann V. Fox, AM
Katherine A. Nelson Fuhrman, AM
Judy Garza, AM
Joy Gustin, AM
Beth A. Hall, AM
Bonnie A. Hattten, AM
Jennifer A. Roggenbuck, AM
Karol R. Rubin, AM
Cheri Schoonveld, AM
Alycia B. Spear, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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, and membrane transport; cell interactions; macromolecular structure; extracellular matrix; cytoskeleton and 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. Special institutes in human genetics, plant molecular genetics, biological process technology, and a center for developmental biology provide opportunities for graduate study. The program administers a specialty in genetic counseling. The program participates in the Joint Degree Program in Law, Health, and Life Sciences.

Prerequisites for Admission—The program is sufficiently flexible to accommodate students with a wide range of backgrounds. Students with bachelor’s degrees in any of the biological, chemical, or physical sciences are encouraged to apply. Recommended academic preparation includes one year each of calculus, organic chemistry, and physics, and background in basic biology, including biochemistry and genetics. Research experience is very strongly recommended. For students of demonstrated ability, background deficiencies can be made up during the first year of graduate study. Exceptional international applicants with minimum TOEFL scores of 625 (paper), 263 (computer), or 107 (Internet, with writing subsection 25 and reading subsection 25) or IELTS score of 7.0 are considered.

Special Application Requirements—Applicants are required to submit three letters of recommendation from persons familiar with their academic and research capabilities; scores from the General (Aptitude) Test of the GRE; and a statement of interests, goals, and research experience. The Subject (Advanced) Test (in biology; chemistry; or biochemistry, cell and molecular biology) of the GRE is not required but highly recommended. Deadline for receipt of completed applications is January 2. Graduate studies begin in the fall semester only.
Courses—Refer to Molecular, Cellular, Developmental Biology and Genetics (MCDG) and Genetics, Cell Biology and Development (GCD) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted only with prior written approval from the director of graduate studies.

M.S. Degree Requirements
Students are admitted to the M.S. program only under exceptional circumstances, (e.g., if they can be in the area for only two years) or if they are accepted into the genetic counseling specialization or into the Joint Degree Program in Law, Health, and the Life Sciences; in all cases, applicants must also be competitive for admission at the Ph.D. level.

The M.S. is offered under Plan A and Plan B. Plan A requires a minimum of 20 course credits and 10 thesis credits; Plan B requires a minimum of 30 course credits and the completion of a Plan B paper.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires 6 credits.

Ph.D. Degree Requirements
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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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.

Molecular Veterinary Biosciences
See Comparative and Molecular Biosciences.

Museum Studies
Minor Only
Contact Information—Museum Studies Graduate Minor; 300 Bell Museum, 10 Church Street S.E., University of Minnesota, Minneapolis, MN 55455 (612-624-6380; fax 612-626-7704; murdo001@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Joanne B. Eicher, Design, Housing, and Apparel, M

Professor
Robert J. Poor, Art History, AM
Peter S. Wells, Anthropology, AM

Associate Professor
Lyndel I. King, Art History, M

Adjunct Assistant Professor
David J. Rhees, The Bakken Museum, AM

Lecturer
Anita F. Cholewa, Bell Museum of Natural History, AM

Other
Gordon R. Murdock, Bell Museum of Natural History, M
Colleen J. Sheehy, Weisman Art Museum, AM

Curriculum—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.

Prerequisites for Admission—Admission to the museum studies graduate minor is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. It is anticipated that no more than 15 students will be admitted to this minor each year.

Courses—Refer to Museum Studies (MST) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted based on director of graduate studies approval.

Minor Only Requirements
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).

Music
Contact Information—School of Music, University of Minnesota, 100A Ferguson Hall, 2106 4th Street South, Minneapolis, MN 55455 (612-624-2847; fax 612-624-8001; MNmusic@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
John E. Anderson, SM
Lydia Artymiw, SM
Thomas J. Ashworth, SM
David B. Baldwin, SM
Alexander Braginsky, SM
Michael Cherlin, SM
James Dillon, SM
David A. Grayson, SM
Craig J. Kirchhoff, SM
Korey B. Konkol, SM
Alex J. Lubet, SM
Glenda Maurice, SM
Guerrino Mazzola, M2
David Myers, SM
Sally O’Reilly, SM
Tanya Remenikova, SM
Rebecca P. Shockley, SM

Associate Professor
Akosua Addo, SM
Dean W. Billmeyer, SM
Mark P. Bjork, SM
Matthew Bribitzer-Stull, SM
David A. Damschroder, SM
Immanuel Davis, SM
John De Haan, SM
Jean Del Santo, SM
Keitha Lucas Hamann, SM
Kelley A. Harness, SM
Noriko Kawai, M
Young Nam Kim, SM
Scott D. Lipscomb, SM
Timothy Lovelace, SM
Jerry Luckhardt, SM
Peter Mercer-Taylor, SM
Fernando A. Meza, SM
Karen Painter, M2
Kathy S. Romney, SM
Paul M. A. Shaw, SM
Dean Sorenson, SM
David Walsh, M2
Wendy Zaroff-Mullins, AM
Assistant Professor
Gabriela Currie, SM
Sumanth Gopinath, M2
Matthew Mehaffey, M2
Anna Schultz, M2
Michael Silverman, M2

Instructor
John W. Miller Jr., AM

Lecturer
James L. Clute, AM
Scott Currie, M
Kathy Kienzle, AM
Basil Reeve, AM
Eugene Rousseau, SM
Mark Russell Smith, SM
John Snow, AM2
Charles Ullery, AM
Jeffrey W. Van, AM

Other
Julia Bogorod, AM
Gary A. Bordner, AM
Christopher Brown, AM
Steven C. Campbell, AM
Timothy Diem, AM
James F. Flegel, AM
Michael C. Gast, AM
Burt Hara, AM
Barbara G. Kierig, AM
Thomas Turner, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 requirements below.

Prerequisites for Admission—Applicants interested in any master’s level program 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. Those applying to the M.A. in music education also generally hold an appropriate teaching license. Applicants interested in doctoral level study must hold a master’s degree in an appropriate field of study.

Special Application Requirements—Applicants to the musicology/ethnomusicology, theory, composition, or music education/therapy programs must submit GRE General Test scores; applicants to other programs are encouraged to submit GRE scores in order to be eligible for certain University fellowships. Applicants whose primary language is not English must score a minimum of 6.5 on the IELTS test or obtain a passing score on the TOEFL exam: 550 (paper), 213 (computer), or 79 (Internet, with a minimum of 21 on writing and 19 on reading).

The various degree programs also require additional application materials. For the M.M. and D.M.A. programs in performance, taped auditions may be accepted for applicants who live more than 200 miles from the Twin Cities. However, applicants are encouraged to perform a live audition if at all possible. For the M.M. and D.M.A. in conducting, a preliminary tape screening is required in video format (DVD).

Although students may be admitted any semester, only students starting in fall semester will be considered for financial assistance. To receive Graduate School fellowship consideration, all materials must be received by December 15. Check with the School of Music for scholarship and assistantship application deadlines.

Diagostic Exams—Music Theory and Music History Placement Exams are administered to all entering students. All graduate students in music must demonstrate proficiency in the material found in the undergraduate music theory and ear training sequences, including the form and structure of tonal music and 20th-century music theory and ear training. Similarly, they must demonstrate proficiency in music history from the Middle Ages to the present. Individual programs may require additional diagnostic exams.

Courses—Refer to Music (MUS), Music Applied (MUSA), and Music Education (MUED) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is subject to adviser and/or director of graduate studies approval. For a 4xxx theory/composition course to be approved there must also be a 5xxx or 6xxx theory/composition course in the degree program.

M.A. Degree Requirements
The master of arts in music offers emphases in musicology/ethnomusicology (Plan A and Plan B), theory (Plan B only), composition (Plan B only), and music education/therapy (Plan B only).

The M.A. in music with emphasis in musicology/ethnomusicology requires 35 credits (25 course credits and 10 thesis cr) for Plan A and 31 course credits for Plan B; the emphasis in composition (Plan B only) requires 41 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. The M.A. in music with an emphasis in education/therapy requires 30 credits: 12 credits in music education/therapy for the major; 10 credits in music; 3 credits of elective from professional education, music, and music education/therapy; and a 5-credit research project.

Language Requirements—A reading knowledge of French, German, or Italian is required for all M.A. degree emphases except those in the education/therapy field.

Final Exam—For the emphasis in musicology/ethnomusicology, the final exams are written and oral. For the emphases in theory, composition, and education/therapy, the final exams are oral.

M.M. Degree Requirements
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.

Language Requirements—None

Final Exam—A final oral exam is required that covers coursework and the final project and/or recital.

D.M.A. Degree Requirements
The doctor of musical arts offers emphases in piano, organ, voice, violin, viola, cello, flute, oboe, clarinet, saxophone, bassoon, trumpet, trombone, percussion, guitar, collaborative piano/coaching, conducting, and woodwind performance. Credit requirements are as follows: 89 credits for...
piano and voice; 85 credits for instrumental performance, guitar, and conducting; 87 credits for organ and woodwinds; and 91 credits for collaborative piano/coaching.

The School of Music offers two options for D.M.A. degrees. The first option requires the minimum credits as outlined above, typically divided as follows: 32 credits of applied study; 12 credits in musicology/ethnomusicology and theory/composition, with at least one 3-credit course in each area; a minimum of 8 credits directly related to the emphasis (literature, pedagogy, performance practice, conducting, secondary instrument, chamber music, etc.); 9 credits in a supporting program outside of music; 20 recital credits for five recitals; and 4 thesis credits for the D.M.A. project document.

The second option allows students to choose a secondary area of concentration to become professionally prepared in an area that complements the performance major. The secondary area option requires the approval of the student’s adviser, the division representing the secondary area, and the director of graduate studies, and is limited to secondary areas approved by the Graduate Committee of the School of Music. Under this option, students perform three doctoral recitals instead of five (12 credits total, at 4 credits each) and fulfill the requirements for a secondary area as described below.

Criteria for Secondary Areas

A secondary area comprises a minimum of 15 credits in total—normally five 3-credit courses, at least two of which must be 8xxx courses. Students choosing this option apply the 8 credits that result from reducing the number of doctoral recitals from five to three toward the secondary area. The remaining credits are derived principally from the other areas of music study already built into the D.M.A.: musicology, theory, pedagogy, etc. The distribution of these credits depends upon the specific secondary area chosen.

A secondary area concentrates either on a single discipline—e.g., musicology, music theory, composition, or choral conducting—or on an interrelated body of courses—e.g., technology and music or pedagogy. All 15 credits of a secondary area must be earned at the University of Minnesota School of Music (i.e., no transfer credits or credits from outside of the School of Music can be used). Students who choose a secondary area are encouraged but not obligated to write their thesis/D.M.A. project in that area.

A list of secondary areas and their course requirements is available upon request from the Graduate Studies Office of the School of Music.

Language Requirements—Some D.M.A. emphases require up to two languages chosen from French, German, Italian, or, with approval, other languages appropriate to the final research project.

Ph.D. Degree Requirements

The doctor of philosophy offers emphases in composition, music education/therapy, music theory, and musicology/ethnomusicology. For the doctor of philosophy in music, emphases and minimum course credit requirements are as follows: 51 credits for musicology, ethnomusicology, and theory; 65 credits for composition; and 66 credits for music education. Programs are individualized and build on the core of coursework required for the corresponding master’s degrees. Coursework includes 12–18 credits outside the major. In addition, 24 thesis credits are required.

Language Requirements—The language requirement for each emphasis is as follows:

Musicology, Ethnomusicology, and Composition—Two languages chosen from French, German, and Italian. Substitution may be made when a different language is needed for the thesis. For composition, one language may also, with approval, be replaced by a collateral field of knowledge or a special research technique.

Theory—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.

Education/Therapy—None.

Minor Requirements for Students Majoring in Other Fields—The minor in music studies consists of 12 credits as follows: four 3-credit-minimum 8xxx courses in musicology/ethnomusicology or theory, with the possible substitution of one or more 5xxx course(s) only with the approval of the student’s adviser and the director of graduate studies (DGS) in the School of Music. In the case of 5xxx substitutions, the professor(s) of the course(s) in question, the graduate student, the graduate student’s adviser, and the School of Music DGS should 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 5xxx or 8xxx 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.

Nanoparticle Science and Engineering

Minor Only

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; www.nanoigert.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor

Donald G. Truhlar, Chemistry, M

Professor

Eray Aydil, Chemical Engineering and Materials Science
Subir Banerjee, Geology and Geophysics, M
Stephen A. Campbell, Electrical and Computer Engineering, M
Paul Crowell, Physics
C. Daniel Frisbie, Chemical Engineering and Materials Science, M
William Gerberich, Chemical Engineering and Materials Science, M
Steven L. Girshick, Mechanical Engineering, M
Wayne L. Gladfelter, Chemistry, M
Joachim Heberlein, Mechanical Engineering, M
James Kakalios, Physics, M
David Kittelson, Mechanical Engineering, M
Uwe Kortshagen, Mechanical Engineering, M
Alon McCormick, Chemical Engineering and Materials Science, M
Peter H. McMurry, Mechanical Engineering, M
David J. Norris, Chemical Engineering and Materials Science, M
David Y. H. Pui, Mechanical Engineering, M
Jeff Roberts, Chemistry, M
Michael Tsapatsis, Chemical Engineering and Materials Science, M
Randall Victoria, Electrical and Computer Engineering, M
Xiaoyang Zhu, Chemistry

Associate Professor

Sean Garrick, Mechanical Engineering, M
Allison Hubel, Mechanical Engineering
Heiko O. Jacobs, Electrical and Computer Engineering, M
R. Lee Penn, Chemistry, M
Bethanie Stadler, Electrical and Computer Engineering

Curriculum—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.
Prerequisites for Admission—Admission to a master’s or doctoral degree-granting program in the Institute of Technology and preparation of a minor program of coursework approved by the director of graduate studies is required. Students in programs outside the Institute of Technology must be approved by the director of graduate studies.

Use of 4xxx Courses—4xxx courses may be included on Degree Program Forms.

Minor Only Requirements
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.

Natural Resources Science and Management

Contact Information—College of Food, Agricultural and Natural Resource Sciences, University of Minnesota, 105 Green Hall, 1530 Cleveland Ave N., Saint Paul, MN 55108 (612-624-7683; fax 612-625-5212; nrsm@umn.edu; www.nrsm.umn.edu). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Peter B. Reich, Forest Resources, SM

Professor
Dorothy H. Anderson, (emeritus), Forest Resources, AM
David Andow, Entomology, ASM
Marvin E. Bauer, Forest Resources, SM
Melvin J. Baughman, Forest Resources, SM
Robert A. Blanchette, Plant Pathology, ASM
Charles R. Blinks, Forest Resources SM
Paul V. Bolskat, Forest Resources, SM
Kenneth N. Brooks, Forest Resources, SM
Thomas E. Burk, Forest Resources, SM
Stephan P. Carlson, Extension Services, M2
John J. Cogan, Educational Policy and Administration, SM
Yosef Cohen, Fisheries, Wildlife, and Conservation Biology, SM
Francesca J. Cuthbert, Fisheries, Wildlife, and Conservation Biology, SM
Alan R. Ek, Forest Resources, SM
Fred N. Finley, Curriculum and Instruction, AM
Bill Gartner, Applied Economics, ASM
Ralph J. Gutierrez, Fisheries, Wildlife, and Conservation Biology, SM
Howard M. Hoganson, North Central Research and Outreach Center, SM
Gary R. Johnson, Forest Resources, M2
Joseph G. Massey, (emeritus), Agriculture, Crookston, ASM
L. David Mech, Fisheries, Wildlife, and Conservation Biology, SM
John L. Nieber, Biosystems and Agricultural Engineering, SM
James A. Perry, Fisheries, Wildlife, and Conservation Biology, SM
Alan Stephen Polasky, Ecology, Evolution, and Behavior, SM
Shri Ramaswamy, Bioproduction and Biosystems Engineering, SM
R. Roger Ruan, Bioproduction and Biosystems Engineering, SM
C. Ford Runge, Applied Economics, ASM
Simo Sarkanan, Bioproduction and Biosystems Engineering, SM
Elmer L. Schmidt, (emeritus), Bioproduction and Biosystems Engineering, SM
Ingrid E. Schneider, Forest Resources, SM
Donald B. Sniff, (emeritus), Ecology, Evolution, and Behavior, SM
J. L. David Smith, Fisheries, Wildlife, and Conservation Biology, SM
Susan G. Stafford, Forest Resources, SM
Alfred D. Sullivan, Office of the President, M2
Jerrod E. Winandy, Bioproduction and Biosystems Engineering, AM

Adjunct Professor
David E. Andersen, Fisheries, Wildlife, and Conservation Biology, SM
Mark E. Ascerno Jr., Entomology, ASM
Edward J. Cushing, Forest Resources, ASM
Daniel L. Erkkila, North Central Research and Outreach Center, M2
Robert G. Haight, Forest Resources, AM
Gjalt Huppes, Bioproduction and Biosystems Engineering, ASM
Douglas H. Johnson, Fisheries, Wildlife, and Conservation Biology, ASM
Ronald E. McRoberts, Forest Resources, AM
W. Keith Moser, Forest Resources, AM
John H. Schomaker, Forest Resources, AM
Gary Worry, Bioproduction and Biosystems Engineering, AM
John C. Zasada, Forest Resources, ASM

Associate Professor
Todd W. Arnold, Fisheries, Wildlife, and Conservation Biology, SM
Robert Blair, Fisheries, Wildlife, and Conservation Biology, SM
Mary M. Blickenderfer, Extension Services, AM
Andrew J. David, Forest Resources, SM
Glenn D. Del Giudice, Fisheries, Wildlife, and Conservation Biology, SM
David T. Grimsrud, (emeritus), Bioproduction and Biosystems Engineering, ASM
Sarah E. Hobbie, Ecology, Evolution, and Behavior, AM
Patrick J. Huelman, Bioproduction and Biosystems Engineering, M2
Michael A. Kilgore, Forest Resources, SM
Richard O. Kimmel, Fisheries, Wildlife, and Conservation Biology, M
John P. Loegering, UMC, Natural Resources, M2
Kristine F. Miller, Landscape Architecture, AM
Kristen C. Nelson, Forest Resources, SM
Karen S. Oberhauser, Fisheries, Wildlife, and Conservation Biology, ASM
Rachel Schurman, Sociology, AM2
Steven J. Severtson, Bioproduction and Biosystems Engineering, SM
Randall Singer, Veterinary Biosciences, M
Timothy M. Smith, Bioproduction and Biosystems Engineering, SM
Steven J. Taff, Applied Economics, AM
Karen-Sue Taussig, Anthropology, AM
Ulrike W. Tschirner, Bioproduction and Biosystems Engineering, SM
Ping Wang, Bioproduction and Biosystems Engineering, SM

Adjunct Associate Professor
Stephen M. Bratkovich, Bioproduction and Biosystems Engineering, ASM
David C. Fulton, Fisheries, Wildlife, and Conservation Biology, SM
Pamela J. Jakes, Forest Resources, AM
Joseph G. O’Brien, Forest Resources, AM
Michael E. Ostry, Forest Resources, AM
Brian J. Pahl, Forest Resources, AM
Brian K. Reilly, Fisheries, Wildlife, and Conservation Biology, SM
Don E. Riemenschneider, Forest Resources, AM
Thomas L. Schmidt, Forest Resources, ASM

Assistant Professor
Dennis R. Becker, Forest Resources, SM
Anthony W. D’Amato, Forest Resources, M2
Joe Knight, Forest Resources, M2
Rebecca A. Montgomery, Forest Resources, SM
Harlan D. Petersen, Bioproduction and Biosystems Engineering, M
Jonathan S. Schilling, Bioproduction and Biosystems Engineering, M2
Sangwon Suh, Bioproduction and Biosystems Engineering, SM
William T. Tze, Bioproduction and Biosystems Engineering, SM
Dionides S. Zamora, Extension Services, M2

Adjunct Assistant Professor
David N. Bengston, Forest Resources, ASM
Brian N. Brodgon, Bioproduction and Biosystems Engineering, M2
Meredith W. Connell, Forest Resources, ASM
Karlyn Eckman, Forest Resources, AM
Alan Franklin, Fisheries, Wildlife, and Conservation Biology, M2
David L. Garshels, Fisheries, Wildlife, and Conservation Biology, SM
Mark H. Hansen, Forest Resources, AM2
Randall K. Kolka, Soil, Water, and Climate, ASM
Michael A. Larson, Fisheries, Wildlife, and Conservation Biology, AM
C. Hobart Perry, North Central Research Station, AM2
Michael R. Reichenbach, Croquet Forestry Center, M
Scott W. Rosenrance, Bioproduction and Biosystems Engineering, AM2
Stephanie Snyder, Forest Resources, AM
Jerrilyn L. Thompson, Forest Resources, M2
Christopher Woodall, Forest Resources, AM2
Research Associate
Dean A. Current, Forest Resources, M2
Lee E. Frelich, Forest Resources, SM
Jacek Oleksyn, Forest Resources, AM
Robert T. Seavey, Bioproducts and Biosystems Engineering, M2
Robert A. Stine, M2

Teaching Specialist
Joe Magners, Fisheries, Wildlife, and Conservation Biology, AM2

Committee Member
Jeffrey S. Lawrence, Fisheries, Wildlife, and Conservation Biology, ASM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Students normally emphasize one of the following tracks: 1) forests—biology, ecology, conservation, and management; 2) economics, policy, management, and society; 3) assessment, monitoring, and geospatial analysis; 4) recreation resources, tourism, and environmental education; 5) forest hydrology and watershed management; 6) forest products; 7) paper science and engineering; and 8) wildlife ecology and management.

Prerequisites for Admission—Prerequisites vary by subfield. Most admitted students have earned degrees in natural resource related majors. Applicants related background are eligible; if admitted, they may complete the prerequisites for advanced courses during the early stages of their graduate program. Applicants for the doctoral program should demonstrate a capacity for advanced study and independent research.

Special Application Requirements—Applications are processed on a continual basis throughout the year, and students are admitted each semester. However, to ensure full consideration for fellowships and assistantships, submission of application materials by December 15 (for fall admission) is required. General GRE scores are required. Master’s student applicants are required to submit thrice letters of recommendation. Applicants for the doctoral program should provide three recommendations from people who can provide evaluations of their capacity for advanced study and independent research.

Courses—Refer to Bioproducts and Biosystems Engineering (BBE), Environmental Sciences, Policy, and Management (ESPM), Fisheries and Wildlife (FW), Forest Resources (FR), and Natural Resources Science and Management (NR) in the course section of this catalog.

Use of 4xxx Courses—Although there is no set maximum number of 4xxx credits, programs with insufficient 5xxx and 8xxx coursework credits will not be approved. Inclusion of 4xxx Forest Resources (FR); Environmental Sciences, Policy, and Management (ESPM); Bioproducts and Biosystems Engineering (BBE); and Fisheries and Wildlife (FW) courses on the Degree Program Form for the M.S., Ph.D., or minor degree is subject to adviser and director of graduate studies approval. Students from other majors may use these 4xxx courses subject to their own program’s approval. The Natural Resources Science and Management Graduate Studies Committee reviews and must approve all graduate degree programs.

Minor Requirements for Students Majoring in Other Fields—Students should contact the director of graduate studies. The selection of courses is influenced by the student’s background and educational objective. Minor field competence is evaluated in the oral exam.

Language Requirements—None.

Final Exam—The final exam is oral.

M.S. Degree Requirements
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 subfield. Students present a seminar on the thesis, the Plan B project, or a topic selected in consultation with the graduate adviser. Specific requirements vary by subfield; prospective students should contact the director of graduate studies or a prospective faculty adviser for specific information.

Ph.D. Degree Requirements
The doctoral program varies from 30 to 60 credits. In addition, students must register for 24 thesis credits. Course selection and thesis proposals are developed by each student in consultation with their faculty adviser and are approved by the Natural Resources Science and Management Graduate Studies Committee.
Scott Selleck, Pediatrics, Genetics, Cell Biology and Development, SM
Virginia S. Seybold, SM
Donald A. Simone, Oral Sciences, SM
Jonathan Slack, Genetics, Cell Biology and Development, M2
John F. Soechting, SM
Peter W. Sorensen, Fisheries and Wildlife, SM
Thomas Stoffregen, Kinesiology, SM
Stanley A. Thayer, Pharmacology, SM
David D. Thomas, Biochemistry, SM
Kamil Ugurbil, Radiology, SM
Govind T. Vatassery, Psychiatry, SM
Catherine Verfaillie, Medicine, SM
Neal F. Viemeister, Psychology, SM
George L. Wilcox, Pharmacology, SM
W. Gibson Wood, Pharmacology, SM

Associate Professor
John H. Anderson, Otolaryngology, SM
W. Dale Branton, M2
Stephen A. Engel, Psychology, SM
Carolyn Fairbanks, Pharmaceutics, Pharmacology, Neuroscience, SM
Patricia L. Faris, Psychiatry, SM
Janet L. Fitzkerley, Pharmacology, Duluth, SM
Jurgen F. Fohlemeister, Physiology, SM
Jonathan Gewirtz, Psychology, SM
Pankaj Gupta, Medicine, M2
Paul Kofuji, SM
Catherine M. Kotz, Food Science and Nutrition, SM
Dezhi Liao, SM
Paul G. Meremstein, SM
Giuseppe Pellizer, SM
A. David Redish, SM
Martin W. Wessendorf, SM
Kevin D. Wickman, Pharmacology, SM

Adjunct Associate Professor
Frank H. Burton, Physiology, M2
Juergen Konczak, Kinesiology, SM

Assistant Professor
Bagrat Amirkhan, M2
Mathew V. Chafee, SM
Lihsia Chen, Genetics, Cell Biology and Development, M2
Laura Gammill, Genetics, Cell Biology and Development, SM
Geoffrey M. Ghose, SM
Michael Koob, Neurology, SM
Naoko Koyano, M2
Lorene Lanier, SM
Arthur C. Leuthold, M2
Scott M. Lewis, Neurology, M2
Angus W. MacDonald III, Psychology, M2
Kirill Martemyanov, Pharmacology, SM
Mark Masino, SM
Yasushi Nakagawa, SM
Theoden Netoff, Biomedical Engineering, SM
Teresa Nick, SM
Duanne Q. Nykamp, Mathematics, SM
John R. Ohlfest, Neurosurgery, SM
Cheryl Olman, Psychology, SM
Raghavendra B. Rao, Pediatrics, M2
Paul R. Schrater, Psychology, SM
Mark J. Thomas, Neuroscience, Psychology, SM
LiLian Yuan, SM
Lance Zipfel, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for
Graduate School requirements that apply to all major fields.

Curriculum—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.

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 (NSC 8334) and thereby select a thesis adviser. Elective courses and at least 12 credits in a minor or supporting program are selected in consultation with the adviser (typical minors include cell biology, physiology, statistics, psychology, and medicine; medicine is primarily for students in the M.D./Ph.D. program). Students with sufficient background and previous course experience may apply for a waiver of specific requirements.

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.

Prerequisites for Admission—Applicants to the Ph.D. program must have a bachelor’s degree or its foreign equivalent from a recognized college or university. Undergraduate coursework should include instruction in several of the following disciplines: biology, neuroscience, mathematics, physics, chemistry, and psychology. Prior research experience.

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 on the (computer), or 107 (Internet) version of the test; or obtain 6.5 on the IELTS examination. There are no minimum GPA or GRE score requirements.

Courses—Refer to Neuroscience (NSC) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted based on director of graduate studies approval.

M.S. Plan A Degree Requirements
The course requirements for a master’s are the same as those for a Ph.D. degree. They are described under Curriculum (above).

Ph.D. Degree Requirements
The course requirements for a Ph.D. degree are described under Curriculum above. More detailed information may be found in the Neuroscience Student Handbook at www.neuroscience.umn.edu/CurStu/HandbookIntro.html.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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).

Nonprofit Management
Postbaccalaureate Certificate
Contact Information—Nonprofit Management Certificate, College of Continuing Education, Student Support Services, 150 Wesbrook Hall, 77 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4000; adv@ccc.umn.edu; www.cce.umn.edu/certificates/mgmt/nonprofit).
For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
David Hollister, Social Work, M

Associate Professor
Melissa Stone, Public Affairs, M

Lecturer
Victoria Van Slyke, Social Work, M
Sherry Wagner-Henry, College of Liberal Arts, M
Curriculum—This interdisciplinary 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 Institute 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.

Admission Requirements—To be admitted to this program, applicants must have a bachelor’s degree from an accredited postsecondary U.S. institution or its foreign equivalent. A cumulative GPA of 3.00 is required. Students must also have two years of paid or unpaid work experience in a nonprofit organization in one or more of the following areas: management of a budget; supervision of staff; program development, implementation, and/or evaluation; fundraising and/or grant writing; regular participation in board meetings and/or on board committees. Admissions information is available at www.cce.umn.edu/certificates/mgmt/nonprofit.

Certificate Requirements—Twenty-one credits of coursework are required, including 7.5 credits of required core courses and a minimum of 13.5 elective course credits selected at the discretion of the student in consultation with his or her academic advisor. Core requirements include participation in a leadership seminar (1 credit) reserved for students in the Nonprofit Management Certificate Program, and successful completion of the following courses: PA 5003—Introduction to Financial Analysis and Management (1.5 cr), PA 5251—Strategic Planning and Management (3 cr), PA 5101—Management and Governance of Nonprofit Organizations (3 cr).

A grade of B or better in core courses and a cumulative GPA of 2.80 or higher is required for certificate completion.

Nursing

Contact Information—Office of Student and Career Advancement Services, School of Nursing, University of Minnesota, 5-160 Weaver Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-625-7980; fax 612-625-7727; SoNstudentinfo@umn.edu; www.nursing.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Lyn Beaver, Integrative, Global and Public Health, SM
Donna Bliss, Adult and Gerontological Health, SM
Connie Delaney, Leadership, Systems, Informatics and Policy, SM
Sandra Edwardson, Leadership, Systems, Informatics and Policy, SM
Ann Garwick, Child and Family Health, SM
Cynthia Gross, SM
Susan Henly, Leadership, Systems, Informatics and Policy, SM
Julie Jacko, Leadership, Systems, Informatics and Policy, SM
Mary Jo Kreitzer, Integrative, Global and Public Health, SM
Barbara Leonard, Child and Family Health, SM
Joan Liaschenko, Leadership, Systems, Informatics and Policy, SM
Ruth Lindquist, Adult and Gerontological Health, SM
Patricia Tomlinson, ASM
Jean Wyman, Adult and Gerontological Health, SM

Clinical Professor

Thomas Clancy, Leadership, Systems, Informatics and Policy, M
Joanne Disch, Leadership, Systems, Informatics and Policy, SM
Mary Rowan, Leadership, Systems, Informatics and Policy, M2

Associate Professor

Melissa Avery, Child and Family Health, SM
Linda Chlan, Adult and Gerontological Health, SM
Laura Duckett, Integrative, Global and Public Health, SM
Jayne Fullkerson, Integrative, Global and Public Health, M2
Joseph Gaugler, Adult and Gerontological Health, SM
Linda Halcon, Integrative, Global and Public Health, SM
Helen Hankes, Integrative, Global and Public Health, SM
Merrie Kaas, Integrative, Global and Public Health, SM
Madeleine Kerr, Integrative, Global and Public Health, SM
Kathie Krichbaum, Leadership, Systems, Informatics and Policy, SM
Martha Kubik, Integrative, Global and Public Health, SM
Linda Lindeke, Child and Family Health, SM
Margaret Moss, Leadership, Systems, Informatics and Policy, SM

Christine Mueller, Adult and Gerontological Health, SM
Carol O’Boyle, Integrative, Global and Public Health, M2
Patricia Painter, Adult and Gerontological Health, M2
Cynthia J. Peden-McAlpine, Leadership, Systems, Informatics and Policy, SM
Cheryl Robertson, Integrative, Global and Public Health, SM
Renee Sieving, Integrative, Global and Public Health, SM
Diane Treat-Jacobson, Adult and Gerontological Health, SM

Clinical Associate Professor

Ulf Bronas, Adult and Gerontological Health, M2
Elaine Darst, Integrative, Global and Public Health, M2
Kathleen Fagerlund, Adult and Gerontological Health, M2
Linda Herrick, Leadership, Systems, Informatics and Policy, M2
Catherine Juve, Child and Family Health, M2
Leonard Lichtblau, Adult and Gerontological Health, M2
Linda Olson Keller, Integrative, Global and Public Health, M

Assistant Professor

Carolyn Garcia, Integrative, Global and Public Health, M2
Niloofar Hadidi, Adult and Gerontological Health, M2
Tondi Harrison, Child and Family Health, M2
Wendy Looman, Child and Family Health, M2
Karen Monson, Integrative, Global and Public Health, M2
Susan O’Connor-Von, Child and Family Health, M2
Bonnie Westra, Leadership, Systems, Informatics and Policy, M2
Fang Yu, Adult and Gerontological Health, M2

Adjunct Assistant Professor

Sharon Tucker, AM

Clinical Assistant Professor

Mary Chesney, Child and Family Health, M2
Mary Findorff, Integrative, Global and Public Health, M
Georgia Nyagaard, Child and Family Health, M
Christine Poe, Child and Family Health, M
Laurie Pung, Adult and Gerontological Health, M
Diane Schadowald, Child and Family Health, M
Kristine Talley, Adult and Gerontological Health, M2
Mary Zaccagnini, Adult and Gerontological Health, M

Lecturer

Lisa Carney Anderson, Leadership, Systems, Informatics and Policy, M2

Senior Research Fellow

Kay Savik, Nursing Research and Scholarship, M

Other

Karen Alaniz, Child and Family Health, M
Bradley Cohen, AM
Barbara McMorris, Integrative, Global and Public Health, AM
Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Graduate programs in the School of Nursing include the Ph.D. and the Post-Masters (M.S.) Certificate.

Ph.D. Program
The Ph.D. program in nursing prepares scholars as scientists, leaders, clinical innovators, and teachers in health care who:
- Discover new knowledge for nursing science and health care practice through ethical, innovative, theory-based research;
- Integrate knowledge to influence health policy and decision-making through collaborative, interdisciplinary action at organizational, local, regional, national, and global levels;
- Create and evaluate evidence-based applications designed to improve the health and wellbeing of individuals, families, communities, and population; and
- Disseminate knowledge to those in nursing, other health sciences, policy makers, and the public through scholarly publication, formal teaching and other creative venues.

Post-Master's (M.S.) Certificate
The Post-Master’s (M.S.) Certificate program in Nursing offers students with M.S. degrees in nursing the opportunity to complete an additional area of study. The following areas of study include:
- Adult Health Clinical Nurse Specialist
- Children with Special Health Care Needs
- Family Nurse Practitioner
- Gerontological Clinical Nurse Specialist
- Gerontological Nurse Practitioner
- Nurse Midwifery
- Nursing and Healthcare Systems Administration
- Pediatric Clinical Nurse Specialist
- Pediatric Nurse Practitioner
- Pediatric Nurse Practitioner—Children with Special Health Care Needs
- Psychiatric-Mental Health Clinical Nurse Specialist
- Public Health Nursing
- Public Health Nursing—Adolescent Nursing
- Women’s Health Care Nurse Practitioner

Prerequisites for Admission—Applicants must meet the stated requirements of the Graduate School. A successful applicant typically has an undergraduate GPA of 3.00 and non-English-speaking applicants must have a TOEFL score of 586 (paper), 240 (computer), or 94 (Internet).

Admission to the Ph.D. program requires either a master’s degree with a strong background in graduate level physical and/or behavioral sciences or a bachelor’s degree from an accredited institution and an exceptionally strong background in a major field of study such as nursing or the physical or behavioral sciences.

Admission to the Post-M.S. Certificate program requires an M.S. degree in nursing from an accredited institution including a current registered nurse license.

Special Application Requirements—For the Ph.D. degree, GRE General Test scores, two letters of reference, and a profile essay are required. The application deadline for the Ph.D. program is December 15 for the following fall semester.

For the Post-M.S. Certificate, two letters of reference and a goal statement are required. The application deadline for the Post-M.S. Certificate is November 1. A complete application includes a School of Nursing application and a Graduate School application.

Special Criteria for Select Areas of Study include the following: GNP requires one year of work experience with elders. FNP, PNP, PCNS, WHCNP, and PCNS require at least one year of clinical experience, preferably with the population in the anticipated area of practice. NMW strongly recommends one year of clinical experience, preferably in labor and delivery. CSHCN prefers applicants to have one year of experience working with children and families, and to have demonstrated leadership potential. PMHCNS does not require experience, but strongly encourages applicants to have current psychiatric nursing experience.

School of Nursing Mission—The mission of the School of Nursing at the University of Minnesota is to generate and disseminate knowledge necessary for promoting health by developing and improving the nursing care of individuals, families, communities and populations that reflect diversity in society. This mission contributes to the achievement of the three-part mission of the University of Minnesota.

School of Nursing Centers
- Center for Adolescent Nursing
- Center for Child and Family Health Promotion Research
- Center for Children with Special Health Care Needs
- Center for Gerontological Nursing
- Katharine J. Densford International Center for Nursing Leadership

- Center for Health Trajectory Research
- Center for Nursing Minimum Data Set Knowledge Discovery
- Center for Spirituality and Healing
- Minnesota Hartford Center of Geriatric Nursing Excellence

Courses—Refer to Nursing (NURS) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—4xxx courses are not routinely accepted on Degree Program Forms.

Ph.D. Degree Requirements
Students are required to take a minimum of 36 credits in required nursing courses in three areas: scholarly processes, nursing science, and area of concentration. The Ph.D. also requires a minimum of 12 credits in a minor or supporting field and 24 thesis credits. Students who do not have an M.S. in nursing will be required to take additional credits.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires 12 credits in nursing with at least 8 credits of 8xxx courses.

Post-M.S. Certificate Requirements
The Post-M.S. Certificate program prepares students for advanced practice roles that address complex health and illness issues. Individual areas of study vary in the number of credits required. See individual area of study information at www.nursing.umn.edu for specific course and credit requirements.

Language Requirements—None.

Final Exam—None.

Nutrition
Contact Information—Nutrition Graduate Program, Department of Food Science and Nutrition, University of Minnesota, 225 Food Science and Nutrition Building, 1334 Eckles Avenue, Saint Paul, MN 55108 (612-624-1290; fax 612-625-5272; nutrgrad@umn.edu; http://fscn.cfans.umn.edu/grad_students/nutr_grad_students.html).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Charles J. Billington, Medicine, ASM
Linda J. Brady, Food Science and Nutrition, SM
Frank B. Cerra, Surgery, ASM
Margot P. Cleary, Hormel Institute, ASM
Scott J. Crow, Psychiatry, ASM
A. Saari Csallany, Food Science and Nutrition, AM
Daniel D. Gallaher, Food Science and Nutrition, SM
Myron D. Gross, Laboratory Medicine and Pathology, SM
John H. Himes, Epidemiology, SM
Mind S. Kurzer, Food Science and Nutrition, SM
Theodore P. Labuza, Food Science and Nutrition, M2
Arthur S. Leon, Kinesiology, SM
Allen S. Levine, Food Science and Nutrition, SM
Junxuan Lu, Hormel Institute, ASM
Mark Lyte, Surgery, ASM
Diane R. Neumark-Sztainer, Epidemiology, SM
Daniel J. O’Sullivan, Food Science and Nutrition, SM
Joseph R. Prohaska, Biochemistry and Molecular Biology, Duluth, SM
Marla M. Reicks, Food Science and Nutrition, SM
Joanne L. Slavin, Food Science and Nutrition, SM
Mary T. Story, Epidemiology, SM

Adjunct Professor
Julie M. Jones, Food Science and Nutrition, AM

Associate Professor
Donald R. Dengel, Kinesiology, SM
Mary C. Gannon, Medicine, SM
Lisa J. Harnack, Epidemiology, SM
Craig A. Hassel, Food Science and Nutrition, SM
Leonard F. Marquart, Food Science and Nutrition, SM
Mark A. Pereira, Epidemiology, M2
Susan K. Raatz, Medical School, SM
Cheryl F. Smith, Food Science and Nutrition, SM
Lyn M. Steffen, Epidemiology, SM
Jian-Min Yuan, Epidemiology, SM

Adjunct Associate Professor
Daune Cransaw, Food Science and Nutrition, AM2
Catherine M. Kotz, Food Science and Nutrition, SM
Patricia L. Splett, Food Science and Nutrition, AM2

Assistant Professor
Tiffany R. Beckman, Medicine Endocrine Office, AM
Chi Chen, Food Science and Nutrition, AM
Xiaoli Chen, Food Science and Nutrition, M2
Carrie P. Earthman, Food Science and Nutrition, SM
Andrew P. Flood, Epidemiology, M2
Doug G. Mashek, Food Science and Nutrition, M2
Susie Nanney, Family Medicine and Community Health, M2
Melissa Nelson, Epidemiology, M2
Sabrina Peterson, Food Science and Nutrition, M2
Kim Robien, Epidemiology and Community Health, M2
Shalamar Sibley, Medical School, M2
Jamie S. Stang, Epidemiology, AM

Adjunct Assistant Professor
Jillian K. Croll, Food Science and Nutrition, M2
Mary K. Schmidt, Food Science and Nutrition, AM2
Alice C. Shapiro, Epidemiology, M2
Chuanfeng Wang, Food Science and Nutrition, AM2

Instructor
U. B. Krinke, Epidemiology, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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, Minnesota); Mayo Clinic (Rochester, Minnesota); and V.A. Medical Center, Hennepin County Medical Center, and Park Nicollet Institute (Minneapolis, Minnesota).

Three subspecialty areas are offered in the doctoral degree program: human nutrition, nutritional biochemistry, and public health nutrition. Thesis work can be conducted in the laboratory, clinic, or field, locally or internationally.

Prerequisites for 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. and Ph.D. programs also require the following nutrition courses, or equivalent, that may be completed after admission to the program: Principles of Nutrition (FSCN 1112), Life Cycle Nutrition (FSCN 3612), and Human Nutrition (FSCN 4612).

Special Application Requirements—GRE scores and three letters of recommendation evaluating the applicant’s scholarship must be submitted. At least two letters should be from professorial-rank faculty. The GRE Writing Assessment Test is recommended.

Courses—Refer to Nutrition (NUTR) and Food Science and Nutrition (FSCN) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is subject to adviser and director of graduate studies approval.

M.S. Degree Requirements
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 (three courses), an orientation and presentation skills class, graduate courses in biochemistry, physiology, and 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.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires a minimum of 6 course credits in nutrition, including NUTR 5621 (4 cr).

Ph.D. Degree Requirements
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 (three courses), an orientation and presentation skills class, graduate level courses in biochemistry, physiology, and statistics, two advanced topics courses, and presentation of the thesis. All students also are expected to obtain teaching experience, subject to the policies of the adviser’s department or division.
The program is accredited by the Accreditation Council for Occupational Therapy Education (ACOTE) of the American Occupational Therapy Association (P.O. Box 31220, Bethesda, MD, 20824-1220; 301-652-AOTA). Graduates of the program may sit for the national certification exam administered by the National Board for Certification of Occupational Therapy (NBCOT). After successful completion of this exam, the individual will be an Occupational Therapist, Registered (OTR). A felony conviction may affect a graduate’s ability to sit for the NBCOT certification examination or attain state licensure. Most states require licensure to practice; however, state licenses are usually based on the results of this certification exam.

Prerequisites for Admission—Applications are no longer being accepted for the masters of science in occupational therapy degree. Applications are being accepted for the master of occupational therapy degree offered as a professional degree. Applications are accepted from individuals with a bachelor’s degree in any field other than occupational therapy, or from those who will have completed their bachelor’s degree before entering the program. Students may be admitted pending successful completion of outstanding prerequisite coursework with the understanding that missing course(s) will be completed before beginning the program. Occasionally, under extenuating circumstances, an individual may be admitted who does not meet all of the admissions requirements.

Special Application Requirements—Interested applicants should contact the program directly for special application requirements or see the electronic program catalog at www.ot.umn.edu.

Courses—Refer to Occupational Therapy (OT) and Physical Medicine and Rehabilitation (PMED) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—4xxx courses cannot be used toward degree requirements.

M.S. Plan B Degree Requirements

Students take 57 credits of predetermined academic coursework, 6 project credits (Plan B), and a minimum of 12 credits of fieldwork education. Optional fieldwork education is available in several specialty areas. Required fieldwork must be completed within 24 months of finishing academic coursework. Plan B projects must be completed within three months following fieldwork. There is no minor or related field requirement. Note: These requirements are only for the master of science in occupational therapy. Contact the program directly for updated program requirements for the master of occupational therapy.

Language Requirements—None.

Final Exam—The final exam is oral.

Oral Biology

Contact Information—Oral Biology M.S., Ph.D., and D.D.S./Ph.D. Graduate Programs, University of Minnesota, 17-164 Moos Health Sciences Tower, 515 Delaware Street S.E., Minneapolis, MN 55455 (612-626-4483; oralbio@umn.edu; www.oralbiology.umn.edu). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor

Apostolos P. Georgopoulos, Neuroscience, SM

Professor

Alvin J. Beitz, Veterinary and Biomedical Sciences, SM
David A. Bereiter, Diagnostic and Biological Sciences, SM
Edward C. Combe, Diagnostic and Biological Sciences, SM
Ralph DeLong, Restorative Sciences, SM
Gary M. Dunny, Microbiology, SM
Sven U. Gorr, Diagnostic and Biological Sciences, SM
William H. Frey II, College of Pharmacy, SM
Mark C. Herzberg, Diagnostic and Biological Sciences, SM
Louis M. Mansky, Diagnostic and Biological Sciences, SM
Joel D. Rudney, Diagnostic and Biological Sciences, SM
Donald A. Simone, Diagnostic and Biological Sciences, SM
Larry F. Wolff, Developmental/Surgical Sciences, SM

Associate Professor

Mansur Ahmad, Diagnostic and Biological Sciences, SM
Conrado Aparicio, Restorative Sciences, SM
Massimo Costalonga, Developmental/Surgical Sciences, SM
Arkadiusz Z. Dudek, Medicine, SM
Alex Fok, Restorative Sciences, SM
Rajaram Gopalakrishnan, Diagnostic and Biological Sciences, SM
Darryl T. Hamamoto, Diagnostic and Biological Sciences, SM
Anna Petryk, Pediatrics, SM
Kylie J. Walters, Biochemistry, Molecular Biology and Biophysics, SM

Assistant Professor

David L. Basi, Developmental/Surgical Sciences, SM
Shelley N. Grimes, Diagnostic and Biological Sciences, SM
Paul J. Jardine, Diagnostic and Biological Sciences, SM
Disciplines may be included as part of the specific areas of interest; courses from other individual programs to accommodate allow considerable flexibility in planning before applying. Curricula are designed to interest with the director of graduate studies area of emphasis or specialize in topics not exceptional student can create his/her own microbiology and immunology, sensory are encouraged to focus in one of five areas research skills and a broad understanding Veterinary Medicine. They give students Dentistry with cooperating faculty in the programs are offered by the School of oral biology also is required.

Applicants must submit 1) scores from the General Test of the GRE, 2) three letters of recommendation from persons who can comment authoritatively about the applicant’s potential for a research and academic career, 3) a clearly written personal statement (one to two pages) describing career goals, 4) an essay describing research aspirations (one to two pages), and 5) a résumé highlighting research experience and accomplishments, For D.D.S./Ph.D. applicants who are U.S. citizens, resident aliens or Canadian citizens, U.S. or Canadian Dental Admission Test (DAT) scores at or above the national average will be accepted in lieu of the GRE. Applicants who have graduated from U.S. or Canadian dental or medical schools within three years of their application to the Ph.D. program may request that previous U.S. or Canadian DAT or MCAT scores be considered in lieu of the GRE.

Students may apply at any time. All students are strongly encouraged, however, to apply at least four months before the anticipated entry date. Students may enter the program in any semester, but summer or fall semester is recommended.

Courses—Refer to Oral Biology (OBIO) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward oral biology degree requirements is not permitted.

M.S. Degree Requirements

The M.S. 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 requires 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 a related nonclinical discipline (minimum 6 cr) and 10 thesis credits. Students must conform to the Graduate School’s GPA requirements for master’s degree students.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—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.

Ph.D. Degree Requirements

The Ph.D program in oral biology is designed as a 4-year program. The first year consists primarily of a core curriculum specified by the graduate faculty in that area of expertise. The core curriculum provides students with a working knowledge of the major concepts and research paradigms in that scientific area, a working vocabulary, and the basis for continued learning. During the first year, the graduate student also selects a laboratory, a research adviser, and a cutting-edge research problem for investigation and thesis preparation. During months 13 through 15 in residence, 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. During month 18, students present a brief research seminar consisting of preliminary data to evaluate the promise of success in the lab. Upon completion of this two-part preliminary examination of the thesis proposal, the student will work largely on thesis research through month 45 in residence. Months 45 through 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 six months before defense of the thesis. The dissertation is defended in month 48.

Although there is no Graduate School minimum credit requirement for the degree, students are expected to complete a core curriculum of 23–25 credits; all students must satisfactorily complete 8 credits of oral biology topics courses (8021–8028) and participate in the oral biology student seminar series (8030) each semester until graduation. 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.
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 are awarded concurrently.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—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.

Otolaryngology

Contact Information—Department of Otolaryngology, University of Minnesota, MMC 396, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-625-3200; fax 612-625-2101; www.ent.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Khalil Ahmed, ASM
Kathleen A. Daly, M2
Peter A. Hilger, M2
Steven K. Juhn, SM
Frank M. Lassman, ASM
Samuel C. Levine, M2
Robert H. Maisel, SM
Robert H. Margolis, SM
David A. Nelson, SM
Peter A. Santi, SM
Bevan Yueh, M2

Adjunct Professor
Michael M. Paparella, ASM

Associate Professor
John H. Anderson, SM
Markus Gapany, M2
George S. Goding Jr., M2
Jizhen Lin, M2
Rick M. Odland, M2
Frank G. Ondrey, SM
Frank L. Rimell, M2
James D. Sidman, AM2

Adjunct Associate Professor
Katherine A. Kendall, M2
Stephen L. Liston, AM

Assistant Professor
Holly C. Boyer, M2
Harley S. Dresner, M2
David D. Hamlar Jr., M2
Tina C. Huang, M2
Seth C. Janus, M2
Samir S. Kharwala, M2
Timothy A. Lander, M2
Amy Anne Lassig, M2
Deirdre D. Michael, M2
Derek J. Schmidt, M2
William E. Walsh, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—This program prepares students in both clinical and experimental aspects of otolaryngology. The M.S., M.S.Otol., and Ph.D.Otol. degrees require 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. Each student selects an adviser and prepares a preliminary research proposal by February 1 of the first year. A full proposal in NIH style is expected by June 1. Both proposals must be reviewed by the graduate research committee. A minimum of six months in basic research begins in the second year. Graduates of the program have careers in teaching, research, and professional practice.

Prerequisites for Admission—The M.S. requires a bachelor’s degree from an accredited university or equivalent. The M.S.Otol. requires an M.D. degree and is usually pursued in conjunction with a residency in otolaryngology. The Ph.D.Otol. 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. The admissions committee reviews previous academic records, letters of recommendation, etc.

Courses—Refer to Otolaryngology (OTOL) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Otolaryngology does not offer 4xxx courses. Use of 4xxx courses from other departments is permitted toward degree requirements with the permission of the director of graduate studies.

M.S. Plan A Degree Requirements

The M.S. (Plan A only) requires a minimum of 35 credits, including 25 course credits (19 in the major and 6 in the minor or related fields) and 10 thesis credits. 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. Students are expected to complete and publish a research paper in a peer-reviewed journal or a presentation/poster at a national scientific meeting.

Language Requirements—None.

Final Exam—The final exams are both written and oral. A grade of 70 percent or higher is expected on a national written exam.

M.S.Otol. Plan A Degree Requirements

The M.S.Otol. (Plan A only) requires a minimum of 35 credits, including 25 course credits (19 in the major and 6 in the minor or related fields) and 10 thesis credits. 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. Students are expected to complete and publish a research paper in a peer-reviewed journal or a presentation/poster at a national scientific meeting.

Language Requirements—None.

Final Exam—The final exams are both written and oral. A grade of 70 percent or higher is expected on a national written exam.

Ph.D.Otol. Degree Requirements

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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A minor is not available, but otolaryngology courses may be taken for related fields or supporting program credits.

Pharmaceutics

Contact Information—Department of Pharmaceutics, College of Pharmacy, University of Minnesota, Room 9-177 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-624-5153; fax 612-626-2125; pceuts@umn.edu; www.pharmacy.umn.edu/pharmaceutics).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Richard C. Brundage, ASM
Janet M. Dubinsky, ASM
William F. Elmuquist, SM
Ronald J. Sawchuk, SM
Henning Schroeder, SM
Ronald A. Siegel, SM
Raj G. Suryanarayanan, SM
Timothy Tracy, ASM
Timothy S. Wiedmann, SM
Cheryl L. Zimmerman, SM

Adjunct Professor
Keith K. Chan, ASM
William H. Frey II, ASM

Associate Professor
Carolyn A. Fairbanks, SM

Adjunct Associate Professor
Walid M. Awni, ASM
Zheng Jane Li, ASM
Evgenyi Y. Shalaev, ASM

Assistant Professor
Belinda Cheung, ASM
Jayanth Panyam, SM
Gregory Rutkowski, AM2
Chanquan Calvin Sun, SM
Chun Wang, ASM

Adjunct Assistant Professor
Laura S. Stone, ASM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Emphases are available in physical pharmacy, biopharmaceutics, and pharmacokinetics. Minor fields of particular value include biochemistry, biometry, chemistry, biomedical engineering, chemical engineering, mechanical engineering, pharmacology, and statistics.

Prerequisites for Admission—The pharmaceutics program considers students who possess a B.S. degree and an exceptional scholastic record from recognized colleges of pharmacy or other scientific fields.

Special Application Requirements—Undergraduate scholastic records, recent GRE scores, a statement of career goals, and three letters of recommendation are used to determine each candidate’s admissibility. Minimum GRE scores of 80 percentile are preferred for the quantitative and analytical sections (or 4.5 on the analytical writing section), as well as a preferred GPA of 3.20 from U.S. schools, and “First Class” or the equivalent on transcripts from foreign institutions. A minimum TOEFL score of 600 (paper), 250 (computer), or 100 (Internet) is preferred for applicants whose native language is not English. English admission is preferred and the deadline to apply is December 31. (Students who want to know their chances for admission before paying the application fee can use a pre-evaluation feature on the pharmaceutics Web site at www.pharmacy.umn.edu/pharmaceutics to determine if their credentials are competitive.)

Courses—Refer to Pharmaceutics (PHM) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted based on the approval of the graduate faculty and director of graduate studies.

M.S. Degree Requirements

Students are not admitted directly into the M.S. program. Pharmaceutics Ph.D. students may pursue an M.S. through a change of degree program. In addition to the coursework, a preliminary written exam and preparation of a thesis and its defense are required. Coursework for the M.S. includes 14 credits in 5xxx or 8xxx courses in the major, and 6 credits in one or more related fields outside the major to comprise a minimum of 20 credits for the degree. A complete list of degree program requirements can be obtained from the director of graduate studies. Additional courses are selected in consultation with the major adviser.

Language Requirements—None.

Final Exam—The final exam is oral.

Ph.D. Degree Requirements

The Ph.D. requires a minimum of 29 course credits in upper division (5xxx or above, including 12 credits in a minor or supporting program), and a collateral field with a minimum of 6 credits. Students must take advanced courses in pharmaceutics, chemistry, mathematics, statistics, and pharmacology. A complete list of degree program requirements may be obtained from the director of graduate studies. In addition, students complete a preliminary written exam, a written research proposal based on thesis research, a preliminary oral exam, and finally a thesis and its defense.

Language Requirements—One collateral field of knowledge chosen with the consent of the director of graduate studies is required. The field must have the approval of the director of graduate studies and the department head. The minor program must be declared prior to the oral examination.

Pharmacology

Contact Information—Graduate Program in Pharmacology, University of Minnesota, 6-120 Jackson Hall, 321 Church Street, S.E., Minneapolis, MN 55455 (612-625-0458; fax 612-625-8408; phclgrad@umn.edu; www.pharmacology.med.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Peter B. Bitterman, SM
Bianca M. Conti-Fine, SM
Richard M. Eisenberg, Duluth, SM
Robert P. Elde, SM
Esam E. El-Fakahany, SM
Patrick E. Hanna, SM
Stephen S. Hecht, SM
Louis M. Mansky, SM
Ping-Yee Law, SM
Horace H. Loh, SM
Paul R. Pentel, SM
**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 January 15 is strongly encouraged to ensure priority consideration for fellowships and research assistantships awarded for the next academic year. Students can be admitted any term, but typically start in fall semester.

**Research Facilities**—Graduate faculty members in the pharmacology program have state-of-the-art laboratories located in Hasselmo Hall, Moos Tower, Molecular and Cellular Biology, and Jackson Hall. The Basic Research Center on Molecular and Cell Biology of Drug Abuse is comprised of pharmacology program graduate faculty.

**Courses**—Refer to Pharmacology (PHCL) in the course section of this catalog for courses pertaining to this program.

**Use of 4xxx Courses**—Use of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

**M.S. Degree Requirements**

Plan A requires a minimum of 20 course credits (14 in pharmacology, and 6 in biochemistry, physiology and/or other related area) and 10 thesis credits. Plan B requires a minimum of 30 course credits (14 in pharmacology, and 16 in biochemistry, physiology, and/or other related areas) and a Plan B project.

Students are expected 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.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—A doctoral minor requires a minimum of 12 credits in pharmacology approved by the director of graduate studies in pharmacology. There are no special requirements (e.g., specific courses, written examination).

**Philosophy**

**Contact Information**—Department of Philosophy, University of Minnesota, 831 Walter Heller Hall, 271 19th Avenue South, Minneapolis, MN 55455-0310 (612-625-6563; fax 612-626-8380; umphil@umn.edu; www.philosophy.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**

Elizabeth S. Belfiore, Classical and Near Eastern Studies, ASM
Brian Bix, Law, SM
Norman E. Bowie, Strategic Management and Organization, ASM
B. Carl Elliott, Public Health, ASM
Eugene Garver, Philosophy, St. John’s University, ASM
Jeanette K. Gundel, Linguistics, ESL, and Slavic Languages and Literatures, AM2
William H. Hanson, SM
Geoffrey Hellman, SM
Jasper S. Hopkins, SM
Michael B. Kac, SM
Jeffrey P. Kahn, Public Health, ASM
Douglas E. Lewis, SM
Joseph I. Owens, SM
Sandra L. Peterson, SM
Naomi B. Scheman, SM
John R. Wallace, SM
C. Kenneth Waters, SM

**Associate Professor**

Sarah W. Holtman, SM
Michelle Mason, M2
Michael D. Root, (emeritus), SM
Valerie Tiberius, SM

**Assistant Professor**

Roy T. Cook, M2
Debra DeBruin, Public Health, AM2
Peter Hanks, M2
Alan Love, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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.

**Prerequisites for Admission**—A four-year B.A. or B.S. degree (or its equivalent) in a basic science program is generally required. Candidates for admission are evaluated on the basis of undergraduate record, GRE score, previous research experience, and letters of recommendation.
Curriculum — The Department of Philosophy offers both Ph.D. and M.A. degrees. Students are generally admitted to the Ph.D. program, while admission to the M.A. is generally intended for those with professional goals in other fields.

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.

Prerequisites for 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 Graduate School and the Department of Philosophy. The Graduate School Application is available online from the Graduate School Web site. The department application for admissions and aid is available from the Committee on Admissions and Aid at the address listed above or may be downloaded from the philosophy Web site, found at www.philosophy.umn.edu/programs /gradprogram/gradprogram.html.

Department applications should 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, Interdisciplinary Center for the Study of Global Change.

Applications, together with all supporting materials, must be received by January 7. The philosophy department generally admits students only for fall semester.

Courses — Refer to Philosophy (PHIL) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses — All philosophy 4xxx courses are available for graduate credit. Philosophy students may use any 4xxx philosophy course on their graduate degree program, but must register concurrently for a related 1-credit 8xxx workshop to receive graduate credit for the 4xxx course. Students from other majors may register for the related workshop with the permission of the instructor of the 4xxx course.

M.A. Degree Requirements

The M.A. is offered under two plans. Plan A requires 14 course credits in philosophy, 6 course credits outside the department, and 10 thesis credits. Plan B requires 24 course credits in philosophy, 6 course credits outside the department, and three Plan B papers. For details see Philosophy Department Degree Program: M.A., available as a PDF on the philosophy Web site.

Language Requirements — None.

Final Examination — The final examination is oral.

Minor Requirements for Students Majoring in Other 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.

Ph.D. Degree Requirements

No minimum credits are required for the Ph.D., though specific philosophy courses are required that total 26–28 credits; 24 thesis credits are also required. Successful second-year department review represents passing the preliminary written examination. Successful third-year department review, which includes passing a three-paper examination, represents 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 Philosophy Department Degree Program: Ph.D., available as a PDF on the philosophy Web site.

Language Requirements — None.

Minor Requirements for Students Majoring in Other Fields — 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.

Physical Therapy

Contact Information — Physical Therapy Program Office, University of Minnesota, MMC 388, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-624-2662; fax 612-625-4274; ptquest@umn.edu; www.physther.umn.edu).

For latest graduate faculty listings, see www .grad.umn.edu/faculty_rosters/faculty.html.

Professor

James R. Carey, SM
Richard P. DiFabio, SM
Carl G. Kukulka, SM
LaDora V. Thompson, SM

Associate Professor

Paula M. Ludewig, SM

Assistant Professor

Kathleen Anderson, SM
Lisa L. Dorsey, SM
Teresa J. Kimberley, SM
Dawn A. Lowe, SM
David J. Nuckley, SM
Becky J Olson-Kellogg, SM
LeAnn Snow, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum — 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 graduate study. Academic coursework and research activity are completed during the first seven semesters. The final two semesters are devoted to clinical internships.

Didactic Curriculum — During the first year of the program the curriculum involves the basic sciences, physical agents, biomechanical principles, and clerkship clinical experiences. The second year advances and integrates first-year coursework into evaluation skills, treatment techniques, and critical thinking. These tools
are utilized during second-year clerkships in orthopedics, rehabilitation, and wellness.

**Clinical Curriculum**—Students complete up to 40 weeks of clinical internships in addition to clinical clerkships imbedded in the academic curriculum. The full-time internships occur during the third year of the program. Each student completes clinical affiliations in the following areas: acute hospital, outpatient, rehabilitation, and a specialty area. These are under direct supervision of experienced clinical faculty and give each student the opportunity to combine theoretical skills with practical experience. Beyond direct patient care, students also develop skills and knowledge related to administration, management and supervision, education, and consultation. Graduates of the program are eligible to apply for state registration or licensure according to the laws of individual states.

**Prerequisites for Admission**—To be considered for admission, the student must complete a baccalaureate degree by June 1 of the year of application (no preferred major); an operational standard GPA of 3.00 for overall coursework and a 3.00 GPA in the physical therapy prerequisite coursework are the preferred minimum; and the student must complete at least 60 credit hours of college coursework. Submit a complete application for admission, including three letters of recommendation, a cumulative GPA of 2.80 while in the program.

**Language Requirements**—None.

**Physics**

**Contact Information**—Physics Program, School of Physics and Astronomy, University of Minnesota, 145 Tate Laboratory of Physics, 116 Church Street S.E., Minneapolis, MN 55455 (612-624-6366; fax 612-624-4578; grad@physics.umn.edu; www.physics.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Regents Professor**
Allen M. Goldman, SM

**Professor**

Benjamin F. Bayman, (emeritus), ASM
John H. Broadhurst, SM
Charles E. Campbell, SM
Cynthia A. Cattell, SM
Hans W. Courant, (emeritus), ASM
Paul A. Crowell, SM
Priscilla B. Cushman, SM
E. Dan Dahlberg, SM
Kris Davidson, Astronomy, SM
Michael Garwood, ASM
Robert D. Gehrz, Astronomy, SM
Clayton F. Giese, (emeritus), ASM
Anand Gopinath, Electrical and Computer Engineering, ASM
J. Woods Halley, SM
Shaul Hanany, SM
Kenneth Heller, SM
Cheng-Cher Huang, SM
Robert E. Humphreys, Astronomy, ASM
Terry J. Jones, Astronomy, ASM
Thomas W. Jones, Astronomy, SM
James Kakalios, SM
Alex Kamenev, SM
Joseph I. Kapusta, SM
Paul Kellogg, (emeritus), ASM
Uwe R. Kortshagen, Mechanical Engineering, ASM
Yuichi Kubota, SM
Robert L. Lysak, SM
Marvin Marshak, SM
Keith A. Olive, SM
Robert O. Pepin, SM
Earl A. Peterson, (emeritus), ASM
Ronald A. Poling, SM
Yong-Zhong Qian, SM
Serge Rudaz, SM
Keith Ruddick, (emeritus), ASM
Roger W. Rusack, SM
Mikhail Shifman, SM
Boris Shklovskii, SM
David Thomas, Biochemistry, Molecular Biology, and Biophysics, ASM
Arkady Vainshtein, SM
Oriol T. Valls, SM
Randall H. Vrba, Electrical and Computer Engineering, ASM
Mikhail Voloshin, SM
Thomas F. Walsh, SM
Renata M. Wentzcovitch, Chemical Engineering and Materials Science, ASM
John R. Wiggant, SM
William Zimmermann Jr., (emeritus), ASM

**Associate Professor**

Eric Ganz, SM
Alex Habib, ASM
Alexander Heger, SM
Chris Leighton, Chemical Engineering and Materials Science, ASM
David Morse, Chemical Engineering and Materials Science, ASM
Joachim Mueller, SM
Marco Peloso, SM
 Jianping Wang, Electrical and Computer Engineering, ASM
Lilly L. Williams, Astronomy, SM

**Assistant Professor**

Dan Cronin-Hennessy, SM
Richard Gran, Physics Duluth, ASM
Vuk Mandic, SM
Jeremiah Mans, SM
Vincent Noireaux, SM
Michael Zudov, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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.

**Prerequisites for Admission**—To be a physics major, an undergraduate major in physics or a strong undergraduate minor in physics is required.

**Special Application Requirements**—Teaching assistantships and a few fellowships are available on admittance to the School of Physics and Astronomy. 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 are required. 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.

**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 a TA must take a workshop on American teaching culture and language skills prior to the department orientation described above and also pass an English test, which is given in late July and August. If students do not pass, they must take a training course until they pass the test. The course is given during the academic year.

**Use of 4xxx Courses**—Use of 4xxx physics courses is permitted for either major or minor degree requirements with prior permission of the director of graduate studies.

**M.S. Degree Requirements**
The M.S. requires a minimum of 20 course credits (Plan A) or 30 course credits (Plan B), including classical physics (PHYS 5011–5012) or quantum mechanics (PHYS 5001–5002) and a minimum of 6 credits in a minor or related field; Plan A also requires 10 thesis credits. The minor requirement may be satisfied by completion of courses in one or two areas outside the specialization with an approval of the director of graduate studies in the minor field. Any course may be used to satisfy the related field requirement.

**Language Requirements**—There is no language requirement.

**Final Exam**—The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**—A physics minor requires a background in differential and integral calculus and one year of calculus-level college physics. 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).

### Planning

See Urban and Regional Planning.

### Plant Biological Sciences

**Contact Information**—Plant Biological Sciences Graduate Program, University of Minnesota, 250 Biological Sciences Center, 1445 Gortner Avenue, Saint Paul, MN 55108 (612-625-4222; fax 612-625-1738; pbiogp@umn.edu; www.cbs.umn.edu/PlantBio/gradprog).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Regents Professor**
Ronald L. Phillips, Agronomy and Plant Genetics, SM
Peter B. Reich, Forest Resources, SM

**Professor**
Deborah L. Allan, Soil, Water, and Climate, SM
David D. Biesboer, Plant Biology, SM
Robert M. Brambl, Plant Biology, SM
Iris D. Charvat, Plant Biology, SM
Jerry D. Cohen, Horticultural Science, SM
Anath Das, Biochemistry, Molecular Biology, and Biophysics, SM
Gary M. Gardner, Horticultural Science, SM
Florence K. Gleason, Plant Biology, SM
Robert J. Jones, Agronomy and Plant Genetics, SM
Paul A. Lefebvre, Plant Biology, SM
Albert H. Markhart III, Horticultural Science, SM
M. David Marks, Plant Biology, SM
David J. McLaughlin, Plant Biology, SM
Neil E. Olszewski, Plant Biology, SM
James A. Perry, Forest Resources, SM
Michael J. Sadowsky, Soil, Water, and Climate, SM
Ruth G. Shaw, Ecology, Evolution, and Behavior, SM
Carolyn D. Silflow, Plant Biology, SM
Kate VandenBosch, Plant Biology, SM
Daniel F. Voytas, Genetics, Cell Biology and Developmental Biology, SM
Susan M. Wick, Plant Biology, SM
Nevin D. Young, Plant Pathology, SM

**Adjunct Professor**
Ford Denison, Ecology, Evolution, and Behavior, SM
John W. Gronwald, Agronomy and Plant Genetics, SM
Deborah A. Samac, Plant Pathology, SM
Carol P. Vance, Agronomy and Plant Genetics, SM

**Associate Professor**
Neil O. Anderson, Horticulture, SM
James A. Bradeen, Plant Pathology, SM
Julie Etterson, Biology, Duluth, SM
J. Stephen Gaath, Plant Biology, SM
Susan I. Gibson, Plant Biology, SM
Jane Glazebrook, Plant Biology, SM
William Gray, Plant Biology, SM
Fumiko Katagiri, Plant Biology, SM
Georgiana May, Plant Biology, SM
Gary J. Muehlbauer, Agronomy and Plant Genetics, SM
Min Ni, SM
Alan G. Smith, Horticultural Science, SM
Peter Tiffin, Plant Biology, SM
Cindy B. Tong, Horticultural Science, SM
John M. Ward, Plant Biology, SM
George Weiblen, Plant Biology, SM

**Adjunct Associate Professor**
Les J. Szabo, Plant Pathology, SM

**Assistant Professor**
Clay Carter, Biology, Duluth, SM
Jeanine S. Haywood, Ecology, Evolution, and Behavior, SM
Adrian Hegeman, Horticultural Science, SM
Rebecca Montgomery, Forest Resources, SM
Jennifer S. Powers, Soil, Water, and Climate, SM
Imke Schmitt, Plant Biology, SM
Nathan Springer, Plant Biology, SM
Robert Stupar, Agronomy and Plant Genetics, SM

**Adjunct Assistant Professor**
David Garvin, Plant Biology, Duluth, SM
Rodney Venterea, Biology, Duluth, SM

### Other

Kevin Silverstein, Plant Biology, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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.

**Prerequisites for 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 January 1 is strongly encouraged to ensure priority consideration for fellowships and teaching research assistantships awarded for the next academic year.

**Courses**
Refer to Plant Biological Sciences (PBS) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**
Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

**M.S. Degree Requirements**
Course programs are planned in consultation with an advisory committee. Students are expected to take a minimum of four courses in the major in addition to a 1-credit current topics course taken during their first year. Students participate in a teacher-training program and then serve as teaching assistants for one semester. Regular attendance at the weekly plant biological sciences colloquium seminar is expected. Plan A students write a thesis proposal and present the results of their research at a colloquium seminar. Plan B students develop a thesis proposal.

**Language Requirements**
None, except as specified by the faculty adviser in consultation with the student.

**Final Exam**
The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**
A master’s minor requires a minimum of 6 credits approved by the director of graduate studies.

**Ph.D. Degree Requirements**
Doctoral requirements are the same as those for a master’s degree. In addition, a dissertation proposal and the presentation of two seminars are required.

**Language Requirements**
None, except as specified by a faculty adviser in consultation with the student.

**Minor Requirements for Students Majoring in Other Fields**
A doctoral minor requires a minimum of 12 credits approved by the director of graduate studies.

**Plant Pathology**

**Contact Information**
Department of Plant Pathology, University of Minnesota, 495 Borlaug Hall, 1991 Buford Circle, Saint Paul, MN 55108 (612-625-8200; plpathpg@umn.edu; www.plpa.cfans.umn.edu).

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.grad.umn.edu/faculty_rosters/faculty.html).

**Professor**
Robert A. Blanchette, SM
Robert Morgan Brambl, SM
Senyu Chen, SM
Carol A. Ishimaru, SM
Linda L. Kinkel, SM
James E. Kurler, SM
Benham E. L. Lockhart, SM
David H. MacDonald, SM
James A. Percich, SM
Brian J. Steffenson, SM
Carol E. Windels, SM
Nevin D. Young, SM

**Adjunct Professor**
Martin Carson, SM
H. Corby Kistler, SM
James Kolmer, SM
Deborah A. Samac, SM

**Associate Professor**
James M. Braden, SM
Jane Glazebrook, SM
Charla Hollingsworth, SM
Ruth Dill-Macky, SM

**Adjunct Associate Professor**
Yue Jin, SM
Jennifer Juzwik, SM
Les J. Szabo, SM

**Assistant Professor**
Dean K. Malvick, SM

**Adjunct Assistant Professor**
Jonathan S Schilling, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**
Plant pathology focuses on the biology of plant-microbe interactions, and incorporates research spanning the biochemical, molecular, genetic, physiological, whole organism, population, and community levels of biological organization. Plant pathologies interfaces with all plant science disciplines, and with food sciences, veterinary medicine, 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.

**Prerequisites for Admission**
Master’s degree applicants must have a sound college background in the basic biological and physical sciences and mathematics, including 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. All students accepted into the department with 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. Such a change in status must be approved by the student’s advisory committee and the director of graduate studies after consultation with the Graduate Studies Committee. 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.
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 and must be submitted to the department at the time of application. Students may apply at any time; however, submission of all application materials by January 10 will ensure priority consideration for fellowships and research assistantships for the next academic year. Students can be admitted any semester.

Courses—Refer to Plant Pathology (PLPA) in the course section of this catalog for courses pertaining to the program, or to the department Web site at www.plpa.agri.umn.edu.

Use of 4xxx Courses—For M.S. Plan A and Ph.D. students, 4xxx courses are not permitted toward degree requirements.

M.S. Degree Requirements
Plan A (thesis) and Plan B (without thesis) both require a minimum of 14 course credits in plant pathology and 6 course credits in a minor or related field. In addition, Plan A requires 10 thesis credits and Plan B requires 8 project or elective credits. Regular attendance at weekly plant pathology seminars is expected. Internships are encouraged as part of the graduate experience; 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 at www.plpa.agri.umn.edu.

Language Requirements—A foreign language is generally not required. However, knowledge of a foreign language may be necessary for students doing research in non-English-speaking countries.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 credits in PLPA 5xxx or 8xxx is required for a doctoral minor.

Policy Issues on Work and Pay

Postbaccalaureate Certificate

Contact Information—Policy Issues on Work and Pay, 101 Wesbrook Hall, 77 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4000; adv@cce.umn.edu; www.cce.umn.edu/certificates/mgmt/piwp). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Stephen F. Befort, Law School, M
John Budd, Human Resources and Industrial Relations, M
Morris Kleiner, Public Affairs, M

Associate Professor
Maria Hannaty, Public Affairs, M
Joseph Ritter, Applied Economics, M

Assistant Professor
Colleen Manchester, Human Resources and Industrial Relations, M

Other
James G. Scoville, Human Resources and Industrial Relations, M

Curriculum—The 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 Institute 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.

Prerequisites for Admission—Students must have a bachelor’s degree from an accredited U.S. university or its foreign equivalent. Applicants should have successfully completed mathematics courses at least up through algebra and a course in microeconomics (ECON 1101 is offered via distance education at the University). A GPA of 3.00 is required and, for international students, a TOEFL score consistent with the Graduate School’s requirements.

Courses—Core courses (5 cr): PA 5431 (3 cr); HRIR 5053 (2 cr). Elective courses: HRIR 5021 (4 cr); HRIR 5023 (2 cr); HRIR 8071 (4 cr); HRIR 8021 (3 cr); HRIR 8024 (2 cr); PA 8386 (3 cr); PA 5401 (3 cr); HIST 5844 (3 cr); LAW 6203 (3 cr); LAW 6231 (3 cr); APEC 5511 (3 cr)

Use of 4xxx Courses—4xxx courses may not be used to meet certificate requirements.

Certificate Requirements

The certificate consists of at least 15 credits: 5 credits in the core (required courses), and 10 credits of supporting electives. Courses are drawn primarily from the Humphrey Institute of Public Affairs and the Center for Human Resources and Labor Studies in the Carlson School of Management, with additional courses from the College of Liberal Arts, the Law School, and Applied Economics. 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. Note that some elective courses require prerequisites, which do not count toward the certificate.

Completion Requirements—Early in the program, each student should file a Certificate Program Plan with the College of Continuing Education indicating the courses that will be taken, subject to change with faculty approval. Completion of the certificate program requires completion of the indicated courses with core courses requiring a grade of B or better and with an overall GPA in certificate coursework of 3.00 or higher.
Political Psychology
Minor Only

Contact Information—Doctoral Minor in Political Psychology, Center for the Study of Political Psychology, University of Minnesota, 1325 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455; (612-624-0864; fax 612-625-2078; ppcenter@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
John L. Sullivan, Political Science, M

Professor
Patricia G. Avery, Curriculum and Instruction, M
Eugene Borgida, Psychology, M
Karlyn K. Campbell, Communication Studies, M
Ronald J. Faber, Journalism and Mass Communication, M
Dean Hewes, Communication Studies, M
Lawrence Jacobs, Humphrey Institute of Public Affairs, M
David W. Johnson, Educational Psychology, M
Paul E. Johnson, Information and Decision Sciences, M
Sally J. Kenney, Humphrey Institute of Public Affairs, AM
Geoffrey Maruyama, Educational Psychology, M
Wendy M. Rahn, Political Science, M
Alexander J. Rothman, Psychology, M
W. Phillips Shively, Political Science, M
Mark Snyder, Psychology, M
Daniel B. Wackman, Journalism and Mass Communication, M

Associate Professor
Christopher Federico, Psychology, Political Science, M
Martha H. Gonzales, Psychology, M
Paul Goren, Political Science, M
Joanne M. Miller, Political Science, M
Martin W. Sampson III, Political Science, M
Brian Southwell, Journalism and Mass Communication, M
Albert R. Tims Jr, Journalism and Mass Communication, M

Assistant Professor
Marco Yzer/Eric Southwell, Journalism and Mass Communication, AM

Curriculum—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 10 programs within the Graduate School and Law School.

Prerequisites for Admission—Admission is contingent upon prior admission to the Graduate School and a doctoral program in a degree-granting department. Applicants are required to demonstrate knowledge of research methods useful in the study of political psychology by successfully completing (with a grade of B or better) two or more methodology courses. Examples include POL 8123, 8129; PSY 8814, 8815; STAT 5021, 5302. Other courses from these and other departments are acceptable. Students should consult with the director of graduate studies prior to enrolling in a course to confirm that it satisfies this requirement. Finally, the director of graduate studies in political psychology must approve admission.

Courses—Contact the minor program office for information on relevant coursework.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to director of graduate studies approval.

Minor Only Requirements
The doctoral minor requires a minimum of 14 graduate credits, including 8 credits in required courses and 6 credits in at least two electives from outside the student’s department. Students are able to tailor the minor to complement their major programs. The required courses are POL 8307, 8308 or PSY 8211, 8212—Proseminar in Political Psychology (2 cr); POL 8311—Political Psychology and Socialization (3 cr); and PSY 8201—Social Cognition (3 cr). Contact the director of graduate studies for more details.
of the application file. The committee accepts students who have or are completing B.A. or B.S. degrees and students who have or are completing M.A. degrees.

Special Application Requirements—All students are admitted directly into the Ph.D. program. The following should be sent directly to the department: department application form; GRE scores; a complete set of transcripts in addition to that required by the Graduate School; a brief statement expressing the applicant’s purpose and goals in pursuing graduate work (in addition to and separate from the statement required as part of the Graduate School application form); three letters of recommendation from professors who know the applicant’s academic work, particularly in political science; samples of the applicant’s written work (papers written for political science courses preferred); and a curriculum vitae. Send photocopies of written work; the department cannot guarantee that materials will be returned.

Graduate study in the Ph.D. program must begin in fall semester; the application deadline is December 15.

The department and the Humphrey Institute of Public Affairs jointly offer a program that leads to an M.A. in public affairs and a Ph.D. in political science. To be eligible, students must be admitted separately by political science and public affairs. Normally, students begin their study in public affairs and later apply to the Ph.D. program in political science. However, students may begin in either program, so it is possible to apply initially to either program or both. Students interested in this joint degree program should contact the director of graduate studies.

Courses—Refer to Political Science (POL) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for course listings pertaining to the program.

Use of 4xxx Courses—4xxx and 5xxx courses from other departments usually are acceptable for supporting or minor programs with approval of the department that teaches the course. Political science courses at these levels are generally not open to Ph.D. students, who are expected to take 8xxx seminars.

M.A. Degree Requirements

Plan B Only

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 while pursuing their doctorate.

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.

Language Requirements—None.

Final Exam—The final exams are written and oral.

Ph.D. Degree Requirements

The program is divided into five subfields: American politics, comparative politics, political theory, international relations, and formal models and methodology. A joint M.A.–Ph.D. program, which leads to an M.A. in public affairs from the Hubert H. Humphrey Institute of Public Affairs and a Ph.D. in political science, is also available. Students concentrate in two of the five subfields and take a minimum of nine political science seminars, including POL 8101 and the core seminars in each of their subfields (POL 8120, 8201, 8301, 8401, 8601). In addition, they take three advanced seminars in their first subfield and three in their second, or four advanced seminars in their first subfield and two in their second subfield (formal models and methodology can be used only as a second subfield).

Language Requirements—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.

Students who concentrate in comparative politics must have appropriate language competence in their area(s) of specialization.

Population Studies

Minor Only

Contact Information—Department of Sociology, University of Minnesota, 909 Social Sciences, 267 19th Avenue South, Minneapolis, MN 55455 (612-624-4300; fax 612-624-7020; popstudies@pop.umn.edu; www.pop.umn.edu/training/population-minor).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

Professor

John S. Adams, (emeritus), Geography, M Ragui A. Assaad, Humphrey Institute of Public Affairs, M
John M. Eyler, History of Medicine, M
Katherine Fennelly, Humphrey Institute of Public Affairs, M
Paul W. Glewwe, Applied Economics, M
Robert E. McCaa, History, M

Phyllis E. Moen, Sociology, M
Jeylan T. Mortimer, Sociology, M
Samuel L. Myers Jr., Humphrey Institute of Public Affairs, M
Steven Ruggles, History, M

Associate Professor

Kathleen Thiede Call, Health Policy and Management, M
Jeffrey R. Crump, Design, Housing, and Apparel, M
Elizabeth E. Davis, Applied Economics, M
Wendy L. Hellerstedt, Epidemiology, M
Deborah Levison, Humphrey Institute of Public Affairs, M
Ian Ross Macmillan, Sociology, M
J. Michael Oakes, Epidemiology, M
Joan M. Patterson, Epidemiology, M
Lisa Park, Sociology, M
John Robert Warren, Sociology, M

Assistant Professor

Cawo Abdi, Sociology, M
Michael E. Davern, State Health Access Data Assistance Center, M
Eric Grodsky, Sociology, M
Carolyn Liebler, Sociology, M
Ann Meier, Sociology, M

Research Associate

Pamela Jo Johnson, Minnesota Population Center, M
Miriam L. King, Minnesota Population Center, M

Curriculum—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.

Prerequisites for Admission—Enrollment in the population studies minor program is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. Students need not formally apply to enroll in the minor; any student currently in good standing in the Graduate School may elect to complete the minor by fulfilling the requirements and filing a Program Completion Form with the director of graduate studies.

Special Application Requirements—None.

Courses—Refer to the minor program Web site at www.pop.umn.edu/training/population-minor for information on coursework pertaining to the program.

Use of 4xxx Courses—4xxx courses may not be included on Degree Program Forms for the population studies minor.

Language Requirements—None.
Minor Only Requirements
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).

Prevention Science
Minor Only
Contact Information—Prevention Science Program, 202 Child Development, 51 East River Parkway, Minneapolis, MN 55455 (612-625-4321; fax: 612-624-6373; prevsci@umn.edu; www.preventionscience.umn.edu).

For the latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Gerald August, Psychiatry, M
Helen Q. Kivnick, Social Work, M
Morris M. Kleiner, Public Affairs, AM
Ann S. Mastan, Child Development, M
Arthur J. Reynolds, Child Development, M
John L. Romano, Educational Psychology, M
Esther F. Wattenberg, Social Work, AM
Maureen R. Weiss, Kinesiology, M

Associate Professor
Nicola Alexander, Educational Policy and Administration, M
Michael L. Bloomquist, Psychiatry, AM
Jayne Fulkerson, Nursing, M
Richard M. Lee, Psychology, M
Linda L. Lindeke, Nursing, AM
Joan Patterson, Epidemiology, AM
Judy Temple, Applied Economics, M
Diane Wiese-Bjornstal, Kinesiology, M

Assistant Professor
Darin J. Erickson, Epidemiology, M
Abigail Gewirtz, Family Social Services, M

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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.

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.

Initially, six areas of concentration will be offered. Students will be expected to select one as a major emphasis. Proposed initial areas of concentration are: 1) promotion of mental health and wellbeing across the lifespan; 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.

Prerequisites for Admission—Students must have gained admission to a master’s or doctoral degree-granting program within the Graduate School, and have prepared a minor program of coursework approved by the director of graduate studies in prevention science. Doctoral students must apply prior to their preliminary oral.

Special Application Requirements—Students are required to make formal application. The admission application must include an Application Form, which can be downloaded from www.cehd.umn.edu/icd/PrevSci/admission.html; a statement of interest; documentation of enrollment as a master’s or doctoral student (current unofficial transcript is acceptable); and specification of an area of concentration within the minor.

Courses—Refer to Prevention Science Minor (PREV) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program. Contact the minor program office for information on other relevant courses.

Use of 4xxx Courses—4xxx courses are not allowed in the minor.

Minor Only Requirements
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 master’s minor requires at least 9 credits, including PREV 8001—Introduction to Prevention Science (3 cr) and 6 credits of elective courses primarily from the student’s area of concentration.

The doctoral minor requires at least 13 credits, ordinarily including PREV 8001—Introduction to Prevention Science (3 cr), PREV 8005—Capstone course (1 cr), and 9 credits of elective courses primarily from the student’s area of concentration.

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 Evaluation
Minor Only
Contact Information—Director of Graduate Studies, Program Evaluation Program, University of Minnesota, 330 Wulling Hall, 86 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-1006; fax 612-624-3377; kingx004@umn.edu; http://education.umn.edu/EdPA/Evaluation/minor.html).

For the latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Michael Baizerman, Social Work, M
Nancy N. Eustis, Public Affairs, M
Judith Garrard, Public Health, M
David R. Johnson, Institute on Community Integration, M
Jean A. King, Educational Policy and Administration M
Richard A. Krueger, Educational Policy and Administration, M
Frances P. Lawrenz, Educational Psychology, M
Arthur J. Reynolds, Institute of Child Development, M
Karen R. Seashore, M

Associate Professor
Stuart Yeh, Educational Policy and Administration M
Research Associate

Debra Ingram, Center of Educational Improvement, M
Valerie Ruhe, Center for Teaching and Learning Services, M

Curriculum—A minor in program evaluation may be pursued at both the doctoral and the master’s levels. The core of the curriculum consists of courses in the foundations of evaluation, evaluation theory, and internship experiences.

Prerequisites for Admission—Prior admission into an established M.A. or Ph.D. is required. Admission to the minor, therefore, will be contingent upon enrollment in good standing within a recognized degree-granting program of the Graduate School.

Special Application Requirements—Students apply for admission through the 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 EdPA and EPsy are not eligible for the minor.

Courses—Refer to Educational Policy and Administration (EDPA), Educational Psychology (EPSY), Family Social Science (FSOS), Public Health (PUBH), and Work and Human Resource Education (WHRE) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses is not permitted.

Minor Only Requirements

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.

Psychology

Contact Information—Department of Psychology, University of Minnesota, S253 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-624-4181; fax 612-626-2079; psyapply@umn.edu; http://www.psych.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor

Ellen S. Berscheid, SM
Megan R. Gunnar, Child Development, ASM
Matthew K. McGue, SM

Professor

Joyce E. Bono, ASM
Eugene Borgida, SM
Thomas J. Bouchard Jr., SM
Dwight A. Burkhart, SM
John P. Campbell, SM
Marilyn E. Carroll, Psychiatry, ASM
Sandra L. Christenson, Educational Psychology, ASM
Scott J. Crow, Psychiatry, AM2
Bruce N. Cuthbert, SM
Mark L. Davison, Educational Psychology, ASM
René V. Dawis, (emeritus), ASM
Byron Egeland, Child Development, ASM
Stephen A. Engel, SM
Patricia A. Frazier, SM
Theresa M. Glomb, Human Resources and Industrial Relations, AM2
Jo-Ida C. Hansen, SM
Dorothy K. Hatsuakami, Psychiatry, ASM
Sheng He, SM
William G. Iacono, SM
Paul E. Johnson, Information and Decision Sciences, ASM
Daniel J. Kersten, SM
Thomas J. Kiresuk, Psychiatry, AM2
Eric Klinger, (emeritus), Social Sciences, Morris, ASM
Matt G. Kushner, Psychiatry, ASM
Gordon E. Legge, SM
Gloria R. Leon, (emeritus), ASM
Allen S. Levine, Psychiatry, ASM
Rodney G. Loper, (emeritus), Counseling and Consulting Services, ASM
Angus MacDonald III, SM
Chad J. Marsolek, SM
Ann S. Masten, Child Development, ASM
Michael H. Miner, Family Medicine and Community Health, AM2
Deniz S. Ones, SM
J. Bruce Overmier, SM
Christopher J. Patrick, SM
Herbert L. Pick Jr., Child Development, ASM
William N. Robiner, Medicine, AM
Alexander J. Rothman, SM
Paul R. Sackett, SM
Jeffry A. Simpson, SM
Mark Snyder, SM
L. Alan Sroufe, Child Development, ASM
Thomas Stoffregen, Kinesiology, ASM
Auke Tellegen, (emeritus), ASM
Travis Thompson, Pediatrics, ASM
Paul van den Broek, Educational Psychology, ASM
Neal F. Vie.meister, SM
Niels G. Waller, SM
Connie R. Wanberg, Human Resources and Industrial Relations, ASM
Richard A. Weinberg, Child Development, ASM
David J. Weiss, SM
James E. Ysseldyke, Educational Psychology, ASM

Associate Professor

Kathy J. Christensen, Neurology, AM2
Christopher M. Federico, SM
Charles R. Fletcher, SM
Jonathan C. Gewirtz, SM
Martha H. Gonzales, SM
William M. Grove, SM
Darwin D. Hendel, Educational Policy and Administration, AM2
Yuhong Jiang, M2
Wilma Koutstaal, SM
Richard M. Lee, SM
Monica Luciana, SM
Traci L. Mann, M2
Andrew J. Oxenham, SM
Gail Burton Peterson, SM
Scott R. Ponsheim, Psychiatry, AM2

Adjunct Associate Professor

Celia E. Gershenson, AM2
Harriett L. C. Haynes, University Counseling and Consulting Services, AM

Assistant Professor

James P. Cleary, Neurology, AM2
Colin G. DeYoung, SM
Nathan R. Kuncel, SM
Cheryl A. Olman, M2
Patricia A. Pardo, Psychiatry, AM2
Joe Rausch, M2
Paul R. Schrater, SM
Mark J. Thomas, M2
Linda K. Van Egeren, AM2

Adjunct Assistant Professor

Abigail Gewirtz, Child Development, AM
John C. Gonsiorek, AM2

Research Associate

Christophe D. Micheyl, AM
Carol B. Peterson, Psychiatry, AM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Students are admitted only for the Ph.D. degree. Doctoral program specialties are offered in biological psychopathology, clinical science and psychopathology research, cognitive and biological psychology, counseling psychology, industrial/organizational psychology, personality, individual differences, and behavior genetics, quantitative/psychometric methods, school psychology, and social psychology.

Prerequisites for Admission—Prospective students generally have completed 12 credits (three to four courses) of psychology work beyond introductory psychology, including one course in statistics or psychological measurement. For the clinical science program, a course in abnormal psychology is required. An undergraduate major in psychology is desirable, but not necessary.

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; a photocopy of transcripts; and scores from the General Test of the GRE should accompany applications. The GRE Subject Test in psychology is strongly recommended. Applicants whose native language is not English should submit the results of the TOEFL IBT. Although there are no specific required minimums for GPAs and GRE scores, the range of scores for those admitted in previous years, as well as other specific requirements, are available from the psychology Web site at www.psych.umn.edu.

Courses—Refer to Psychology (PSY) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Certain 4xxx courses may be taken for graduate credit. Students should consult the instructor or director of graduate studies.

M.A. Degree Requirements

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; for Plan B, it may be written, oral, or both.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires a minimum of 6 credits, with specific courses determined in consultation with an adviser and other faculty.

Ph.D. Degree Requirements

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 area requirements. The programs 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 12–15 credits in a minor or supporting program.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—The doctoral minor requires a minimum of 12 credits and is designed according to student needs.

Public Affairs

Contact Information—Director of Graduate Student Services, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax 612-626-0002; hhhadmit@umn.edu; www.hhh.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

Professor

Ragui A. Assaad, M2
J. Brian Atwood, M2
Michael Barnett, M2
John M. Bryson, M2
Nancy N. Eustis, M2
Katherine Fennelly, M2
Edward G. Goetz, M2
Stephen A. Hoenack, M2
Lawrence R. Jacobs, M2
Sally J. Kenney, M2
Morris H. Kleiner, M2
Robert T. Kudrle, M2
Greg H. Lindsey, M2
Samuel L. Myers, M2
Joe Soss, M2

Associate Professor

Barbara Crosby, M2
Maria J. Hanratty, M2
Jennifer Kuzma, M2
Deborah Levison, M2
Joseph A. Ritter, M2
Jodi R. Sandfort, M2
Melissa M. Stone, M2
Judy Temple, M2

Assistant Professor

Ryan P. Allen, M2
Jason Cao, M2
Yingling Fan, M2
Greta Friedemann-Sanchez, M2
Carissa Schively Slotterback, M2
Elizabeth J. Wilson, M2
Zhirong Zhao, M2

Other

Steven P. Andreasen, AM
Harry C. Boyte, M2
Gary M. DeCramer, M2
Kaye Husbands Fealing, AM2
Sherry Gray, M
Steve Kelley, M1
P. Jay Kiedrowski, M2
Lee Munich, M2
Joseph H. Nathan, M2
Timothy Penny, AM
Sudha Shetty, M
Paul C. Stone, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The master of public affairs (M.P.A.) is intended for mid-career professionals. This program prepares mid-career students for public leadership and policy making. Completion of degree requirements is possible within a calendar year (two semesters and a summer) of full-time enrollment, or two to three years of part-time enrollment. Structured concentrations include advanced policy analysis methods; economic and community development; global public policy; public and nonprofit leadership and management; science, technology and environmental policy; social policy; women and public policy; land use/urban design planning; economic and workforce development; housing and community development; environmental planning; and transportation planning.

Prerequisites for Admission—Ten years or more of career or public affairs experience, basic competency in computers, and a U.S. bachelor’s degree or foreign equivalent are required.

Special Application Requirements—In addition to the materials submitted to the Graduate School, applicants must submit to the Humphrey Institute a photocopy of the Graduate School Admission Application, a Humphrey Institute Applicant Data Form, copies of all transcripts, a statement of purpose, at least three letters of recommendation, and a professional résumé. Entry is for fall and spring semesters. The deadline for applications is April 1 of the preceding academic year for fall and October 15 for spring.

Courses—Refer to Public Affairs (PA) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses Degree Program Forms is permitted with instructor’s and adviser’s permission.

M.P.A. Degree Requirements

The M.P.A. requires 30 credits, including PA 5941—Leadership for the Common Good (4 cr), PA 8001—Transforming Public Policy (4 cr), and PA 8002—Synthesis Workshop or an equivalent capstone workshop (4 cr); 9 credits in concentration courses; 6 credits in skills courses; and 3 credits of electives.

Language Requirements—None.
**Public Art**

**Minor Only**

**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).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**
Diane Katsiaficas, Art, M
Thomas A. Rose, Art, M

**Associate Professor**
Jane M. Blocker, Art History, M
Lyndel I. King, Art History, M
Rebecca J. Krinke, Landscape Architecture, M
Kristine F. Miller, Landscape Architecture, M

**Assistant Professor**
Christine A. Baemler, Art, M

**Lecturer**
Craig A. Amundsen, Public Space Design M
Diane A. Mullin, Art History, M

**Curriculum**—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.

**Prerequisites for 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.

**Courses**—Contact the minor program office for the most current information on relevant coursework pertaining to this program.

**Minor Requirements**—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.

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**Public Health**

**Minor Only**

**Contact Information**—Student Services Center, School of Public Health, University of Minnesota, MMC 819, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-3500 or 1-800-774-8636; fax 612-624-4498; sph.ssc@umn.edu; www.sph.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**
Michael Baizerman, Social Work, M
Judith M. Garrard, M
Ann W. Garwick, Nursing, M
Susan G. Gerberich, M
Bernard L. Harlow, M
Robert W. Jeffery, M
Barbara J. Leonard, Nursing, M
A. Marshall McBean, M
Patricia M. McGovern, M
Lisa A. Peterson, M
Michael D. Resnick, Pediatrics, M
Francois Sainfort, M
William A. Toscano, M

**Associate Professor**
Kristin E. Anderson, M
Jeff B. Bender, M
Leslie A. Grant, M
Linda L. Halcon, Nursing, M
Rhonda J. Jones-Webb, M
James S. Pankow, M
Joan M. Patterson, M
Renee E. Sieving, Nursing, M

**Assistant Professor**
Carolyn M. Garcia, Nursing, M
Melissa A. Nelson, AF
Peter C. Raynor, M

**Clinical Assistant Professor**
Mary J. Findorff, Nursing, M

**Curriculum**—The public health minor is available to master’s (M.A. and M.S.) and doctoral students.

**Prerequisites for Admission**—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. Students enrolled in graduate programs within the School of Public Health are not eligible for this minor.

**Special Application Requirements**—Students declaring a minor in public health should contact the director of graduate studies in public health early as possible. Enrollment is contingent upon approval of the application by the director of graduate studies, after which a minor program adviser(s) is assigned.

**Courses**—Refer to Public Health (PUBH) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Use of 4xxx courses is not permitted.

**Minor Only Requirements**
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.

**Language Requirements**—None.

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**Public Policy**

**Contact Information**—Director of Graduate Student Services, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax 612-626-0002; hhhadmit@umn.edu; www=hhh.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Professor**
Ragui A. Assaad, M2
J. Brian Atwood, M2
Michael Barnett, M2
John M. Bryson, M2
Nancy N. Eustis, M2
Katherine Fennelly, M2
Edward G. Goetz, M2
Stephen A. Hoenack, M2
C. David Hollister, AM
Lawrence R. Jacobs, M2
Sally J. Kenney, M2
Morris M. Kleiner, M2
Robert T. Kudrle, M2
Greg H. Lindsey, M2
Samuel L. Myers, M2
Joe Soss, M2
Associate Professor
Barbara Crosby, M2
Maria J. Hanratty, M2
Jennifer Kuzma, M2
Deborah Levinson, M2
Joseph A. Ritter, M2
Jodi R. Sandfort, M2
Melissa Stone, M2
Judy Temple, M2

Assistant Professor
Ryan P. Allen, M2
Jason Cao, M2
Yingling Fan, M2
Greta Friedemann-Sanchez, M2
Carissa Schively Slotterback, M2
Elizabeth J. Wilson, M2
Zhirong Zhao, M2

Other
Steven P. Andreassen, AM
Sheila D. Ards, AM2
Harry C. Boyte, M2
Gary DeCramer, M2
Kaye Husbands Fealing, AM2
Sherry Gray, M
Steve Kelley, M2
P. J. Kiedrowski, M2
Lee W. Munnich, M2
Joseph H. Nathan, M2
Timothy Penny, AM
Sudha Shetty, M
Paul C. Stone, M2

Special Application Requirements—In addition to the materials submitted to the Graduate School, applicants must submit to the Humphrey Institute a photocopy of the Graduate School Application, the Humphrey Institute Applicant Data Form, copies of all academic transcripts, a statement of purpose, at least three letters of recommendation, a GRE official score report, and a professional résumé or C.V. Students who wish to be considered for financial aid should apply no later than January 5 of the preceding academic year. Deadline for admission only is April 1. Entry is for fall semester.

Courses—Refer to Public Affairs (PA) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses towards degree requirements is permitted with instructor’s and adviser’s permission.

M.P.P. Degree Requirements
The M.P.P. requires 45 credits—approximately 20 credits in required core courses, a three-course concentration (9 credits minimum), and a 3-credit course to complete the professional paper. Remaining credits are taken in elective courses. A noncredit internship is also required, unless the student is exempted based on previous relevant employment. Students may pursue a minor.

Language Requirements—None.
Final Exam—Final oral presentation is required.

Minor Requirements for Students Majoring in Other Fields—A minor is constructed in consultation with the student’s minor adviser.

Quaternary Paleoecology
Minor Only

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; qpminor@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Thomas C. Johnson, Geological Sciences, Large Lakes Observatory, Duluth, M

Professor
Subir K. Banerjee, Geology and Geophysics, M
James Cotner, Ecology and Geophysics, M
R. Lawrence Edwards, Geology and Geophysics, M
Guy E. Gibbon, Anthropology, M
Emi Ito, Geology and Geophysics, M
Edward A. Nater, Soil, Water, and Climate, M
Peter S. Wells, Anthropology, M

Associate Professor
David L. Fox, Geology and Geophysics, M
Katherine Klink, Geography, M
Martha Tappen, Anthropology, M

Assistant Professor
Kurt F. Kipfmüller, Geography, M
Susy S. Ziegler, Geography, M

Adjunct Professor
Daniel R. Engstrom, Geology and Geophysics, AM

Curriculum—The faculty of the graduate minor in quaternary paleoecology 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.

Prerequisites for Admission—Admission is contingent on prior admission to a Graduate School degree-granting program.

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 recommendation from their current adviser. Application may be made at any time.

Courses—Contact the director of graduate studies at qpminor@umn.edu for information on relevant coursework.

Use of 4xxx Courses—Any 4xxx course that meets the approval of the director of graduate studies may be used to satisfy the minor requirement.

Minor Only Requirements
Students develop their curricula in consultation with their major advisers and the director of graduate studies in quaternary paleoecology. Students choose courses from relevant fields outside their major field. Master’s students must take a total of 6 credits. Ph.D. students take a total of 9 credits (one course may be in the major field). Some requirements may be waived depending on the student’s background.
Rehabilitation Science

Contact Information—Program in Rehabilitation Science, MMC 388, 420 Delaware Street S.E., Minneapolis, MN 55455, (612-625-3966; fax 612-625-4274; adm002@umn.edu; www.med.umn.edu/rehabscience/).

For latest faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
James Carey, SM
Richard DiFabio, SM
Carl Kukulka, SM
Walter C. Low, SM
Robert Patterson, SM
LaDora Thompson, SM

Associate Professor
Dennis Dykstra, SM
Paula Ludewig, SM
Virgil Mathiowetz, SM
Erica Stern, SM

Assistant Professor
Kathleen Anderson, SM
Lisa Dorsey, SM
Teresa Jacobson Kimberley, SM
Dawn Lowe, SM
David J. Nuckley, SM
Patricia Schaber, SM
LeAnn Snow, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The graduate program in rehabilitation science is a post-professional program designed to train researchers and academicians. The rehabilitation science M.S. and Ph.D. degrees are geared to occupational and physical therapists and students with related interests. 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.

Prerequisites for 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. A GPA of 3.00 is preferred and applicants must have an agreement from a rehabilitation science faculty member to serve as an adviser. Compatibility of research interests is a major determinant in the selection of a student/adviser relationship.

Special Application Requirements—In addition to the Graduate School’s application (including personal statement and fee), applicants must submit the following materials: GRE General Test scores; official transcripts; three letters of reference; and TOEFL score for international students.

Courses—Refer to Rehabilitation Science (RSC) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms requires adviser and director of graduate studies approval. The use of 4xxx courses on Degree Program Forms is highly discouraged.

M.S. Degree Requirements
Plan A (thesis) requires a minimum of 33 credits: a minimum of 14 credits in the major, including 4 credits of rehabilitation science seminar (RSC 8100) and a research design course in rehabilitation science; a minimum of 6 credits in a minor or related field; 3 credits in statistics (EPSY 5261 or equivalent); and a minimum of 10 thesis credits (RSC 8777). In place of the 10 thesis credits for Plan A, Plan B (without thesis) requires courses chosen in consultation with an adviser and a Plan B project. Students must maintain a 3.00 minimum GPA for all coursework taken in the program. The Graduate School requires ethics in research training. Students should work with an adviser to identify a plan to meet this requirement. For additional information, visit www.research.umn.edu/ethics or contact the program.

Language Requirements—None.

Final Exam—For Plan A, the final exam is oral; for Plan B, it may be written, oral, or both.

Ph.D. Degree Requirements
The Ph.D. requires a minimum of 36 course credits: 16 credits in core courses, including 6 credits of rehabilitation science seminar RSC 8100; 12 credits in a minor or supporting program; 8 credits in statistics (credits earned in core courses and statistics cannot be applied to the minor or supporting program); and 24 thesis credits. Students must maintain a 3.00 minimum GPA for all coursework taken in the program. In addition to these minimum requirements, the adviser may require additional courses. The Graduate School requires ethics in research training. Students should work with an adviser to identify a plan to meet this requirement. For additional information, visit www.research.umn.edu/ethics or contact the program.

Language Requirements—None.

Religious Studies

Minor Only

Contact Information—Director of the Program in Religious Studies, University of Minnesota, 245 Nicholson Hall, 216 Pillsbury Avenue S.E., Minneapolis, MN 55455 (612-625-3553; re1s@umn.edu).

For latest faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Frederick M. Asher, Art History, M
Bernard S. Bachrach, History, M
Iraq Bashiri, History, M
Penny Edgell, Sociology, M
Caesar E. Farah, African American and African Studies, M
Jasper S. Hopkins, Philosophy, M
Riv-Ellen Prell, American Studies, M
Calvin J. Roetzel, Classical Near Eastern Studies, M
Theofanis G. Stavrou, History, M
James D. Tracy, History, M
Ann Waltner, History, M

Associate Professor
Bernard M. Levinson, Classical Near Eastern Studies, M
Philip H. Sellew, Classical Near Eastern Studies, M

Other
Jeanne Kilde, M

Curriculum—The minor in religious studies is available to master’s (M.A. and M.S.) and doctoral students in relevant fields such as history, classics, English, anthropology, philosophy, and American studies, and is under the general direction of members of the graduate faculty who represent a broad spectrum of disciplines.

Prerequisites for Admission—Admission is contingent on prior admission to a master’s or doctoral degree-granting program within the Graduate School.

Special Application Requirements—Students should consult with the director of graduate studies for the program as early as possible, and in any case no later than their third semester of study. The director of graduate studies must approve the applicant’s proposed course of study and sign the student’s Degree Program Form.
**Rhetoric and Scientific and Technical Communication**

**Contact Information**—Department of Writing Studies, University of Minnesota, 180 Westbrook Hall, 77 Pleasant Street S.E., Minneapolis, MN 55455; (612-624-3445; fax 612-624-3617; WRIT@umn.edu; www.writestudies.umn.edu)

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

**Professor**

Carol Ann Berkenkotter, SM  
Karyn K. Campbell, Communication Studies, ASM  
Ann Hill Duin, SM  
Shirley N. Garner, English, ASM  
Alan G. Gross, Communication Studies, ASM  
Laura J. Gurak, SM  
Joseph A. Konstan, Computer Science and Engineering, ASM  
Earl E. McDowell, SM  
Donald J. Ross Jr., SM  
Edward A. Schiappa, Communication Studies, ASM  
Mary M. Lay Schuster, SM  
Elaine E. Tarone, ILES, ASM  
Bille J. Wahlstrom, SM  
Arthur E. Walzer, Communication Studies, ASM

**Associate Professor**

Lisa Albrecht, School of Social Work, AM  
Lee-Ann Kastman Breuch, SM  
Robert L. Brown Jr., Cultural Studies and Comparative Literature, ASM  
Patrick L. Bruch Jr., Postsecondary Teaching and Learning, AM2  
Richard J. Graff, SM  
Ronald W. Greene, Communication Studies, ASM  
John Logie, SM  
Bernadette C. Longo, SM  
Daniel J. Philippon, English, ASM  
Thomas Reynolds, M2  
Kirt H. Wilson, Communication Studies, ASM

**Other**

Kirsten Jamsen, Center for Writing, M

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—The M.A. and Ph.D. in rhetoric and scientific and technical communication prepare students to address complex issues in language, science, and technology. The programs are flexible enough to allow students to approach their studies from a variety of perspectives and research methods. These programs prepare students for teaching at a university and conducting research in rhetoric and scientific and technical communication. The programs can also prepare students for specialist positions in industry and government that require the analysis and design of human communication systems. Required courses include theory, research, and practice in rhetoric and scientific and technical communication; analysis of scientific or technical discourse; and coursework in a minor or related field.

All M.A. and Ph.D. applicants must meet the admission requirements of the Graduate School. M.A. and Ph.D. 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.

**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 Graduate School. Nonnative speakers of English are required to take the TOEFL 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.

**Courses**—Refer to Writing Studies (WRIT) in the course section of this catalog or in **Twin Cities Courses** on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Inclusion of 4xxx courses on Degree Program Forms is subject to approval by the adviser and the director of graduate studies.

**M.A. Degree Requirements**

Students may choose between Plan B (paper option) or an exam option. Plan B is recommended for most students.

Plan B requires students to complete 33 credits of coursework with a grade of B or better and work with their committee to create a reading list of 20 to 30 works related to their interests and coursework. Students are then required to do a written and oral exam on these works.

M.A. students take at least one course in rhetorical theory and criticism (WRIT 5775 is required; WRIT 5776 is highly recommended), one course in technical communication research and theory (WRIT 8011 is required; WRIT 8012 is highly recommended), 6 credits in a selected specialty area, 6 credits in a minor or support program, 12 electives to fulfill the minimum 33-credit course requirement, and either WRIT 8792 for the exam option or WRIT 8794 for the Plan B option. See www.writestudies.umn.edu/grad/rstcMA.html.

**Language Requirements**—M.A. students must demonstrate proficiency in a foreign language of their choice either by taking 3 credits of a beginning-level language course or by having their adviser and the director of graduate studies certify that they have reading comprehension in a particular language.

Students can fulfill this requirement by taking a beginning 3-credit course or by completing a noncredit course such as FREN 100—Reading French in the Arts and Sciences or GER 222—Beginning German. These courses are offered through the College of Continuing Education, usually in the summer.

**Final Exam**—Both the paper and the exam option require final oral exams. For the paper option students must defend their paper, both in terms of its substance and its appropriateness for the targeted publication. For the exam option, students must defend their answers on the written exam and answer questions related to their reading list.

**Minor Requirements for Students Majoring in Other Fields**—For master’s degree students, the minor requires 6 credits in 5xxx and 8xxx WRIT courses.

**Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.**
Ph.D. Degree Requirements
Ph.D. students in rhetoric and scientific and technical communication are required to earn a minimum of 42 credits. This plan requires a minimum of 21 credits in rhetoric seminars and courses—two of those seminars must be in rhetorical theory and criticism within departmental course offerings. Students take two courses (6 cr) in rhetorical theory and criticism; two courses in technical communication research and theory (6 cr), including WRIT 8011 and 8012; and a total of 12 credits divided between a substantive area of study, such as the rhetoric of science or feminist theory in scientific and technical communication (6–12 cr) and research methods courses (0–6 cr); and 12 credits in a minor or related field. Minor or supporting programs may focus on areas such as communication studies, English, curriculum and instruction, women’s studies, cognitive psychology, or history of science. In addition, 6 elective credits are needed to fulfill the minimum credit requirement. Students may fulfill 18 credits of Ph.D. work in completing M.A. requirements (usually two courses in rhetorical theory and three courses in other core areas). Twenty-four thesis credits are also required. The preliminary exams are both written (based on coursework and reading lists) and oral (based on the written preliminary exam). See writingstudies.umn.edu/grad/rstcPhD.html for more information.

Language Requirements—Ph.D. students must demonstrate proficiency in a foreign language of their choice either by taking 3 credits of a language course or having their adviser and the director of graduate studies certify that they have reading comprehension in a particular language. A student could also fulfill this requirement by taking a beginning 3-credit course or by completing a non-credit course such as FREN 100—Reading French in the Arts and Sciences or GER 222—Reading German. These courses are offered through the College of Continuing Education, usually in the summer.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—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.

Risk Analysis for Introduced Species and Genotypes

Minor Only

Contact Information—Director of Graduate Studies, Risk Analysis for Introduced Species and Genotypes, University of Minnesota, 200 Hodson Hall, 1980 Folwell Avenue, Saint Paul, MN 55108 (612-625-0890; fax 612-625-5299; issigert@umn.edu, www.isg-igert.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Peter B. Reich, Forest Resources, M
G. D. Tilman, Ecology, Evolution, and Behavior, M

Professor
David Andow, Entomology, M
Gary J. Balas, Aerospace Engineering and Mechanics, M
Roger Becker, Agronomy and Plant Genetics, M
Susan M. Galatowitsch, Horticultural Science, M
William D. Hueston, Veterinary Population Medicine, M
William D. Hutchison, Entomology, M
Nicholas R. Jordan, Agronomy and Plant Genetics, M
Anne R. Kapuscinski, Fisheries, Wildlife and Conservation Biology, M
James J. Luby, Horticultural Science, M
Mary H. Meyer, Horticultural Science, M
Roger D. Moon, Entomology, M
Raymond M. Newman, Fisheries, Wildlife, and Conservation Biology, M
Gary W. Oehlert, Statistics, M
Alan S. Polasky, Applied Economics, M
David W. Ragsdale, Entomology, M
Michael J. Sadowsky, Soil, Water, and Climate, M
Ruth G. Shaw, Ecology, Evolution, and Behavior, M
Peter W. Sorensen, Fisheries, Wildlife, and Conservation Biology, M
Deborah L. Swackhamer, Environmental Health Sciences, M
Sanford Weisberg, Statistics, M
Donald L. Wyse, Agronomy and Plant Genetics, M

Adjunct Professor
Robert G. Haight, Forest Resources, M
Douglas H. Johnson, Fisheries, Wildlife, and Conservation Biology, M
Carl Richards, Biology, Duluth, M

Associate Professor
John L. Adgate, Environmental Health Sciences, M
Neil O. Anderson, Horticultural Science, M
Robert B. Blair, Forest Resources, M
Donn K. Branstrator, Biology, Duluth, M
George E. Heimpel, Entomology, M
Sarah E. Hobbie, Ecology, Evolution, and Behavior, M
Frances R. Homans, Applied Economics, M
Terry Hurley, Applied Economics, M

Vera A. Krischik, Entomology, M
Jennifer Kuzma, Humphrey Institute of Public Affairs, M
Kristen C. Nelson, Forest Resources, M
Karen S. Oberhauser, Fisheries, Wildlife, and Conservation Biology, M
Daniel J. Philippin, English, M
Rachel Schurman, Sociology, M
Alan G. Smith, Horticultural Science, M
George D. Weiblen, Plant Biology, M

Adjunct Associate Professor
Robert C. Venette, Entomology, M

Assistant Professor
Diane Larson, Ecology, Evolution, and Behavior, M
Rebecca A. Montgomery, Forest Resources, M

Research Associate
Lee E. Frelich, Forest Resources, M

Curriculum—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.

Prerequisites for Admission—Admission to a master’s or doctoral degree-granting program within the Graduate School. Students from programs other than the complementary programs listed above should consult the director of graduate studies in risk analysis for introduced species and genotypes to determine if they have adequate training in the science (including social and economic sciences) to complete the minor.

Courses—Refer to Introduced Species and Genotypes (ISG) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—4xxx courses are permitted toward minor requirements based on director of graduate studies approval.

Minor Only Requirements
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 cr), ISG 5020 (1 cr) and ISG 8001 (1 cr); taken
twice for credit). The doctoral minor requires at least 13 credits, including the master’s courses, plus ISG 8021 (3 cr), ISG 8031 (1 cr) and a 3-credit course in quantitative modeling or a decision analysis course offered by another program.

Science, Technology, and Environmental Policy

Contact Information—Director of Graduate Student Services, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax 612-626-0002; hhhadmit@umn.edu; www.hhh.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Ragu A. Assaad, M2
J. Brian Atwood, M2
Michael Barnett, M2
John M. Bryson, M2
K. William Easter, Applied Economics, AM2
Nancy N. Eustis, M2
Katherine Fennelly, M2
Edward G. Goetz, M2
Stephen A. Hoenack, M2
Lawrence R. Jacobs, M2
Anne Kapuscinski, Fisheries, Wildlife, and Conservation Biology, AM
Sally J. Kenney, M2
Morris M. Kleiner, M2
Robert T. Kudrle, M2
Greg H. Lindsey, M2
Ann R. Markusen, M2
Samuel L. Myers, M2
Philip G. Pardey, Applied Economics, AM2
Joe Soss, M2

Associate Professor

Barbara Crosby, M2
Maria J. Hanratty, M2
Jennifer Kuzma, M2
Deborah Levison, M2
Joseph A. Ritter, M2
Jodi R. Sandfort, M2
Melissa M. Stone, M2
Judy Temple, M2

Assistant Professor

Ryan P. Allen, M2
Jason Cao, M2
Yingling Fan, M2
Greta Friedemann-Sanchez, M2
Carissa Schively Slotterback, M2
Elizabeth J. Wilson, M2
Zhirong Zhao, M2

Other

Harry C. Boyle, M2
Gary DeCramer, M2
Kaye Husbands-Fealing AM2
Sherry Gray, M
Steve Kelley, M
P. Jay Kiedrowski, M2
Lee W. Munnich, M2

Joseph H. Nathan, M2
Timothy Penny, AM
Sudha Shetty, M2
Paul C. Stone, M2.

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The M.S. program 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. A dual M.S./juris doctor degree program is available.

Prerequisites for Admission—Students typically have undergraduate degrees or advanced coursework in one of the natural or engineering sciences. They are also expected to have completed the equivalent of an introductory course in microeconomics, one semester of calculus, and have a U.S. bachelor’s degree or foreign equivalent. For students without significant coursework in the natural or engineering sciences, the M.P.P. program with a concentration in science, technology, and environmental policy is recommended.

Special Application Requirements—In addition to the materials submitted to the Humphrey Institute, applicants must submit to the Humphrey Institute a photocopy of the Graduate School Application, the Humphrey Institute Applicant Data Form, copies of all academic transcripts, a statement of purpose, at least three letters of recommendation, a GRE official score report, and a professional résumé or C.V. Students who wish to be considered for financial aid should apply no later than January 5 of the preceding academic year. Deadline for admission only is April 1. Entry is for fall semester.

Courses—Refer to Public Affairs (PA) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted with instructor’s and adviser’s permission.

M.S. Degree Requirements

The M.S., which is offered under both Plan A (thesis) and Plan B (without thesis), requires 40 credits, including at least 21 credits in five core areas—12 credits in the area of science, technology, and environmental policy and 9 credits of the politics of public affairs, economic reasoning, and empirical analysis. Students should take an additional 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. Plan A also requires 10 thesis credits. Plan B requires completion of a Plan B paper (3 cr). The remaining elective credits are chosen in consultation with the student’s adviser. Students may pursue a minor.

Language Requirements—None.

Final Exam—The final exam is oral.

Scientific and Technical Communication

Contact Information—Department of Writing Studies, University of Minnesota, 180 Westbrook Hall, 77 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-3445; fax 612-624-3617; WRIT@umn.edu; www.writingstudies.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Carol Ann Berkenkotter, M2
Ann Hill Duin, M2
Alan G. Gross, AM2
Laura J. Gurak, M2
Earl E. McDowell, M2
Donald Ross, M2
Mary M. Lay Schuster, M2
Billie J. Wahlstrom, M2
Arthur E. Walzer, AM2

Associate Professor

Lee-Ann Kastman Breuch, M2
Patricia Bruch, M2
Richard J. Graff, M2
John Logie, M2
Bernadette C. Longo, M2
Daniel J. Philippin, AM2
Thomas Reynolds, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The M.S. in scientific and technical communication is a professional degree that focuses on applying technical communication theory and research to
the practice of scientific and technical communication in the workplace and laboratory. It is designed for those students planning to be technical communicators or information developers in business and industry.

All M.S. applicants must meet the admission requirements of the Graduate School. M.S. students are expected to have completed coursework or have equivalent experience in advanced communication (e.g., writing/editing, oral communication, visual communication, organizational communication, or communication theory) and one of the following areas: computer science, management information systems, science, technology, mathematics, engineering, or other related fields.

**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 Graduate School. Nonnative speakers of English are required to take the TOEFL with satisfactory scores. All applicants must submit three letters of recommendation, two writing samples, and a professional objective statement. M.S. deadlines are April 15 for fall semester admission and October 15 for spring semester admission.

**Courses**

Refer to Writing Studies (WRIT) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**

Inclusion of 4xxx courses on Degree Program Forms is subject to approval by the adviser and the director of graduate studies. Currently two 4xxx courses are part of the degree program requirements.

**M.S. Degree Requirements**

A minimum of 33 credits are required as follows: The program is made up of a core course area (18 cr) which includes an introduction to the field, usability and human factors, editing, information design, research, and visual rhetoric, all with an emphasis in scientific and technical communication. The competency area (12 cr) is a group of courses in a scientific or technical field, such as health sciences, international technical communication, technical communication and law, technical communication and environmental science, or technical communication and software engineering, to name a few possibilities. The final course is a capstone course (3 cr) where the student works with an extended problem-solving situation in business, government, industry, or academia. The student acts as consultant to explore a problem, identify possible solutions, introduce a solution, and apply it. For more information on this degree, see www.msstc.umn.edu.

**Language Requirements**

—None.

**Final Exam**

—The final exam is an oral presentation of a research project in the capstone course.

**Minor Requirements for Students Majoring in Other Fields**

For master’s students, the minor requires 6 credits in 5xxx and 8xxx rhetoric courses.

**Scientific Computation**

**Contact Information**

—Scientific Computation Program, University of Minnesota, 6-145 Jackson Hall, 321 Church Street S.E., Minneapolis, MN 55455 (612-626-1458; fax 612-626-5009; www.scicomp.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

**Regents Professor**

Apostolos P. Georgopoulos, Neuroscience, SM
Donald G. Fruehlar, Chemistry, SM

**Professor**

Douglas N. Arnold, Mathematics, SM
Victor H. Barocas, Biomedical Engineering, SM
Daniel L. Boley, Computer Science and Engineering, SM
Graham V. Candler, Aerospace Engineering and Mechanics, SM
J. Bernardo Cockburn, Mathematics, SM
Christopher J. Cramer, Chemistry, SM
Jeffrey J. Derby, Chemical Engineering and Materials Science, SM
Timothy J. Ebner, Neuroscience, SM
David M. Ferguson, Medicinal Chemistry, Pharmacognosy, SM
Efi Foufoula-Georgiou, Civil Engineering, SM
Jiali Gao, Chemistry, SM
Thomas W. Jones, Astronomy, SM
Daniel D. Joseph, Aerospace Engineering and Mechanics, SM
Daniel J. Kersten, Psychology, SM
Vipin Kumar, Computer Science and Engineering, SM
David J. Lilja, Electrical and Computer Engineering, SM
Mitchell B. Luskin, Mathematics, SM
John L. Nieber, Biosystems and Agricultural Engineering, SM
Hans G. Othmer, Mathematics, SM
N. P. Papanikolopoulos, Computer Science and Engineering, SM
Yousef Saad, Computer Science and Engineering, SM
Guillermo R. Sapiro, Electrical and Computer Engineering, SM
George R. Sell, Mathematics, SM
Jaideep Srivastava, Computer Science and Engineering, SM
Harlan W. Stech, Mathematics and Statistics, Duluth, SM
Ellad Tadmor, Aerospace Engineering and Mechanics, SM
David D. Thomas, Biochemistry, SM
Vaughan R. Voller, Civil Engineering, SM
Renata M. Wentzcovitch, Chemical Engineering and Materials Science, SM
George L. Wilcox, Neuroscience, SM
Paul R. Woodward, Astronomy, SM
David A. Yuen, Geology and Geophysics, SM

**Associate Professor**

Scott Fahrenkrug, Animal Science SM
George Karypis, Computer Science and Engineering, M2
Krishnan Mahesh, Aerospace Engineering, SM
Darrin M. York, Chemistry, SM

**Assistant Professor**

Bagrat Amirikian, Neuroscience, M2
Rui Kuang, Computer Science and Engineering, M2

**Lecturer**

Norman J. Troullier, Chemistry, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**

—This program encompasses coursework and research on the fundamental principles for using intensive computation to support research in the physical, biological, and social sciences and engineering. Emphasis is on research issues, state-of-the-art methods, and applying 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. The program and degree requirements are described in detail on the program website.

**Prerequisites for Admission**

—Applicants fill out the online Graduate School Application and the Survey of Research Interests Form found on the program website. A bachelor’s degree in a field that uses scientific computation is required for admission.

**Special Application Requirements**

—Applicants must submit scores from the General Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives. Students may apply at any time; however, submission of all application materials by January 1 is strongly encouraged to ensure priority consideration for fellowships and assistantships.
Courses—Refer to the Scientific Computation (SCIC) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval. Students from other majors may include such courses subject to their own program’s approval.

M.S. Plan A Degree Requirements

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.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—The master’s minor requires approval of the director of graduate studies and a minimum of 4 credits from the core curriculum; the credits may not be from courses in the student’s major field.

Ph.D. Degree Requirements

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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires approval of the director of graduate studies and 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.

Security Technologies

Note: The first entering graduate class for this program will matriculate in June 2010. The information on this program, including courses and requirements, is preliminary and may change as the curriculum is finalized.

Contact Information—Security Technologies Graduate Program, Technological Leadership Institute, University of Minnesota, 510 West Bank Office Building, 1300 South Second Street, Minneapolis, MN 55454 (612-624-5747; fax 612-624-7510; tlsis@umn.edu; www.tli.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Trevor R. Ames, Veterinary Population Medicine, M2
Massoud Amin, Electrical and Computer Engineering, M2
Frank F. Busta, (emeritus) National Center for Food Protection and Defense, M2
Alok Gupta, Carlson School of Management, M2
Theodore P. Labuza, Food Science and Nutrition, M2
Alfred Marcus, Strategic Management and Organization, M2
Andrew Odlyzko, Mathematics, M2
Dennis L. Polla, Electrical Engineering, M2

Associate Professor

Kevin W. Linderman, Operations and Management Science, M2
Srinad Sreevalsan, Veterinary Population Medicine, M2

Assistant Professor

Elizabeth A. Amin, Medicinal Chemistry, M2
Nicholas Hopper, Computer Science and Engineering, M2
Frederick J. Riggins, Information and Decision Sciences, M2

Senior Fellow

Kirk Froggatt, Agilent Technologies, M2
Steve Kelley, Center for Science, Technology and Public Policy, M2

Other

Jeff Bender, Veterinary Medical Center, M2
Lockwood Carlson, Management of Technology, M2
Shaun Kennedy, National Center for Food Protection and Defense, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 multi-disciplinary 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.

Prerequisites for Admission—Qualified applicants must hold at least 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. Minimum requirements also include one year of calculus, probability/statistics, two science or engineering courses. Preference will be given to applicants with an undergraduate GPA of 3.00 or above.

Use of 4xxx Courses—4xxx courses may not be included on Degree Program Forms.

M.S.S.T. Degree Requirements

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 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

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
system-wide risk/threat management, and complex interactive networks (including finance and economics, policy and regulation);
• Regulatory, policy, legal, economic, and business implications;
• Management and leadership development (including communication skills, change management, ethics, project management, and conflict management).

Language Requirements—None
Final Exam—An oral presentation of the capstone project is required.

Minor Requirements for Students Majoring in Other Fields—The master’s minor requires 7 credits. The Ph.D minor requires 12 credits.

Social, Administrative, and Clinical Pharmacy

Contact Information—College of Pharmacy, University of Minnesota, 7-155 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-624-2973; fax 612-625-9931; cremi001@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Barbara Brandt, Pharmaceutical Care and Health Systems, SM
Richard C. Brundage, Experimental and Clinical Pharmacology, SM
Robert J. Cipolle, Pharmaceutical Care and Health Systems, SM
James C. Cloyd, Experimental and Clinical Pharmacology, SM
William F. Ebert, Experimental and Clinical Pharmacology SM
Judith M. Garrard, School of Public Health, SM
Cynthia R. Gross, Experimental and Clinical Pharmacology, SM
David R. Guay, Experimental and Clinical Pharmacology, SM
Ronald S. Hadsall, Pharmaceutical Care and Health Systems, SM
Charles E. Halstenson, Experimental and Clinical Pharmacology, ASM Robert Kriel, Pediatrics, M2
Thomas E. Lackner, Experimental and Clinical Pharmacology, M2
Tom Alan Larson, Pharmaceutical Care and Health Systems, M2
Ilo E. Leppik, Experimental and Clinical Pharmacology, M2
Henry J. Mann, Experimental and Clinical Pharmacology, M2
Peter C. Morley, Pharmaceutical Care and Health Systems, SM
Paul L. Ranelli, Pharmaceutical Care and Health Systems, SM
Rory P. Remmel, Medicinal Chemistry, SM
John C. Rotschafer, Experimental and Clinical Pharmacology, SM
Ronald Sawchuk, Experimental and Clinical Pharmacology SM
Mark R. Schleiss, Pediatrics, AM2

Jon C. Schommer, Pharmaceutical Care and Health Systems, SM
Stephanie Schoenfeld Meyer, Pharmaceutical Care and Health Systems, SM
Randall D. Seifert, Pharmaceutical Care and Health Systems, SM
Stuart M. Speedie, Health Informatics, Medical School, SM
Robert J. Straka, Experimental and Clinical Pharmacology, M2
Timothy P. Stratton, Pharmaceutical Care and Health Systems, SM
Timothy S. Tracy, Experimental and Clinical Pharmacology, SM
Donald L. Udén, Pharmaceutical Care and Health Systems, M2
Vernon E. Weckwerth, Health Services Administration, SM
Cheryl L. Zimmerman, Pharmacometrics, SM

Adjunct Professor
Paul C. Langley, Pharmaceutical Care and Health Systems, ASM
Thomas S. Rector, College of Pharmacy, AM2
Leo J. Sioris, Experimental and Clinical Pharmacology, M2

Associate Professor
Sidney B. Benson, Pharmaceutical Care and Health Systems, M2
Angela K. Birnbaum, Experimental and Clinical Pharmacology, SM
Michael C. Brown, Pharmaceutical Care and Health Systems, M2
Richard R. Cline, Pharmaceutical Care and Health Systems, SM
Brian J. Isetts, Pharmaceutical Care and Health Systems, M2
Pamala A. Jacobson, Experimental and Clinical Pharmacology, SM
Kristin K. Janke, Pharmaceutical Care and Health Systems, M2
Mark Kirstein, Experimental and Clinical Pharmacology, M2
Michael Kotylar, Experimental and Clinical Pharmacology, SM
Aymun N. Noreddin, Pharmacy Practice and Pharmaceutical Sciences, Duluth, M2
William S. Oetting, Experimental and Clinical Pharmacology, M2
Pamela Phelps, Pharmacy, M2
Mark E. Schneiderhan, Pharmaceutical Care and Health Systems, M2
Wendy L. Saint Peter, Pharmaceutical Care and Health Systems, M2
Craig Weinert, Experimental and Clinical Pharmacology, AM2
Marcia M. Worley, Pharmaceutical Care and Health Systems, M2

Adjunct Associate Professor
Sauwakon Ratanawijitrasm, Pharmaceutical Care and Health Systems, AM
Robert F. O’Dea, Pharmacology, AM2
John V. St. Peter, Experimental and Clinical Pharmacology, M2

Assistant Professor
Terrence J. Adams, Pharmaceutical Care and Health Systems, M
Bjoern Bauer, Pharmaceutical Care and Health Systems, M
L’Aurelle A. Johnson, Experimental and Clinical Pharmacology, M
Jatinder K. Lamba, Experimental and Clinical Pharmacology, M2

Susan E. Marino, Experimental and Clinical Pharmacology, M
Serguei V. Pakhomov, Pharmaceutical Care and Health Systems, M2
Marnie L. Peterson, Experimental and Clinical Pharmacology, SM
Raquel Rodríguez, Pharmaceutical Care and Health Systems, M2
Doneka R. Scott, Experimental and Clinical Pharmacology, AM2
Debra J. Skaar, Experimental and Clinical Pharmacology, M2
Heather E. Vezina, Experimental and Clinical Pharmacology M2

Adjunct Assistant Professor
Puree Anchantachoti, Pharmaceutical Care and Health Systems, AM
Joshua W. Devine, Pharmaceutical Care and Health Systems, AM
Nitin Kaila, Experimental and Clinical Pharmacology, AM
Chulaporn Limwattananon, Pharmaceutical Care and Health Systems, AM
Supon Limwattananon, Pharmaceutical Care and Health Systems, AM
Djeneane R. Oliveira, Pharmaceutical Care and Health Systems, AM
Amy L. Pittenger, Pharmaceutical Care and Health Systems, M
Burin Sriwong, Pharmaceutical Care and Health Systems, AM
Samuel Wagner, Pharmaceutical Care and Health Systems, AM
Xin Ye, Pharmaceutical Care and Health Systems, AM

Clinical Professor
Daniel E. Keyler, Experimental and Clinical Pharmacology, AM2

Clinical Assistant Professor
Angeline M. Carlson, Pharmaceutical Care and Health Systems, AM2
Scott J. Knoer, Fairview Pharmacy, M2

Adjunct Clinical Assistant Professor
Patrick P. Gleason, Pharmaceutical Care and Health Systems, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Students are prepared for research and related activities 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 University’s many health and social science departments. Programs 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.

Two program tracks are available. The emphasis of the social and administrative pharmacy (SAPH) track 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.

The emphasis of the experimental and clinical pharmacology (ECP) track is to advance the science of human pharmacology and therapeutics to improve the safe, effective, and economical use of drugs by patients. This includes the translation of both laboratory and clinical research to the medical use process.

**Prerequisites for 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 department supplementary application form in addition to the Graduate School forms. The supplementary form along with three letters of recommendation should be sent directly to the department. GRE scores are required and a performance level of 580 is preferred on the TOEFL for all international applicants whose native language is not English.

**Courses**—Refer to Social, Administrative, and Clinical Pharmacy (SACP), Social and Administrative Pharmacy (SAPH), and Experimental and Clinical Pharmacology (ECP) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Use of 4xxx courses towards degree requirements is permitted with director of graduate studies approval.

**M.S. Degree Requirements**

The M.S. program is offered under Plan A and Plan B. Plan A requires at least 31 credits, including 15 credits in the major field, at least 6 credits in a minor or related field, and 10 thesis credits.

Plan B requires at least 30 credits, including 15 credits in the major field and at least 6 credits in a minor or related field; the balance of coursework 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.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**—A master’s minor requires 6 credits in program courses, which are determined in consultation with the director of graduate studies.

**Ph.D. Degree Requirements**

The Ph.D. requires 34 credits in the major, 12 credits in a minor or supporting program, and 24 thesis credits. Two preliminary written exams are required: one concentrates on research design, methodological issues, and statistical analysis; the other on material specific to the student’s chosen track. Students must also pass a preliminary oral exam.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—A doctoral minor requires a minimum of 12 credits in program courses determined in consultation with the director of graduate studies.

**Social and Philosophic Studies of Education**

**Minor Only**

**Contact Information**—Department of Educational Policy and Administration, University of Minnesota, 330 Wulling Hall, 86 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-1006; fax 612-624-3377; [http://education.umn.edu/EdPA](http://education.umn.edu/EdPA)).

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.grad.umn.edu/faculty_rosters/faculty.html).

**Professor**

Josef A. Mestenhauser, (emeritus), Educational Policy and Administration, AM

R. Michael Paige, Educational Policy and Administration, M

Karen Rose Seashore, Educational Policy and Administration, M

**Associate Professor**

Peter W. Demerath, Educational Policy and Administration, M

Arthur M. Harkins, Educational Policy and Administration, M

**Lecturer**

Richard D. Nunneley, Educational Policy and Administration, AM

**Curriculum**—The graduate minor provides a multidisciplinary foundation for the study of education from the perspectives of history, philosophy, and the social sciences. The minor program is shaped to suit the particular needs and interests of the student at either the master’s or doctoral level. In consultation with a faculty member in social and philosophic studies of education in the Department of Educational Policy and Administration (EDPA), 5xxx and 8xxx courses are selected both in EDPA and in related fields.

**Prerequisites for Admission**—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. Interested students should consult with a faculty member in social and philosophic studies of education in the Department of Educational Policy and Administration to develop a proposed course of study.

**Special Application Requirements**—The director of graduate studies in the Department of Educational Policy and Administration must approve the applicant’s proposed course of study by signing the student’s Degree Program Form.

**Courses**—Contact the minor program office for information on relevant coursework.

**Use of 4xxx Courses**—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

**Minor Only Requirements**

M.A. students must complete at least 9 graduate credits (at least one course each) in the two areas of study below. Doctoral students must complete at least 12 graduate credits (at least two courses each) in the two areas of study.

**Area I**—History and philosophy of education: EDPA 5021, 5023, 5024, 5032, PHIL 4324, GWSS 5103.

**Area II**—Social sciences and education: EDPA 5041, 5044, 5103, 5128, 5302, 8002, 8104.

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
Social Work

Contact Information—School of Social Work, University of Minnesota, 105 Peters Hall, 1404 Gortner Avenue, Saint Paul, MN 55108 (612-625-1220 or 1-800-779-8636; fax 612-624-3744; jreineard@umn.edu; www.ssw.che.umn.edu). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Darlyne Bailey, SM
Michael Baizerman, SM
Jerome Beker, SM
Velmer S. Burton Jr., SM
Jeffrey L. Edleson, SM
Jane F. Gilgun, SM
C. David Hollister, SM
Rosalie A. Kane, Public Health, SM
Helan Q. Kivnick, SM
David J. Klaassen, AM2
Dario Menanteau-Horta, SM
Jean K. Quam, SM
Ronald H. Rooney, SM
Mark S. Umbreit, SM
Esther Wattenberg, (emeritus), ASM
Susan Wells, SM
Oliver J. Williams, SM

Associate Professor

Lisa Albrecht, SM
Priscilla Gibson, SM
Linda E. Jones, SM
Elizabeth Lightfoot, SM
Yat-Sang (Terry) Lum, SM
James R. Reinardy, SM

Assistant Professor

Colleen Fisher, M2
Hee Yun Lee, M2
Ross R. VeLure Roholt, M2

Other

Tracy A. Crudo, M2
Sonia Davila-Williams, M2
Peter Dimock, M2
M. J. Gilbert, M2
Trude D. Hendrickson, M2
Judith M. Hoy, M2
Nancy J. Johnston, M2
Lisa Kimball, M2
Traci L. LaLiberte, M2
Steve Maxwell, M2
Janelle Rae Miedema, M2
Megan H. Morrissey, M2
Victoria Van Slyke, M2
Anne W. Vande Berg, Rochester, M2
Kate Walthour, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The M.S.W. prepares students for advanced social work practice. A 50-credit program and a 34-credit advanced standing program are available. The curriculum offers concentrations in direct or community practice.

The School of Social Work and the Humphrey Institute of Public Affairs offer two dual master’s degrees: the master of social work/master of public policy (M.S.W./M.P.P.), and the master of social work/master of urban and regional planning (M.S.W./M.U.R.P.). Dual degree students generally take coursework in each department for the first two years, and in the third year, take courses concurrently in two departments, facilitating the integration of content from both fields. Students may apply some credits taken in the dual degree programs toward requirements in both departments. Each dual degree option is a minimum sequence of three years of full-time study. Students who choose an M.S.W. concentration in direct practice will need longer than six semesters to complete both programs. Students may begin their studies in either program.

A dual master of social work/master of public health (M.S.W./M.P.H.) is offered with the School of Public Health. The M.S.W./M.P.H. degree provides exposure to a blend of course offerings in biometry, community health education, environmental health, epidemiology, health services administration, maternal and child health, and public health nutrition. The purpose of this degree is to educate and prepare professional public health social workers that are competent in the practice of professional social work with the additional outlook, skills, and expertise of public health. Students are able to complete the requirements for both degrees in approximately six to eight academic semesters or less, depending upon the number of credits carried each semester.

The Ph.D. program 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.

Prerequisites for Admission—Applicants to the M.S.W. program must have a background in the liberal arts that includes coursework in history and social sciences, the humanities and the arts, physical and biological sciences and mathematics and a college-level course in statistics. A college-level biology course with content on human anatomical and physiological development is also required. Strong preference is given to applicants with paid or volunteer experience in social service settings. Applicants should review the current application packet on the School of Social Work Web site at www.ssw.che.umn.edu for the most current application requirements. Doctoral applicants must meet requirements and standards set by the Graduate School and the School of Social Work. Applicants are preferred to have earned the master’s degree in social work from a school of social work accredited by the Council on Social Work Education; however, applicants with a master’s degree in a closely related discipline will be considered for admission. Preference is also given to candidates with at least two years of post-M.S.W. practice experience. Candidates for the Ph.D. program who do not have an M.S.W. may be required to take several master’s-level foundation courses.

Special Application Requirements—Three letters of recommendation, a résumé documenting social service experience, a complete set of transcripts (in addition to those required by the Graduate School), an example of academic or scholarly writing, a personal statement, and a department application form are required of all applicants. GRE scores are not required for admission to the master’s program, but are required from applicants who do not have an official grade point average from their undergraduate degree. GRE scores are required for admission to the Ph.D. program. The application deadline for the M.S.W. program and for the Ph.D. program is in early January. The Ph.D. program has a second review deadline in early March. Beginning students in either program are admitted fall semester only. Check the School of Social Work Web site at www.cehd.umn.edu/ssw for specific dates.

Courses—Refer to Social Work (SW) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted with director of graduate studies approval.
M.S.W. Coursework Only

Degree Requirements
The M.S.W. requires 50 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 of part-time study, and must be completed within seven years of the date of the earliest coursework taken for the degree.
The 50-credit program includes a set of required foundation courses (25 cr), courses from a selected concentration, two field internships, and social work electives. A maximum of 24 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 24 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.

Language Requirements — None.

Ph.D. Degree Requirements
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. Typically 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 social work teaching course; a supervised research practicum and practicum seminar; supporting program courses; statistics courses. Students must also have teaching experience in the School of Social Work while in the program and fulfill the computer skills requirement.

Language Requirements—None.

Sociology

Contact Information — Graduate Program Associate, Department of Sociology, University of Minnesota, 909 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-624-4300; fax 612-624-7020; socdept@soc.umn.edu; www.soc.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

Regents Professor
Steven Ruggles, History, AM2

Professor
Ronald R. Aminzade, SM
John Arthur, Sociology/Anthropology, Duluth, AM2
Yanjie Bian, SM
Rose M. Brewer, African American and African Studies, AM2
Penny A. Edgell, SM
Barry C. Feld, Law School, AM2
David H. Knoke, SM
Carl P. Malmquist, SM
Dario Menanteau, Social Work, AM2
Phyllis E. Moen, SM
Jeylan T. Mortimer, SM
David M. Pellow, SM
Joel B. Samaha, SM
Joachim J. Savelsgberg, SM
Karen R. Seashore, Educational Policy and Administration, AM2
Mark Snyder, Psychology, AM2
Joe Soss, Public Affairs, AM
Christopher Uggen, SM

Associate Professor
Elizabeth H. Boyle, SM
Jeffrey P. Broadbent, SM
Kathleen T. Call, Public Health, AM2
Joseph H. Gerteis, SM
Michael R. Goldman, SM
Douglas Hartmann, SM
Kathleen E. Hull, SM
Walt Jacobs, Postsecondary Teaching and Learning, AM2
Erin L. Kelly, SM
Jeffrey R. Maahs, Sociology/Anthropology, Duluth, AM
Ian Ross Macmillan, SM
Donna D. McAlpine, Health Services Research, Policy, and Administration, AM2
J. Michael Oakes, Epidemiology, AM2
Lisa Sun-Hee Park, SM
Jennifer L. Pierce, American Studies, ASM
Rachel Schurman, SM
John Robert Warren, SM

Adjunct Associate Professor
Michael David Finch, Health Services Research, Policy, and Administration, AM2

Assistant Professor
Cawo M. Abdi, M2
Teresa Gowan, M2
Eric S. Grodsky, M2
Carolyn Liebler, AM
Enid L. Logan, M2
Ann Meier, M2
Joshua A. Page, M2
Teresa T. Swartz, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum — Sociology is concerned with the study of human societies, groups, and social life. The program offers substantive training in five areas of specialization: family and life course; inequality—race, class, and gender law; crime and deviance; organizations, work, and markets; and political sociology and social movements. Methodological training is available in historical and comparative research, survey research, network analysis, advanced statistical analysis, and qualitative research. Training for students interested in both academic and applied employment is generally available.

Prerequisites for Admission — 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 is recommended. Individuals who have completed fewer than 18 credits may be admitted but 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 general academic potential, commitment to the field, creativity, and potential for contribution to the field. In addition to the Graduate School Application Form and required documents, applicants must submit the following: valid GRE scores; a sample of written work, usually a term paper, written in English; three letters of recommendation; and a statement of professional objectives. The department accepts new students for fall admission only. The final application deadline for admittance and financial aid is December 1.

Courses — Refer to Sociology (SOC) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses — Use of 4xxx courses is not permitted toward degree requirements.

M.A. Degree Requirements
Students are admitted only for the Ph.D.; the M.A. is an optional degree for students enrolled in the doctoral program.

Program descriptions in this catalog are current as of July 20, 2009. For up-to-date information, contact the program offices.
Students must take six required core courses (17 cr) and two additional substantive courses in sociology (6 cr). Students must also complete a minimum of 6 credits in a minor or related field and must complete a minimum of 30 credits total. Courses are chosen in consultation with the adviser and the program committee to meet the student’s educational and professional goals. Plan B students submit two papers, at least one of which is empirical. Plan A students are required to submit a master’s thesis and register for 10 thesis credits.

Language Requirements—None.

Final Exam—The M.A. final exam is oral.

Ph.D. Degree Requirements
The doctoral program is for students planning to do research or teach.

Students take six required core courses (17 cr), including two 1-credit courses on professional skills development. Beyond that, each student’s program is individually planned in consultation with the adviser and program committee to meet both the student’s goals and broad program requirements. Those requirements include four substantive courses in sociology (12 cr minimum) and at least one semester of training in advanced methods (3 cr minimum). Students must also complete a minimum of 12 credits in a minor or supporting program and register for 24 thesis credits. 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. Students prepare for a written preliminary examination by developing in close consultation with the adviser a reading list covering the scope of the preliminary exam paper. The reading list selections and the preliminary exam paper must be logically related to the student’s major interest in the field. Three representatives from the sociology department must serve on the student’s preliminary oral examining and prospectus hearing committees.

Language Requirements—None. However, coursework in a foreign language may be used as minor or supporting program coursework for those students who conduct research in comparative sociology.

Final Exam—The Ph.D. final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires four courses in sociology, at least one of which is 8xxx. Course choices are subject to the approval of the director of graduate studies.

Software Engineering
Contact Information—Software Engineering Graduate Program, University of Minnesota Software Engineering Center, 200 Union Street S.E., 4-192 EE/CS Building, Minneapolis, MN 55455 (612-625-1381; fax 612-625-0572; msse@cs.umn.edu; www.msse.umn.edu).

For latest faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
John V. Carlin, M2
Mats P. E. Heimdahl, M2
Joseph A. Konstan, M2
Shashi Shekhar, M2
Jaideep Srivastava, M2

Assistant Professor
John E. Collins, M2

Other
Michael Barton, AM2
Neil A. Bitzenhofer, AM2
Michael Calvo, AM2
Jesse D. Freese, AM2
Richard Hedger, AM2
Stephen Kan, AM2
John Kruse, AM2
Kevin Larson, AM2
Nathaniel Schutta, AM2
Elizabeth M. Sisley, AM2
John Skovbrotten, AM2
Jeffrey Thompson, AM2
Jamshid A. Vayghan, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 Institute of Technology’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 the first three semesters.

Prerequisites for 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.

Courses—Refer to Software Engineering (SENG) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is subject to adviser and/or director of graduate studies approval.

M.S.S.E. Degree Requirements
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.

Language Requirements—None.

Final Exam—None.

Soil Science
Contact Information—Director of Graduate Studies, Department of Soil, Water, and Climate, University of Minnesota, 439 Borlaug Hall, 1911 Upper Buford Circle, Saint Paul, MN 55108 (612-625-1244; fax 612-625-2208; dgs@soils.umn.edu; www.soils.umn.edu).

For latest faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Deborah L. Allan, SM
Jay C. Bell, SM
Paul R. Bloom, SM
Terence H. Cooper, SM
Peter H. Graham, SM
Satish C. Gupta, SM
Thomas Halbach, M2
John A. Lamb, SM
Gary L. Malzer, SM
Jean-Alex E. Molina, SM
John F. Moncrief, SM
David J. Muller, SM
Edward A. Nater, SM
Gyles W. Randall, SM
Carl Rosen, SM
Michael J. Sadowsky, SM
Michael A. Schmitt, SM
Mark W. Seeley, SM

Twin Cities Degree Programs and Faculty
Adjunct Professor
John M. Baker, SM
Charles E. Clapp, SM
Jonathan A. Foley, SM
William C. Koskinen, SM
Michael R. Russelle, SM

Associate Professor
Timothy J. Griffiths, SM
Jennifer Y. King, M2
Albert L. Sims, M2
Jeffrey S. Strock, SM

Assistant Professor
Daniel Kaiser, M2
Joe Knight, M2
Dylan B. Millet, M2
Jennifer S. Powers, M2
Peter K. Snyder, M2
Brandy Marie Toner, M2
Tracy E. Twine, M2

Adjunct Assistant Professor
Adam S. Birr, AM2
Jane Johnson, AM2
Randall Kolka, AM2
Tyson Ochsner, AM2
Pamela J. Rice, AM2
Kurt A. Spokas, AM2
Rodney T. Venterea, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The program offers two concentrations: soil science and climatology. This multidisciplinary program encompasses aspects of chemistry, physics, biology, atmospheric sciences, and geology. The discipline is divided into five subdisciplines: climatology, soil chemistry/fertility, soil classification/genesis, soil microbiology/biochemistry, and soil physics. The soil science concentration focuses on the study of soil climate as it applies to environmental and agricultural issues. The climatology concentration focuses on the interdisciplinary study of earth-atmosphere interactions as well as climate predictability as it applies to environmental and agricultural issues. This concentration requires competence in both atmospheric sciences and related areas of soil science. The minor, supporting, or related fields area is usually selected from some allied field such as agronomy, botany, chemistry, microbiology, biochemistry, physics, geology, economics, forestry, agricultural engineering, or atmospheric science.

Prerequisites for Admission—The academic background normally required includes standard courses in college physics, chemistry, geology, microbiology, and mathematics, including one course in calculus, and an introductory course in soil science. For agricultural climatology, additional courses in mathematics, physics, meteorology, and engineering may be substituted. Candidates for the Ph.D. degree are normally required to have completed an acceptable master’s degree thesis.

Special Application Requirements—A statement of career goals and three letters of recommendation evaluating the applicant’s potential for graduate study should accompany applications to both the M.S. and Ph.D. programs. Submission of GRE scores is required; students whose native language is not English are also required to submit TOEFL scores meeting the general Graduate School requirements and are expected to have ranked in the top 20 percent of their class. Students may be admitted in any semester.

Program-specific requirements and procedures for electronic application for admittance to the soil science graduate program are listed and updated on the department’s Web site at www.soils.umn.edu.

Use of 4xxx Courses—Use of 4xxx courses is permitted toward degree requirements per adviser and/or director of graduate studies approval.

Courses—Refer to Soil, Water, and Climate (SOIL) in the course section of this catalog for courses pertaining to the program or at the departmental Web site for an updated list of courses.

M.S. Degree Requirements
All M.S. students must complete a minimum of 30 credits: 14 credits in the major area, one seminar (1 cr) teaching experience, and a minimum of 6 credits in a minor or related field. Plan A students must take a minimum of 10 thesis credits: Plan B 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 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 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.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—Students may minor in soil science with the approval of the director of graduate studies and under the direction of a soil science graduate faculty member serving as the minor adviser. The master’s minor requires completion of a minimum of two of the four core area courses in soil science and a seminar.

Ph.D. Degree Requirements
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 courses in soil science.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Students may minor in soil science with the approval of the director of graduate studies and under the direction of a soil science graduate faculty member serving as the minor adviser. The doctoral minor requires a minimum of 12 credits in soil science, including a minimum of three of the four core area courses in soil science, a seminar, and teaching experience.

Speech-Language-Hearing Sciences

Contact Information—Department of Speech-Language-Hearing Sciences, University of Minnesota, 115 Shevlin Hall, 164 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-3322; fax 612-624-7586; slhs@umn.edu; www.slhs.umn.edu). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Arlene E. Carney, SM
Joe E. Reichle, SM
Dianne Y. Tassell, ASM
Jennifer Windsor, SM

Associate Professor
Mary R. T. Kennedy, M2
Kathryn Kohntert, M2
Benjamin Munson, M2
Peggy B. Nelson, M2
Robert S. Schlauch, SM
Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Emphasis in the master’s program is speech-language pathology. Emphasizes in the Ph.D. programs are speech-language pathology, speech science, language science, audiology, and hearing science.

The emphasis in the Au.D. program focuses on meeting the standards for certification as an audiologist 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.

Prerequisites for Admission—Prospective students must have completed an undergraduate degree. Individuals from speech-language-hearing sciences or other academic areas are welcome. Students entering the M.A. program with minimal background in speech-language-hearing sciences should expect their program to extend beyond the usual two years.

Special Application Requirements—Three letters of recommendation evaluating the applicant’s scholarship (two from professorial-rank faculty are recommended), a complete set of transcripts (in addition to that required by the Graduate School), and GRE scores are required. TOEFL is required for nonnative English speaking applicants. Deadline for application to the master’s and Au.D. programs is January 1; late applications are considered only if space is available. Master’s students ordinarily begin graduate study during fall semester. Review of applicants to the doctoral program is continuous.

Courses—Refer to Speech-Language-Hearing Sciences (SLHS) in the course section of this catalog or in Twin Cities:

Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

M.A. Degree Requirements

Emphasis in the master’s program is speech-language pathology, which is accredited by the American Speech-Language-Hearing Association’s Council on Academic Accreditation. Students who complete the M.A. are eligible for clinical certification by the Association.

Students may select between two M.A. options. Plan A requires coursework and a thesis that is experimental in nature. Plan B requires coursework, a comprehensive written examination, and an oral examination.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 credits, approved by the director of graduate studies, is required for a master’s minor.

Au.D. Degree Requirements

The Au.D. is a four-year plan of study for students entering with a background in speech-language-hearing sciences. Students without a background should expect an additional year of study. In addition to study in the major field, the degree requires 8 related-fields credits. Students may complete a M.A. degree before their final year of study. 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.

Language Requirements—None.

Ph.D. Degree Requirements

Emphasizes 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, but there are also some department and Graduate School 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 8420) 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.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A minimum of 15 credits, approved by the director of graduate studies, is required for a doctoral minor.

Sport Management

Contact Information—Marta Fahrenz, Coordinator of Graduate Studies, School of Kinesiology, University of Minnesota, 223B Cooke Hall, 1900 University Avenue S.E., Minneapolis, MN 55455 (612-625-5300; fax 612-626-7700; kin@umn.edu; @cehd.umn.edu/kin).

For the latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Mary Jo Kane, SM
Maureen Weiss, SM

Associate Professor

Stephen D. Ross, SM
Diane M. Wiese-Bjornstal, SM

Assistant Professor

Lisa A. Kihl, M2

Lecturer

Rayla Allison, M2
Eric A. Brownlee, M2
Jo Ann Buysse, M2
James C. Turman, AM2

Other

Anthony Brown, Recreational Sports, AM2
James C. Turman, AM2
Along with following program-specific requirements, read the General Information section of this catalog for Graduate School requirements that apply to all major fields. 

**Curriculum**—Sport management is an interdisciplinary field that provides students with academic training and field experience for careers in sport and fitness management professions. Typical professions in this field include sport organization management, sport information management (including marketing, promotion, advertising, and fundraising), and exercise and sports science (including fitness assessments and exercise prescriptions). Program graduates are prepared for careers in a variety of settings, including sport agencies, professional and amateur sport organizations, and sport media. The sport management program encompasses many different subjects, including sociology, business, marketing, communications, and psychology.

**Prerequisites for Admission**—Although prospective master’s students generally have an undergraduate degree in kinesiology, physical education, or sport and exercise science, others with a baccalaureate degree who have related preparation and a significant background and interest in sport management may be admitted. Admitted students may be required by their adviser to complete background preparation in undergraduate and graduate kinesiology and related coursework.

**Special Application Requirements**—Applicants must submit a University of Minnesota Graduate School application form; a completed School of Kinesiology Application Form; a written statement of academic interests, goals, and objectives; scores from the General Test of the GRE (verbal and quantitative) that are less than five years old; three letters of recommendation from persons familiar with their scholarship and research potential; a scholarly paper; and photocopies of official 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 can be admitted any term.

**Research Facilities**—Research facilities for graduate students in sport management include the Sports Business Institute; the Sport Marketing Research Group; and the Tucker Center for Research on Girls and Women in Sport.

**Courses**—Refer to Kinesiology (KIN) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Inclusion of 4xxx courses on Degree Program Forms is subject to adviser and director of graduate studies approval.

**M.A. Degree Requirements**
The M.A. is offered under Plan A and Plan B. Plan A requires 36 credits, including 16 core course credits in kinesiology, 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 in kinesiology, 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. A GPA of at least 3.00 is required to maintain good standing and to graduate.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**—A master’s minor requires at least 6 credits of graduate-level sport management courses.

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**Statistics**

**Contact Information**—School of Statistics, University of Minnesota, 313 Ford Hall, 224 Church Street S.E., Minneapolis, MN 55455 (612-625-8046; fax 612-624-8868; info@stat.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

**Professor**

R. Dennis Cook, SM
Charles J. Geyer, SM
Douglas M. Hawkins, SM
Glen D. Meeden, SM
Christopher J. Nachtsheim, Operations and Management Science, SM
Gary W. Oehlert, SM
Peihua Qiu, SM
Ronald R. Regal, Mathematics and Statistics, Duluth, SM
Xiaoliang Shen, SM
William D. Sudderth, SM
Sanford Weisberg, SM
Yuhong Yang, SM

**Associate Professor**

Singdhansu Chatterjee, SM
Birgit Grund, SM
Tiefeng Jiang, SM
Galin Jones, SM

**Assistant Professor**

Lan Wang, M2
Hui Zou, M2

**Research Associate**

Aaron K. Rendahl, AM2

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Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

**Curriculum**—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.

**Prerequisites for Admission**—Applicants to the master’s program must be familiar with basic statistical concepts and methods, and with mathematics through multivariable calculus and linear algebra. Applicants to the doctoral program must, in addition to the above, be familiar with the elements of real analysis.

**Special Application Requirements**—Applications should be complete by January 1 for admission the following fall semester; spring semester admission is only considered under unusual circumstances. Three letters of recommendation and GRE General Test are required. Applicants whose native language is not English must submit a TOEFL score (or equivalent IELTS or MELAB) and should have a score of at least 600 (paper), 250 (computer), or 100 (Internet). See www.stat.umn.edu/Admissions/HowToApply.html for complete details.

**Courses** Refer to Statistics (STAT) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—Certain 4xxx courses from other departments may be used to meet degree requirements with the approval of the director of graduate studies. STAT 4101–2 can be used in statistics graduate minors.

**M.S. Plan B Degree Requirements**
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 three courses (at least 9 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 and complete their Plan B project. A total of at least 34 course credits is required. A written preliminary examination is taken at the beginning of the second year.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**—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.

**Ph.D. Degree Requirements**

The Ph.D. program core courses cover statistical theory (STAT 8101, 8102, 8111, and 8112; 14 cr), statistical methods (STAT 8051, 8052, 8053, and 8054; 14 cr), and statistical practice (STAT 8802 and 8055; 4 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. preliminary written examination is given at the end of the first year of study and covers theory and methods at the level of STAT 8051, 8052, 8101, and 8102. For more complete information, consult the School of Statistics Graduate Student Handbook or www.stat.umn.edu/Programs/PhDRequirements.html.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—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.

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### Stem Cell Biology

**Contact Information**—Stem Cell Biology Graduate Program, Stem Cell Institute, University of Minnesota, MC 2873, 2001 6th Str. S.E., Minneapolis, MN 55455 (612-625-0602; fax 612-624-2436; Scbgrad@umn.edu).

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.grad.umn.edu/faculty_rosters/faculty.html).

**Regents Professor**

Bruce R. Blazar, Pediatric Hematology/Oncology/Bone Marrow Transplantation, M2

**Professor**

Daniel J. Garry, Medicine/Cardiology, M2
Wei-Shou Hu, Chemical Engineering/Material Science, M2
Steven K. Juhn, Otolaryngology, M2
Walter C. Low, Neurosurgery, M2
Steven McLoon, Neuroscience, M2
Jaime Modiano, Veterinary Clinical Sciences, M2
Timothy D. O’Brien, Veterinary Population Medicine, M2
Mark E. Rosenberg, Medicine/Renal, M2
Jonathan M. W. Slack, Genetics, Cell Biology and Development, M2
Doris A. Taylor, Integrative Biology and Physiology, M2
LaDora V. Thompson, Physical Medicine and Rehabilitation, M2
Jianyi Zhang, Medicine, M2

**Associate Professor**

Dan S. Kaufman, Medicine/Hematology, Oncology/Bone Marrow Transplantation, M2
Rita C. R. Perl ingeiro, Medicine, M2

**Assistant Professor**

Christina E. Clarkson, Veterinary Biosciences, M2
James R. Dutton, Genetics, Cell Biology and Development, M2
Scott C. Fahrenkrug, Animal Science, M2
Meri Firpo, Medicine/Endocrinology, M2
Sandeep Gupta, Medicine/Renal, M2
Yasuhi ko Kawakami, Genetics, Cell Biology and Development, M2
Susan A. Keirstead, Integrative Biology and Physiology, M2
Nobuki J. Kikyo, Medicine/Hematology, Oncology and Transplantation, M2

**Curriculum**—This degree program prepares 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 classes 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 laboratory classes, 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.

**Prerequisites for Admission**—A bachelor’s degree or foreign equivalent in biological science or a related field, with a 3.20 GPA. A preferred TOEFL score of 580 (paper), 237 (computer) with a minimum score of 4 in the TWE, or 92 (Internet) with a minimum score of 21 on each of the two components, or 6.5 on the IELTS (with not less than 6.0 in each of the four components) is required for applicants whose native language is not English.

**Special Application Requirements**—Applicants must forward to the Stem Cell Biology Graduate Program two letters of recommendation; a brief (max. 500 words) personal statement outlining previous research experience, research interests, long and short term goals; TOEFL or IELTS results (international students only); a curriculum vitae or résumé, and copies of transcripts.

**Courses**—See Stem Cell Biology (SCB) in the course section of this catalog or in [Twin Cities Courses](http://www.ctc.umn.edu) on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**—This program does not accept 4xxx courses.

**M.S. Plan A Degree Requirements**

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 of the thesis. Requirements include at least 20 course credits and 10 thesis credits.

**Language Requirements**—None

**Final Exam**—The final exam consists of an oral presentation based on the written thesis.
Minor Requirements for Students Majoring in Other Fields
The minor in stem cell biology is available to students in relevant Ph.D. programs such as molecular, cellular, developmental biology and genetics; microbiology, immunology and cancer biology; neuroscience; pharmacology; and bioengineering with an interest in stem cell biology. In addition to the major requirement appropriate to the specific program, the stem cell biology minor will require 12 credits from designated courses with a minimum GPA 3.00. The main research project of the Ph.D. degree must be done in the lab of a faculty member of the stem cell biology graduate program.

Strategic Communication
Contact Information—Graduate Studies Office, Strategic Communication M.A. Program, School of Journalism and Mass Communication, University of Minnesota, 111 Murphy Hall, 206 Church Street S.E., Minneapolis MN 55455 (612-625-4054; fax 612-626-8251; sjmcgrad@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
John Eighmey, M2
Ronald Faber, M2
Daniel B. Wackman, M2

Associate Professor
Kenneth O. Doyle, M2
Brian Southwell, M2
Albert R. Tims, M2

Assistant Professor
Jisu Huh, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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 by in-depth study of strategic process management.

Prerequisites for Admission—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.

Special Application Requirements—Applications to both the School of Journalism and Mass Communication and the University of Minnesota Graduate School must be received before June 15. Acceptance is on a rolling basis, with a maximum of 20 students accepted. Applications are processed only when they are complete and accompanied by the application fee, which is nonrefundable.

Courses—Refer to Journalism and Mass Communications (JOUR) in the course section of this catalog for courses pertaining to this program.

Use of 4xxx Courses—Use of 4xxx courses is not permitted.

M.A. Degree Requirements
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.

Language Requirements—Foreign language study is recommended for students who plan to work internationally.

Stream Restoration Science and Engineering
Postbaccalaureate Certificate
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; srsegrad@umn.edu; www.nced.umn.edu/sr_certificate_uofm).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Ken Brooks, Forest Resources, M
Efi Foufoula-Georgiou, Civil Engineering, M
Susan Galatowitsch, Horticultural Science, M
John Gulliver, Civil Engineering, M
Miki Hondo, Civil Engineering, M
Claudia Neuhauser, Ecology, Evolution, and Behavior, M
Ray Newman, Fisheries, Wildlife, and Conservation Biology, M
John Nieber, Bioproducts and Biosystems Engineering, M
Chris Paola, Geology and Geophysics, M
James Perry, Fisheries, Wildlife, and Conservation Biology, M
David Pitt, Landscape Architecture, M
Vaughan Voller, Civil Engineering, M
Bruce Wilson, Bioproducts and Biosystems Engineering, M

Adjunct Professor
Bruce Vondracek, Fisheries, Wildlife, and Conservation Biology, M

Associate Professor
Bill Arnold, Civil Engineering, M
David Fulton, Fisheries, Wildlife, and Conservation Biology, M
Jacques Finlay, Ecology, Evolution, and Behavior, M
Studies in Africa and the African Diaspora

Minor Only

Contact Information—Department of African American and African Studies, University of Minnesota, 808 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-624-9847; fax 612-624-9838). For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
Allen F. Isaacman, History, AM

Professor
Rose M. Brewer, African American and African Studies, M
Samuel Myers, Public Affairs, AM
August H. Nimtz Jr., Political Science, AM
John S. Wright, African American and African Studies, M

Associate Professor
Keletso E. Atkins, African American and African Studies, M
Louis R. Bellamy, Theatre Arts, AM
Roderick Fergusson, American Studies, AM
Priscilla Gibson, Gender, Women, and Sexuality Studies, AM
Walt Jacobs, African American and African Studies, M
Tricia Keaton, American Studies, M
Tade O. Okediji, African American and African Studies, M
Gloria Williams, Design, Housing, and Apparel, AM
Kirt H. Wilson, Communication Studies, AM

Assistant Professor
Pearl Barner II, African American and African Studies, M
Victoria B. Coifman, African American and African Studies, M
Njeri R. Githire, African American and African Studies, M
Keith A. Mayes, African American and African Studies, M
Yuichiro Onishi, African American and African Studies, AM
Alexis D. Pate, African American and African Studies, AM
Charles Ben Pike, African American and African Studies, M

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—This interdisciplinary graduate minor is administered through the Department of African American and 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.

Prerequisites for Admission—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School.

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 Studies 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.

Courses—Refer to Afro-American Studies (AFRO) in the course section of this catalog or on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses towards degree requirements is subject to adviser and/or director of graduate studies approval.

Minor Only Requirements

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.

Studies of Science and Technology

Minor Only

Contact Information—Director of Graduate Studies, Studies of Science and Technology, University of Minnesota, 746 Heller Hall, 271 19th Avenue South, Minneapolis, MN 55455; (612-625-6635; fax 612-626-8380; mcps@umn.edu; www.sst.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Carl Elliott, Bioethics, M
John M. Eyler, History of Medicine, M
Fred N. Finley, Curriculum and Instruction, M
Alan C. Gross, Communication Studies, M
Laura J. Gurak, Writing Studies, M
William H. Hanson, Philosophy, M
Geoffrey Hellman, Philosophy, M
Jeffrey P. Kahn, Bioethics, M
Kenneth H. Keller, Center for Science, Technology, Public Affairs, M
Sally G. Kohlstedt, Geology and Geophysics, M
Thomas J. Misa, History of Science and Technology, M
Naomi Scheman, Philosophy, M
Robert W. Seidel, Charles Babbage Institute, M
Alan E. Shapiro, Ecology, Evolution, and Behavior, M
Daniel J. Philippon, English, M
C. Kenneth Waters, Philosophy, M

Associate Professor
Jennifer K. Alexander, Mechanical Engineering, M
Bruce P. Braun, Geography, M
Jennifer Lee Gunn, History of Medicine, M
Michel H. Janssen, History of Science and Technology, M
Susan D. Jones, Ecology, Evolution, and Behavior, M
Jean M. Langford, Anthropology, M
Daniel J. Philippon, English, M
John B. Shank, History, M
Karen Sue Taussig, Anthropology, M

Assistant Professor
Mark E. Borrello, Ecology, Evolution, and Behavior, M
Alan C. Love, Philosophy, M
Hiromi Mizuno, History, M

Curriculum—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 SST minor is for students from any major who want to gain a deeper understanding of the nature and development of science and technology.

The SST minor provides introductory core courses in historiography and philosophy of science, followed by research seminars and other elective courses in four main research areas: models, theories, and reality; classical science; biological and biomedical sciences; and science, technology, and society. Seminar topics vary yearly depending on faculty and student interest.

Prerequisites for Admission—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School and is by permission of the director of graduate studies in SST.

Special Application Requirements—Prospective students should contact director of graduate studies.

Courses—Refer to Studies of Science and Technology (SST) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses is not permitted toward minor requirements.

Minor Only Requirements
A master’s minor requires 7 graduate credits and a 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.

Language Requirements—None.

Surgery

Contact Information—Department of Surgery, University of Minnesota, 420 Delaware Street S.E., MMC 195, Minneapolis, MN 55455 (612-626-2590; surgwww@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Regents Professor
John S. Najarian, SM

Professor
Roderick A. Barke, SM
Gregory J. Beilman, M2
Henry Buchwald, SM
Frank B. Cerra, SM
Bruce L. Cunningham, M2

Agustin P. Dalmaso, SM
William C. Engeland, Neuroscience, SM
John E. Foker, SM
Bernhard J. Hering, M2
Arnold S. Leonard, ASM
Michael A. Maddaus, M2
Robert D. Maddoff, M2
Arthur J. Matas, SM
J. Ernesto Molina, M2
William D. Payne, M2
David A. Rothenberger, M2
Ashok K. Saluja, SM
Steven M. Santilli, M2
Sara J. Shumway, M2
David E. R. Sutherland, SM
Herbert B. Ward, M2

Adjunct Professor
Arnold S. Leonard, ASM

Associate Professor
Jerome H. Abrams, M2
Richard Bianco, SM
Daniel Saltzman, M2

Assistant Professor
Robert D. Acton, M2
Rafael S. Andrade, M2
Ranjit John, M2
Karen R. Wasiluk, SM

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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).

Prerequisites for Admission—Prospective students must be in the general surgery training program and have two to three clinical years of training completed.
Courses—Refer to Surgery (SURG) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses is not permitted toward degree requirements.

M.S.Exp.Surg. Plan A Degree Requirements

The master’s degree in experimental surgery (M.S.Exp.Surg.) is offered under Plan A only. At least 32 course credits (26 in the major and 6 in the minor or related fields) plus 10 thesis credits are required for a total of 42 credits.

Language Requirements—None.

Final Exam—The final exam is oral.

M.S.Surg. Plan A Degree Requirements

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.

Language Requirements—None.

Final Exam—The final exam is oral.

Ph.D.Surg. Degree Requirements

Students spend two to three years in the Medical School’s general surgery program. A minimum of 79 course credits (67 in the major, plus 12 to 16 in the minor or supporting program) is required; 24 thesis credits are also required.

Language Requirements—None.

Sustainable Agriculture Systems

Minor Only

Contact Information—Director of Graduate Studies, Sustainable Agriculture Systems Minor, Minnesota Institute for Sustainable Agriculture, University of Minnesota, 411 Borlaug Hall, 1991 Upper Buford Circle, Saint Paul, MN 55108 (612-625-8235; fax 612-625-1268; jorda020@umn.edu; www.misa.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Deborah L. Allan, Soil, Water, and Climate, M
David A. Andow, Entomology, M
David D. Biesboer, Plant Biology, M
Vernon B. Cardwell, Agronomy and Plant Genetics, M
Iris D. Charvat, Plant Biology, M
Sharon M. Danes, Family Social Science, M
Susan M. Galatowitsch, Horticultural Science, M
Peter H. Graham, Soil, Water, and Climate, M
Jeffrey Lynn Gunolus, Agronomy and Plant Genetics, M
Robert Philip King, Applied Economics, M
Albert H. Markhart III, Horticultural Science, M
Roger D. Moon, Entomology, M
D. J. Mulla, Soil, Water, and Climate, M
Kent D. Olson, Applied Economics, M
James H. Orf, Agronomy and Plant Genetics, M
Paul Porter, Agronomy and Plant Genetics, M
Edward B. Radcliffe, Entomology, M
Paul C. Rosenblatt, Family Social Science, M
Michael P. Russell, Soil, Water, and Climate, M
Craig C. Sheaffer, Agronomy and Plant Genetics, M
John M. Shutiske, Biosystems and Agricultural Engineering, M
Marla Spivak, Entomology, M
William F. Wilcke, Biosystems and Agricultural Engineering, M
Donald Wyse, Agronomy and Plant Genetics, M

Associate Professor

John Deen, Veterinary Population Medicine, M
Ruth Dill-Macky, M
Jeffrey H. Gillman, Horticultural Science, M
Craig A. Hassel, Food Science and Nutrition, M
Kristen C. Nelson, Forest Resources, M

Assistant Professor

Helene Murray, Agronomy and Plant Genetics, M

Fellow

Carl V. Phillips, Minnesota Center for the Philosophy of Science, M

Curriculum—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.

Prerequisites for Admission—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School.

Special Application Requirements—Contact the director of graduate studies in sustainable agriculture systems for an Intent to Enroll Form. Students are admitted each semester.

Courses—Refer to Sustainable Agriculture Systems (SAGR) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—4xxx courses are permitted toward minor requirements based on director of graduate studies approval.

Minor Only Requirements

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 3321). A unique component of the minor is an on-site internship with growers, grassroots organizations, or public agencies working in sustainable agriculture.

Technical Communication

Postbaccalaureate Certificate

Contact Information—Department of Writing Studies, University of Minnesota, 180 Westbrook Hall, 77 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-3445; fax 612-624-3617; WRIT@umn.edu; www.writings.l.lib.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Carol Ann Berkenkotter, M
Ann Hill Duin, M
Alan G. Gross, M
Laura J. Gurak, M
Earl E. McDowell, M
Donald Ross, M
Mary M. Lay Schuster, M
Billie J. Wahlstrom, M
Arthur E. Walzer, M

Associate Professor

Lee-Ann Kastman Breuch, M
Patrick Bruch, M
Richard J. Graff, M
John Logie, M
Bernadette C. Longo, M
Daniel J. Philippon, M
Thomas Reynolds, M

Assistant Professor

Chris Russell, M

Along with the program-specific requirements listed below, read the General Information section of this catalog for
Graduate School requirements that apply to all major fields.

Curriculum—The postbaccalaureate certificate in technical communication is designed to provide instruction for working technical and scientific communicators and graduate-level communication students to enhance their knowledge and skills base. After completing this certificate program, students should be able to apply technical communication principles to analyze a project’s audience and purpose, and based on this analysis, produce technical documents in several media that are of professional quality and appropriate for the communication situation.

The certificate 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.

Special Application Requirements—To be admitted into the technical communication graduate certificate program, students must have a bachelor’s degree from an accredited institution and a preferred performance level for their GPA of 3.00. (Students who have relevant professional experience, but who don’t have a 3.00 GPA should contact the director of graduate studies.)

Admission to the certificate program is recommended no later than after completion of the first course in the program.

Courses—Refer to Writing Studies (WRIT) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on Degree Program Forms is subject to approval by the adviser and the director of graduate studies. Two 4xxx courses are currently part of this program.

Certificate Requirements—Fifteen credits are required for this certificate: 12 credits in core requirement courses that include an introduction to graduate studies in the field, editing, information design, and visual display, all as they are applied to technical communication; and 3 credits in an elective class in either usability or research in the field.

If interested, a student may apply up to 12 credits from the certificate program towards the M.S. in scientific and technical communication (upon successful admission to the M.S. program).

For more information on this degree, see www.msstc.umn.edu/certificate.html and www.cce.umn.edu/certificates/techcomm.

Language Requirements—None.

Theatre Arts

Contact Information—Department of Theatre Arts and Dance, University of Minnesota, 580 Rarig Center, 330 21st Avenue South, Minneapolis, MN 55455 (612-625-5029; fax 612-625-6334; theatre@umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
C. Lance Brockman, M2
Michal Kobialka, SM
Mathew J. LeFebvre, M2

Associate Professor
Louis R. Bellamy, M2
Ananya Chatterjee, M2
Carl L. Flink, M2
Martin B. Gwinup, M2
Sonja Arsham Kuffinec, SM
Elizabeth H. Nash, M2
Joan A. Smith, M2

Assistant Professor
Lisa Channer, M2
Marcus Dillard, M2
Cindy Garcia, M2
Diyah Larasati, M2
Michael Sommers, M2
Dominic Taylor, M2
Margaret L. Werry, M2

Education Specialist
Susan M. Binder, M
Brent “Mickey” Henry, M
Christine Swartwout, M
Sherry L. Wagner-Henry, M

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—Theatre arts programs provide practical and theoretical education for the performer, artist, educator, scholar, and audience member. Training the historian, theorist, artist, and craftsperson is linked to and centered in the laboratory experience of live performance as well as in the academic classroom. The programs serve the dual roles of examining the various historical and contextual relationships of past and present theatre while educating audiences and theatre artisans/educators of tomorrow. The programs prepare students for careers in professional or academic theatre and related artistic fields.

Prerequisites for Admission—Students are admitted for fall semester only. The M.A./Ph.D. program and the M.F.A. design/technology program admit every year. Prerequisites for the initial screening phase of admission include a U.S. bachelor’s degree or comparable foreign degree from a recognized college or university, a minimum of 18 undergraduate credits or the equivalent in theatre arts or related disciplines, and a 3.00 GPA. Applicants for the M.A./Ph.D. must submit scores from the GRE by February 1. International students’ TOEFL scores must be submitted by January 15. A score of 550 (paper), 213 (computer), or 79 (Internet) is preferred.

The master’s degree is a prerequisite for admission to the Ph.D. program. Students without a master’s degree are admitted to the Ph.D. with the intention that the M.A. will be attained in route to the Ph.D. For admission to the M.A./Ph.D. or Ph.D. program, students must have a working knowledge/reading proficiency of at least one foreign language (or a sign language). A computer language proficiency of at least one foreign language (or a sign language). A computer

Special Application Requirements—The application deadline for all degree programs is January 5. Applications received after that date will be considered only if there is an opening in the particular program. M.A./Ph.D. students wishing to have materials reviewed for the Graduate School fellowship (for support of first-year students) must have materials submitted by January 5. All programs require a current résumé, statement of purpose/intent, and three letters of recommendation to be submitted with the department application.

The M.A./Ph.D. program requires a current résumé, statement of purpose/intent, and three letters of recommendation to be submitted with the department application.

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The M.A./Ph.D. program requires a current résumé, statement of purpose/intent, and three letters of recommendation to be submitted with the department application.
M.A. Degree Requirements

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.

For both Plan A and B, 30 credits are required from the following: three of the six sequence courses (8111–8116) plus 8102, totaling 12 credits; 3 credits from a course in performance conventions; 3 credits in an independent seminar; 6 elective credits from inside or outside the department; 6 credits at the graduate level from outside the department (outside courses must be at least 3 credits each). For Plan A, 10 additional thesis credits (TH 8777) and an oral defense of the thesis are required. For Plan B, three papers are required.

Language Requirements—See the requirements for the Ph.D.

Final Exam—For Plan A, the final exam is written and oral. For Plan B, the final exam is written; an oral exam typically is not required, but one may be requested by the M.A. committee.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires a minimum of 9 credits as approved by the director of graduate studies.

M.F.A. Degree Requirements

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 60 graduate credits, although a particular program’s requirements may exceed this minimum. 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.

Language Requirements—None.

Final Exam—Students must take a final oral exam related to the final creative project and must submit a written record of the project and the research related to it.

Ph.D. Degree Requirements

The Ph.D. certifies that a degree recipient has knowledge and understanding of theatre historiography and practice as well as pedagogical and professional strategies for communicating and applying that knowledge. 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.

The core curriculum, designed to help students finish the program within five years, consists of two parts: coursework (three years); and research and dissertation writing. The three years of coursework are tailored so that the first two years are structured, with the third year more open, allowing students to pursue their individual areas of interest in depth. Students are required to successfully complete six required courses over the three-year sequence: three courses must be in specific areas of theatre historiography, to be chosen from six seminars (TH 8111–6 sequence); historiography (TH 8102); a course in performance conventions; and an independent seminar in which students refine and materialize their work. This seminar, which can take the form of an independent study, directed reading/production, or a regular course format designed by the student and the adviser, usually takes place at the beginning of the third year. Students must also take coursework in a supporting program or a minor (12 cr); and 24 thesis credits, for a minimum total of 54 credits beyond the B.A. Topics courses and seminars supplement the core curriculum. Students must demonstrate a research technique appropriate to the thesis. This could take the form of a foreign language or a discipline research methodology, which might increase the total number of credits required for the degree.

Language Requirements—Ph.D. students are expected to demonstrate proficiency in at least one foreign language as certified by the adviser or program faculty in the language.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires a minimum of 12 credits as approved by the director of graduate studies.

Transportation Studies

Postbaccalaureate Certificate

Contact Information—Transportation Studies Certificate, Information Center, College of Continuing Education, University of Minnesota, 77 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4000; fax 612-625-6381; info@cce.umn.edu; cts@umn.edu; www.cts.umn.edu).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor

Gary Davis, Civil Engineering, M

Associate Professor

Karen Donohue, Operations and Management Sciences, M

David Levinson, Civil Engineering, M

Assistant Professor

Jason Cao, Humphrey Institute of Public Affairs, M

Yingling Fan, Humphrey Institute of Public Affairs, M

Nikolas Geroliminis, Civil Engineering, M

Henry Liu, Civil Engineering, M

Curriculum—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.
Urban and Regional Planning

Contact Information—Director of Graduate Student Services, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax 612-626-0002; hhhadmit@umn.edu; www.hhh.umn.edu). For latest graduate faculty listings, see www.grad.umn.edu/faculty/rosters/faculty.html.

Professor
Ragui A. Assaad, M2
J. Brian Atwood, M2
Michael Barnett, M2
John M. Bryson, M2
Nancy N. Eustis, M2
Katherine Fennelly, M2
Edward G. Goetz, M2
Stephen A. Hoenack, M2
C. David Hollister, AM2
Lawrence R. Jacobs, M2
Anne R. D. Kapuscinski, Fisheries, Wildlife, and Conservation Biology, AM
Sally J. Kenney, M2
Morris M. Kleiner, M2
Robert T. Kudrle, M2
Greg H. Lindsey, M2
Samuel L. Myers, M2
David G. Pitt, Landscape Architecture, AM2
Carlisle F. Runge, Applied Economics, AM
Joe Soss, M2

Associate Professor
Barbara Crosby, M2
Maria J. Hanratty, M2
Laura T. Kalamkis, AM
Jennifer Kuzma, M2
David M. Levinson, Civil Engineering, AM2
Deborah Levison, M2
Laura Musacchio, AM
Joseph A. Ritter, M2
Jodi R. Sandfort, M2
Melissa M. Stone, M2
Julie Temple, M2

Assistant Professor
Ryan P. Allen, M2
Jason Cao, M2
Yingling Fan, M2
Greta Friedemann-Sanchez, M2
Julian Marshall, Civil Engineering, AM
Carissa Schively Slotterback, M2
Elizabeth J. Wilson, M2
Zhirong Zhao, M2

Other
Harry C. Boyte, M2
William Craig, Geography, AM
Gary DeCramer, M2
Kaye Husbands Fealing, AM2
Sherry Gray, M
Steve Kelley, M
P. Jay Kiedrowski, M2
Judith Martin, AM
Lee W. Munnich, M2
Joe Nathan, M2

Myron W. Orfield Jr., AM
Timothy Penny, AM
Sudha Penny, M
Paul C. Stone, M2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—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. Dual degrees include M.U.R.P./juris doctor, M.U.R.P./master of landscape architecture, M.U.R.P./master of science in civil engineering, and M.U.R.P./master of social work.

Prerequisites for Admission—Students are expected to have a U.S. bachelor’s degree or foreign equivalent. Basic competence in college algebra and computers is required. Introductory coursework in microeconomics and political science is recommended.

Special Application Requirements—In addition to the materials submitted to the Graduate School, applicants must submit to the Humphrey Institute a photocopy of their Graduate School Application Form, the Humphrey Institute Applicant Data Form, copies of all academic transcripts, a statement of purpose, at least three letters of recommendation, a GRE official score report, and a professional résumé or C.V. Students who wish to be considered for financial aid should apply no later than January 5 of the preceding academic year. Deadline for admission only is April 1. Entry is for fall semester.

Courses—Refer to Public Affairs (PA) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted with instructor’s and adviser’s permission.
M.U.R.P. Degree Requirements

The M.U.R.P., which is offered under Coursework Only and Plan A, requires 48 credits including core courses (26 cr), specialization electives (9 cr), and 10 credits of electives. Each student completes an internship in a public or private planning agency, usually during the summer after the first year of the program. All students also take a capstone workshop (3 cr) that constitutes a final, professional-level project. Students in the Coursework Only option complete a professional paper. Students selecting the Plan A option register for 10 thesis credits and complete a thesis. Specializations for the degree include housing and community development; regional, economic, and workforce development; transportation planning; land use/urban design planning; and environmental planning. Students may pursue a minor.

Language Requirements—None.

Final Exam—The final exam is oral for Plan A. The client presentation in the capstone workshop fulfills the requirement for the final exam for Coursework Only.

Minor Requirements for Students Majoring in Other Fields—A minor is constructed in consultation with the student’s minor adviser.

Veterinary Medicine

Contact Information—Director of Graduate Studies, Veterinary Medicine Graduate Program, College of Veterinary Medicine, 443 VMC, 1365 Gortner Avenue, Saint Paul, MN 55108 (612-626-1948; fax 612-626-2825; cvmmsphd@umn.edu; www.cvm.umn.edu/vmed).

For latest graduate faculty listings, see www.grad.umn.edu/faculty_rosters/faculty.html.

Professor
Trevor R. Ames, Veterinary Population Medicine, SM
P. Jane Armstrong, Veterinary Clinical Sciences, SM
Alvin Beitz, Veterinary Biomedical Sciences, SM
Russell F. Beyer, Veterinary and Biomedical Sciences, SM
David R. Brown, Veterinary and Biomedical Sciences, SM
Cathy S. Carlson, Veterinary Population Medicine, SM
James E. Collins, Veterinary Population Medicine, SM
Michael G. Conzemius, Veterinary Clinical Sciences, SM
Peter Davies, Veterinary Population Medicine, SM
Scott A. Dee, Veterinary Population Medicine, SM

Ronald Del Vecchio, Agriculture, Crookston, M2
Melvin L. Fahning, Veterinary Population Medicine, SM
Daniel A. Feeney, Veterinary Clinical Sciences, SM
John Fetrow, Veterinary Population Medicine, SM
Douglas N. Foster, Animal Science, SM
Sagar M. Goyal, Veterinary Population Medicine, SM
David A. Halvorson, Veterinary and Biomedical Sciences, SM
Robert M. Hardy, Veterinary Clinical Sciences, M2
David W. Hayden, (emeritus), Veterinary Population Medicine, SM
William D. Hueston, Veterinary Population Medicine, SM
Richard Isaacson, Veterinary and Biomedical Sciences, SM
Han S. Joo, Veterinary Population Medicine, SM
Mathur S. Kannan, Veterinary and Biomedical Sciences, SM
Jody P. Lulich, Veterinary Clinical Sciences, SM
Louis Mansky, Diagnostic and Biological Sciences, SM
James Mickelson, Veterinary and Biomedical Sciences, SM
Jaime Modiano, Veterinary Clinical Sciences, SM
Thomas W. Molitor, Veterinary Population Medicine, SM
Roger D. Moon, Entomology, SM
Robert B. Morrison, Veterinary Population Medicine, SM
Michael P. Murtaugh, Veterinary and Biomedical Sciences, SM
Kakambi V. Nagaraja, Veterinary and Biomedical Sciences, SM
Timothy D. O’Brien, Veterinary Population Medicine, SM
Carl A. Osborne, Veterinary Clinical Sciences, SM
Phillip K. Peterson, Medicine, M2
David J. Polzin, Veterinary Clinical Sciences, SM
Patrick T. Redig, Veterinary Clinical Sciences, M2
Jagdev M. Sharma, Veterinary and Biomedical Sciences, SM
Bert E. Stromberg, Veterinary and Biomedical Sciences, M2
Stephanie J. Valberg, Veterinary Population Medicine, SM
Larry J. Wallace, Veterinary Clinical Sciences, SM
Robert Washabau, Veterinary Clinical Sciences, SM
Scott J. Wells, Veterinary Population Medicine, SM

Adjunct Professor
Kay S. Faaberg, Veterinary and Biomedical Sciences, SM

Clinical Professor
Betty A. Heffernan, Veterinary Clinical Sciences, M2
Paul Rapnicki, Veterinary Population Medicine, M2

Associate Professor
Jeff B. Bender, Veterinary Population Medicine, SM
John Deen, Veterinary Population Medicine, SM

Scott Fahrenkrug, Animal Science, SM
Sandra M. Godden, Veterinary Population Medicine, SM
Yinduo Ji, Veterinary and Biomedical Sciences, M2
James R. Lokensgard, Medicine, M2
Moses K. Njenga, Veterinary and Biomedical Sciences, M2
Elizabeth Pluhar, Veterinary Clinical Sciences, SM
Margaret V. Root Kustritz, Veterinary Clinical Sciences, M2
Mark S. Rutherford, Veterinary and Biomedical Sciences, SM
Leslie Sharkey, Veterinary Population Medicine, M2
Randall Singer, Veterinary and Biomedical Sciences, SM
Ashok Singh, Veterinary Population Medicine, SM
Srinand Sreevatsan, Veterinary Population Medicine, SM
Anthony Tobias, Veterinary Clinical Sciences, SM
Sheila M. Torres, Veterinary Clinical Sciences, SM
Ava M. Trent, Veterinary Population Medicine, M2
Julia Wilson, Veterinary Population Medicine, M2
Arno Wunschmann, Veterinary Population Medicine, M2

Associate Clinical Professor
Mostafa Boujlihad, Veterinary Population Medicine, M2
Lynelle Graham, Veterinary Clinical Sciences, M2
Erin D. Malone, Veterinary Population Medicine, M2
Roberto Novo, Veterinary Clinical Sciences, M2
Jane E. Quandt, Veterinary Clinical Sciences, M2
Kurt D. Rossow, Veterinary Population Medicine, SM
Jerry Torsion, Veterinary Population Medicine, M2
Andre Ziegler, Veterinary Population Medicine, M2

Assistant Professor
Hwa Choi, Veterinary Clinical Sciences, M2
Connie J. Gebhart, Veterinary and Biomedical Sciences, SM
Timothy Johnson, Veterinary and Biomedical Sciences, M2
Molly E. McCue, Veterinary Population Medicine, SM
Claudia Munoz-Zanzi, School of Public Health, M2
Ned Patterson, Veterinary Clinical Sciences, M2
Katey Pelican, Veterinary Population Medicine, M2
Pamela Skinner, Veterinary and Biomedical Sciences, M2
Catherine St. Hill, M2
Troy Trumble, Veterinary Population Medicine, M2

Assistant Clinical Professor
Anibal Armien, Veterinary Population Medicine, M2
Julie Ann Churchill, Veterinary Clinical Sciences, M2
A majority of applicants have a D.V.M. degree or its equivalent. Applicants lacking a D.V.M. degree, including those currently enrolled in a D.V.M. degree program, may be accepted upon approval by the program advisory committee.

Prerequisites for Admission—A majority of applicants have a D.V.M. degree or its equivalent. Applicants lacking a D.V.M. degree, including those currently enrolled in a D.V.M. degree program, may be accepted upon approval by the program advisory committee.

Special Application Requirements—Applicants must submit a clearly written statement outlining their career interests and goals, any previous research experience, and identifying the specialty track desired. Also required are a complete set of official transcripts, a C.V. or résumé, and three letters of recommendation from individuals knowledgeable about the applicant’s academic performance. Applicants are requested but not required to take the GRE prior to consideration for admission. International students are required to submit an official TOEFL score. Submission of all application materials by a March 1 deadline is required for full consideration for fellowships and research assistantships awarded for the next academic year. Students are typically admitted for fall semester, though there is an October 1 deadline for spring semester admission consideration.

Research Facilities—Research facilities available to the veterinary medicine graduate student include the Advanced Genetic Analysis Center, the Clinical Investigation Center, the Raptor Center, the Swine Center, the Swine Disease Eradication Center, and the Avian Disease Research Center.

Courses—Refer to Veterinary Medicine (VMED) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

Use of 4xxx Courses—Use of select 4xxx courses to meet degree requirements is acceptable with prior approval from the adviser and director of graduate studies.

M.S. Degree Requirements
The M.S. is offered under Plan A and Plan B. Plan A requires 20 course credits: 14 course credits in the major, 6 course credits in a minor or related field, plus 10 thesis credits. Plan B requires 30 course credits: 14–20 course credits in the major and 10–16 credits in a minor or related field. Three papers are also required (e.g., a case report, a research project, and a literature review).

Language Requirements—None.

Final Exam—The final exam is written and oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires 6 course credits taken from recommended courses in the veterinary medicine major.

Ph.D. Degree Requirements
There are no minimum requirements but students usually take 24–30 credits in the major field and 12 credits minimum for official minor or supporting program. In addition, 24 thesis credits are required.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires 12 course credits taken from recommended courses in the veterinary medicine major.

For latest graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/faculty.html](http://www.grad.umn.edu/faculty_rosters/faculty.html).

Professor
Darlyn Bailey, M2
James M. Brown, SM
Judith J. Lambrecht, SM
Theodore Lewis, SM
Gary N. McLean, SM
James R. Stone III, SM
Ruth G. Thomas, SM
Baiyin Yang, SM

Associate Professor
Alexandre A. Ardichvili, SM
Kenneth R. Bartlett, SM
Richard M. Joerger, M2
Gary W. Leske, SM
Rosemarie J. Park, SM
Jane Pihal, SM
Marilyn Rossmann, SM

Assistant Professor
Brad Greiman, M2
Shari L. Peterson, SM

Other
Mauvalyn M. Bowen, AM2
Marie J. Maher, AM2
Tom Stertz, AM2
John R. Vreyens, AM2
Joyce A. Walker, AM2
Robert D. Shumer, ASM
Catherine C. Twohig, M2
Jerome A. Stein, Social Work, AM2

Along with the program-specific requirements listed below, read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—The program offers specializations in adult education; agricultural, food, and environmental education; business and industry education; human resource development; and comprehensive work and human resources education. Students 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.

**Prerequisites for Admission**
Prospective master’s students generally have completed an undergraduate degree or extensive coursework in the specialization area. Prospective doctoral degree students should have academic background and experience in at least one specialization area.

**Special Application Requirements**
Scores from the GRE General Test are required for applicants with a bachelor’s degree from a U.S. institution. Applicants should designate the specific specialization to which they seek admission in their goal statement. A current résumé is required. Students are admitted each term.

**Courses**
Refer to Adult Education (ADED), Agricultural, Food, and Environmental Education (AFEE), Business and Industry Education (BIE), Human Resource Development (HRD), and Work and Human Resource Education (WHRE) in the course section of this catalog or in Twin Cities Courses on the University Catalog Web site for courses pertaining to the program.

**Use of 4xxx Courses**
A maximum of 15 credits of 4xxx courses may be used in the related field or supporting program. Students who plan to use any 4xxx courses in their program are responsible for determining that those courses is available for graduate credit. Degree Program Forms must include rationale for the use of 4xxx course credits.

**M.A. Degree Requirements**
The M.A. is offered under Plan A and Plan B. Students in either plan complete a minimum of 30 to 34 credits of 5xxx courses, including 14 credits in the major and 6 credits in the related field. Plan A students also take 10 thesis credits; Plan B students complete a 3- to 6-credit project or paper, with remaining credits taken in either the major or related field.

**Language Requirements**—None.

**Final Exam**—The final exam is oral.

**Minor Requirements for Students Majoring in Other Fields**—The master’s minor requires a minimum of 6 credits in one of the specializations above, approved by the director of graduate studies.

**Ph.D. Degree Requirements**
The Ph.D. requires 60 course credits and 24 thesis credits. Course credits include a minimum of 12 credits in general aspects, a minimum of 20 credits in research, and a minimum of 16 credits in the specialization. Course credits must also include 12 elective credits and 12 credits from outside the department, which may overlap with those in general aspects, research, and the specialization.

**Language Requirements**—None.

**Minor Requirements for Students Majoring in Other Fields**—The doctoral minor requires a minimum of 12 credits in one of the specializations, approved by the director of graduate studies.

**Ed.D. Degree Requirements**
The Ed.D. requires 60 course credits and 24 field study credits (thesis credits). Course credits include a minimum of 12 credits in general aspects, a minimum of 11 credits in research, and a minimum of 28 credits in the specialization, 4 of which must be internship credits. Course credits must also include 12 credits from outside the department, which may overlap with those in general aspects, research, and the specialization.

**Language Requirements**—None.

**Final Exam**—A written preliminary exam in each of the program areas (general aspects, research, and specialization) and a final oral exam are required.

**Minor Requirements for Students Majoring in Other Fields**—A doctoral minor requires a minimum of 12 credits in one of the specializations, approved by the director of graduate studies.
Related Fields

Graduate degree programs do not exist in the following fields. However, students may earn graduate credit in courses related to their program and use faculty members on their examining committees from these fields. For graduate courses, see the Course section in this catalog.

Family Practice and Community Health

Professor
Sharon S. Allen

Psychiatry
(ASPY and CAPY)

Professor
Gerald J. August, E
Marilyn E. Carroll, E
Scott J. Crow, E
Elke D. Eckert, E
William H. Frey, Pharmacy, E
Judith G. Garrard, Health Services Research, Policy and Administration, E
Dorothy Hatsukami, Epidemiology, E
Jerome L. Kroll, E
Matt G. Kushner, E
Thomas B. MacKenzie, E
Michael K. Popkin, E
Nancy C. Raymond, E
George Realmuto, E

Associate Professor
Michael L. Bloomquist, E
Daniel R. Hanson, E
Scott R. Sponheim, E

Assistant Professor
John P. Vuchetich, E
Tonya J. White, E

Russian

Professor
Gary R. Jahn, E

Associate Professor
Leonard A. Polakiewicz, E

Therapeutic Radiology

Professor
Bruce J. Gerbi, E
Patrick D. Higgins, E
John J. Kersey, Pediatrics, E
Chang W. Song, E

Associate Professor
Parham Alaei, E

Neurosurgery

Professor
Walter C. Low, E
Robert E. Maxwell, E
Gaylan L. Rockswold, E

Pediatrics

Regents Professor
Alfred F. Michael, E
James G. White, E

Professor
Carlyle C. Clawson, E
Patricia Ferrieri, E
Edward L. Kaplan, Epidemiology, E
James H. Moller, E
Harvey Sharp, E
Warren J. Warwick, E

Associate Professor
Pi-Nian Chang, E
Amos S. Deinard, E
Chandy John, E

Assistant Professor
Elizabeth E. Giles, E
Aaron S. Kelly, E

Senior Research Associate
Nancy L. Leland, E
Course Descriptions

Numbers, Symbols, and Abbreviations

Guide to Course Designators

Accounting (ACCT) 215
Adult Education (ADED) 215
Adult Developmental Psychology (ADPSY) 216
Aerospace Engineering and Mechanics (AEM) 216
Afro-American Studies (AFRO) 218
Agricultural, Food, and Environmental Education (AFE) 219
Agronomy and Plant Genetics (AGRO) 220
Akkadian (AKKA) 220
American Indian Studies (AMIN) 220
American Sign Language (ASL) 221
American Studies (AMST) 221
Anesthesiology (ANES) 221
Animal Science (ANSC) 221
Anthropology (ANTH) 222
Applied Economics (APEC) 224
Applied Plant Sciences (APSC) 226
Arabic (ARAB) 226
Arabic (ARAB) 226
Architectural Engineering (ARCH) 226
Art (ARTS) 229
Art History (ARTH) 230
Asian American Studies (AAS) 232
Asian Languages and Literatures (ALL) 232
Astronomy (AST) 233
Biochemistry (BIOC) 234
Biosystems Engineering (BTBXH) 235
Bioinformatics (BINF) 235
Biological Science (BMEN) 236
Biological Sciences (BMSC) 236
Biophysics (BPHY) 237
Bioproducts and BioSystems Engineering (BBE) 237
Business Administration (BA) 239
Business and Industry Education (BIE) 239
Center for Spiritual Health and Counseling (CSPH) 240
Central Asian Studies (CAS) 242
Chemical Engineering (CHEN) 242
Chemical Physics (CAPH) 243
Chemistry (CHEM) 243
Chicano Studies (CHIC) 245
Child and Adolescent Psychiatry (CAPY) 245
Child Psychology (CPSY) 246
Chinese (CHN) 247
Civil Engineering (CE) 248
Classical and Near Eastern Studies (CENES) 251
Clinical Laboratory Science (CLLS) 252
Cognitive Science (CGSC) 253
Communication Studies (COMM) 253
Comparative and Molecular Biosciences (CMB) 254
Computational Biology (COMPSY) 255
Comparative Studies in Discourse and Society (CSDS) 255
Computer Engineering (CMPE) 256
Computer Science (CSCI) 256
Conservation Biology (CBIO) 258
Control and Dynamic Systems (CSDY) 259
Coptic (COPT) 259
Cultural Studies and Comparative Literature (CSCL) 259
Curriculum and Instruction (CIT) 259
Dance (DANCE) 260
Dentistry (DENT) 267
Design (DES) 268
Design, Housing, and Apparel (DHA) 268
Development Studies and Social Change (DSSC) 270
Dutch (Dutch) 270
East Asian Studies (EAS) 270
Ecology, Evolution, and Behavior (EEB) 270
Economics (ECON) 271
Education (EDUC) 274
Education and Human Development (EDHID) 274
Educational and Human Development (EDPA) 274
Educational Psychology (EPSY) 278
Electrical and Computer Engineering (EE) 284
English: Creative Writing (ENGW) 287
English: Linguistics (ENGL) 288
Entomology (ENT) 289
Environmental Sciences, Policy, and Management (ESPM) 290
Experimental and Clinical Pharmaceutical Economics (ECP) 292
Family Medicine and Community Health (FMCH) 292
Family Policy Minor (FPMI) 292
Family Studies and Human Development (FSOS) 292
Finance (FINA) 294
Financial Mathematics (FM) 294
Finnish (FIN) 294
Fisheries and Wildlife (FW) 294
Food Science and Nutrition (FSCN) 295
Foreign Study—SPAN (FSSP) 296
Forest Resources (FR) 296
French (FREN) 297
French and Italian (FRIT) 298
Gay, Lesbian, Bisexual, and Transgender Studies (GLBT) 298
Gender, Women, and Sexuality Studies (GWSS) 298
Genetics, Cell Biology, and Development (GCD) 300
Geographic Information Science (GIS) 301
Geography (GEOG) 301
Geological Engineering (GEOE) 303
Geology and Geophysics (GEO) 303
German (GERM) 305
German, Scandinavian, and Dutch (GSD) 305
Gerontology (GERO) 306
Global Studies (GLOS) 306
Graduate School (GRAD) 307
Greek (GRK) 307
Health Informatics (HINF) 307
Hebrew (HEBR) 308
Hindi (HIND) 308
History (HIST) 308
History of Medicine (HVED) 312
History of Science and Technology (HiST) 313
Hmong (HMMG) 313
Horticultural Science (HORT) 313
Human Factors (HUMF) 314
Human Resource Development (HRD) 314
Human Resources and Industrial Relations (HRIR) 315
Industrial Engineering (IE) 317
Information and Decision Sciences (IDSC) 318
Infomatics Systems Engineering (ISE) 319
Innovation Studies (IS) 319
Insurance and Risk Management (INS) 319
Interdisciplinary Archaeological Studies (INAR) 319
Interpersonal Communication (ICEL) 320
Introductory Species and Genotypes (ISG) 320
Italian (ITAL) 320
Japanese (JPN) 320
Korean (KOR) 320
Latin (LAT) 320
Liberal Studies (LS) 327
Linguistics (LING) 327
Logistics Management (LM) 328
Management (MGMT) 328
Management of Technology (MOT) 329
Managerial Communications (MCOM) 330
Manufacturing Systems (MS) 330
Marathi (MAR) 331
Marxism (MARX) 331
Marketing (MARKT) 331
Master of Business Administration (MBM) 331
Master of Healthcare Administration (MHA) 332
Materials Science (MATS) 332
Mathematics (MATH) 333
Mathematical and Systems Modeling (MTHE) 337
Mechanical Engineering (ME) 338
Mechanical Engineering (MEDC) 340
Medieval Studies (MEST) 341
Microbial Engineering (MCE) 341
Microbiology, Immunology, and Cancer Biology (MICB) 341
Middle Eastern Languages and Cultures (MEL) 342
Molecular Cellular Developmental Biology and Genetics (MCDBG) 342
Museum Studies (MST) 342
Music (MUS) 342
Music Applied (MUSA) 346
Music Education (MUED) 346
Nanoparticle Science and Engineering (NPSE) 346
Natural Resources Science and Management (NR) 348
Neuroscience (NSC) 348
Neuroscience Department (NSCI) 349
Neurosurgery (NSU) 349
Nursing (NURS) 349
Nutrition (NUTR) 354
Occupational Therapy (OT) 354
Operations and Management Sciences (OMS) 355
Oral Biology (OBIO) 355
Otolaryngology (OTOL) 356
Pharmacology (PHCL) 357
Pharmacology (PHCL) 357
Philosophy (PHIL) 358
Physical Medicine and Rehabilitation (PHMED) 359
Pharmacology (PT) 359
Physics (PHYS) 359
Physiology (PHYSL) 361
Plant Biological Sciences (PBS) 362
Plant Biology (PBC) 362
Plant Pathology (PLPA) 362
Polish (POL) 363
Political Science (POLG) 365
Politics and Policy (PORT) 367
Preventive Science Minor (PREV) 367
Psychology (PSY) 370
Public Affairs (PA) 370
Public Health (PHUB) 375
Radiology (RAD) 375
Recreation Resource Management (RRM) 375
Recreation, Park, and Leisure Studies (RSL) 375
Rehabilitation Science (RSC) 376
Religious Studies (REL) 377
Russian (RUSS) 377
Sanskrit (SANK) 378
Scientific Computation (SCIC) 378
Social and Administrative Sciences (SASP) 379
Social Work (SW) 379
Social and Administrative, and Clinical Pharmacy (SACP) 379
Sociology (SOC) 382
Software Engineering (SENG) 383
Soil and Water Science (SBS) 384
Spanish (SPAN) 385
Spanish and Portuguese (SPPT) 386
Speech-Language-Hearing Sciences (SLHS) 386
Statistics (STAT) 388
Surgical Education (SCED) 390
Surgery (SURG) 390
Sustainable Agriculture (SAGR) 390
Teaching English as a Second Language (TESL) 390
Theatre Arts (TH) 391
Therapeutic Radiology (TRAD) 392
Toxicology (TXCL) 392
Translation and Interpreting (TRIN) 393
Urban Studies (URBS) 393
Veterinary and Biomedical Sciences (VBS) 393
Veterinary Medicine, Graduate (VMED) 393
Water Resources Science (WRS) 395
Writing Studies (WRIT) 397
Youth Development and Research (YOST) 398
Course Numbers, Symbols, and Abbreviations

The courses in this catalog are not offered every semester. For a listing of courses offered in a particular semester, consult the Class Schedule at http://onestop.umn.edu/onestop/registration.html.

Course Numbers—Courses numbered from 5000 to 5999 (listed as 5xxx if individual course number is unspecified) are primarily for graduate students, but are also open to third or fourth year undergraduate students. (5xxx courses in the School of Dentistry and in some clinical departments of the Medical School may not be applied to graduate programs.) Courses numbered 8000 or above (8xxx) are open to graduate students only.

Courses at the 6000 (6xxx) and 7000 (7xxx) levels are for postbaccalaureate students in professional degree programs not offered through the Graduate School. Courses numbered at the 4000 (4xxx) level are primarily for undergraduate students in their fourth year of study. 4xxx, 6xxx, and 7xxx courses may be applied toward a Graduate School degree with approval by the student’s major field and if the course is taught by a member of the graduate faculty or an individual authorized by the program to teach at the graduate level. For course descriptions for 4xxx, 6xxx, and 7xxx courses, consult the list of University courses at http://onestop2.umn.edu/courses/index.html.

Courses at the 1000 (1xxx), 2000 (2xxx), and 3000 (3xxx) levels are for undergraduates and may not be applied to graduate programs. Courses numbered 0000 to 0999 do not carry credit.

Course Designators—In conjunction with course numbers, departments and programs are identified by a 2-, 3-, or 4-letter prefix known as a designator (e.g., CE for Civil Engineering, POL for Political Science, WOST for Women’s Studies). When no course designator precedes the number of a course listed as a prerequisite, that prerequisite course is in the same discipline as the course being described.

Course Symbols and Abbreviations—The following abbreviations and symbols are used throughout the course descriptions of most University catalogs to denote common and recurring items of information.

- Prereq—Course prerequisites.
- cr—Credit.
- 1-4 cr [max 6]—The course can be taken for 1 to 4 credits and may be repeated for up to 6 credits.
- !—Work for this course will extend past the end of the term. A grade of K will be assigned to indicate that the course is still in progress.
- †—All courses preceding this symbol must be completed before credit will be granted for any term of the sequence.
- *—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.”
- DGS—Director of graduate studies.
- W—Following a course number, the W indicates the course is writing intensive.
- A-F, S-N, NGA—Grading options. NGA means “no grade associated.” If no grading option is listed, the course may be taken either A-F or S-N. For more information about grading, see page 14.

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. §3101. Prereq-3578 or #)

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

Department
College
Course number
Course designer
Grading option
Course title
Course credits
Course description
Prerequisite information
Credit will not be granted if credit has been received for the course listed after this symbol.
Accounting (ACCT)

Department of Accounting

Curtis L. Carlson School of Management

ACCT 5100. Corporate Financial Reporting. (4 cr; A-F or Aud. Prereq-qmgmt student, non-accounting major)

Overview of asset/liability valuation and income measurement. Focus on how economic events are reported in the financial statements. Examines accounting theory and the accounting standard-setting process.

ACCT 5101. Intermediate Accounting I. (4 cr; A-F or Aud. Prereq-Grade of at least B- in 2050, [mgmt major or mgmt grad student])

Valuation, measurement, and reporting issues related to selected assets/ liabilities of a firm. Theory underlying accounting issues. Applying accounting principles.

ACCT 5102. Intermediate Accounting II. (4 cr; A-F or Aud. Prereq-5101 [mgmt or grad mgmt student])

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 cr; A-F or Aud. Prereq-[5101 or 5102 or 5101 or 5100 or 6100], [acct major or grad mgmt student])

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 cr; A-F or Aud. Prereq-5125)

Financial/operational auditing. Standards. Managing the function.

ACCT 5135. Fundamentals of Federal Income Tax. (4 cr; A-F or Aud. Prereq-[3050 or 5101 or 3010 or 5100 or 6100], [mgmt or grad mgmt student])

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.

ACCT 5160. Financial Statement Analysis. (2 cr; A-F or Aud. Prereq-[5100 or 6100 or 5101 or 5101], [accounting or finance major])

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. Consolidations and Advanced Reporting. (2 cr; A-F or Aud. Prereq-[5102, mgmt or grad mgmt student])

Theory underlying the preparation of consolidated financial statements, as well as the mechanical computations needed to prepare the statements themselves.

ACCT 5236. Introduction to Taxation of Business. (2 cr; A-F or Aud. Prereq-5155, acct major)

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 cr; S-N only. Prereq-5135, accounting major)

Tax return preparation/consulting experience. Partnership memorandum. Mn 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 5271. Accounting Information Systems. (2 cr; Stdnt Opt. Prereq-5101 or 5100 or 5100 or 6100)

Applications of electronic data processing systems in accounting, including modeling, financial planning, auditing, and data security. Analysis/design of accounting information systems.

ACCT 5281. Special Topics in Financial Reporting. (2 cr; A-F or Aud. Prereq-5120, [mgmt or grad mgmt student])

Covers areas of financial reporting frequently covered on the CPA exam, including partnerships, foreign operations, and accounting for government and nonprofit organizations.

ACCT 5310. International Accounting. (2 cr; A-F or Aud. Prereq-5101, [5102 or 5101])

Macroeconomic concepts of international economics. Trade, international markets for capital, role of accounting. Accounting policies/approaches among nations. Financial statements produced in other countries.

ACCT 5320. Current Topics in Accounting. (2 cr; S-N only)

Topics vary.

ACCT 5420. MacC directed study. (0-4 cr [max 4 cr]; A-F or Aud. Prereq- MacC student)

Internship or directed study in Master of Accountancy degree program.

ACCT 8001. Internal Control. (4 cr; A-F only. Prereq-5402-Macc grad major)


ACCT 8002. Securities and Exchange Commission (SEC) and Standard Setting. (4 cr; A-F only, Prereq-Macc grad major)


ACCT 8006. Advanced Audit. (4 cr; A-F only. Prereq-Macc student)

Auditing of derivatives, business combinations, fair value instruments, and other accounting topics. Evaluating the discipline of forensic accounting.

ACCT 8007. International Accounting. (2 cr; A-F or Aud. Prereq-5402-Macc student)

Rapid changes in environment of international business, how they impact regulation of financial accounting. Causes/histories of international differences in design of financial accounting/reporting systems, current efforts to harmonize them into worldwide system. Role/impact of currency translation on financial statements.

ACCT 8800. Empirical Research: Topics. (2 cr [max 4 cr]; Stdnt Opt)

Current research topics that are cutting-edge and in instructor’s area of expertise. Topics vary.


Economic measures of information contained in accounting numbers; volume and price reactions to accounting disclosure; earnings management; accounting based valuation; market microstructure.

ACCT 8802. Emerging Issues in Accounting. (4 cr [max 8 cr]; Stdnt Opt. Prereq-Business admin PhD student or #)

Topics vary.

ACCT 8803. Empirical Research: Accounting Choice. (2 cr; A-F only)


ACCT 8811. Information Economics I. (4 cr; Stdnt Opt. Prereq-Business admin PhD student or #)

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 cr; Stdnt Opt. Prereq-Business admin PhD student or #)

Information in capital markets; asset pricing with asymmetric information; economics of disclosure and information acquisition.

ACCT 8831. Theory of Contracts I. (2 cr; Stdnt Opt)

Foundational models of moral hazard, models with adverse selection, fundamentals of economics literature. How models have been applied to fundamental issues in accounting research.

ACCT 8832. Theory of Contracts II. (2 cr; Stdnt Opt)

How theoretical economics literature has introduced contraction frictions such as incompleteness/renegotiation. How these frictions have been applied to issues in accounting research.

ACCT 8892. Readings in Accounting. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq-Business admin PhD student or #)

Readings appropriate to an individual student’s program or objectives that are not available in regular courses.

ACCT 8894. Research in Accounting. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq-Business admin PhD student or #)

Individual research on an approved topic appropriate to student’s program and objectives.

Adult Education (ADED)

Department of Work and Human Resource Education

College of Education and Human Development

ADED 5101. Strategies for Teaching Adults. (3 cr; A-F or Aud)

Psychological theories of adult learning; learning styles and personality types; teaching styles; group and team learning; moderating and study circles; teaching technologies and distance learning; gender, race, and cultural communication. Applications of strategies.

ADED 5102. Perspectives of Adult Learning and Development. (5 cr; Stdnt Opt)

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.

ADED 5103. Designing the Adult Education Program. (3 cr; A-F or Aud)

Designing and implementing educational programs for adults. Application of concepts, theories, and models in different adult learning situations.

ADED 5196. Field Experience in Adult Education. (5-6 cr [max 6 cr]; S-N or Aud)

Supervised fieldwork and practice. Presentations and evaluations of adult education practices.
Course Descriptions

ADED 5201. Introduction to Adult Literacy. (3 cr; Sdtnt Opt)

ADED 5202. Assessment of Adult Literacy. (3 cr; Sdtnt Opt. Prereq--ADED 5224, 5252, 5226)

ADED 5203. Methods of Teaching Adult Literacy. (3 cr)

ADED 5211. Introduction to the Undereducated Adult. (1 cr; A-F or Aud)
Definitions of literacy in workplace, community, and family. Issues: poverty/welfare, ethnicity, cultural diversity, social class, language/learning, immigrants.

ADED 5212. Introduction to Adult Literacy in the Workplace. (1 cr; A-F or Aud. Prereq--5211)
Review workplace literacy programs, funding, program planning, and needs assessment. Reading/recruiting workers. Role of employers and the unions. Writing for low literacy employees.

ADED 5215. Introduction to Adult Literacy in the Community. (1 cr; A-F or Aud; Prereq--ADED 5211)
Reviews role of the community programs in the United States in literacy building, the family in developing 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, and immigrant groups. Social action approaches to literacy education.

ADED 5224. Formal Assessment of Adult Literacy. (1 cr; A-F or Aud. Prereq--5211)
Assessment of adult English/literacy skills needed for work, family, community, and continuing education. Formal testing policy, techniques, standardized tests. Underlying assumptions about testing, cultural bias, and interpretation of formal tests. Test preparation programs.

ADED 5225. Informal Assessment of Adult Literacy. (1 cr; A-F or Aud. Prereq--5211)
Informal assessment of adult English/literacy skills for work, family, community, and further education. Informal testing techniques, setting educational goals, formal versus informal assessment.

ADED 5226. Advanced Assessment of Adult Literacy. (1 cr; A-F or Aud. Prereq--ADED 5224, 5222, 5225)
Applications and case studies. Educational planning for work, family, and community.

ADED 5233. Methods of Teaching Beginning Adult Literacy. (1 cr; A-F or Aud; Prereq--5211)
Learning English and literacy as an adult: initial approaches to teaching reading, writing, and communications skills. Theories of learning and curriculum design. Technology as a teaching tool: teaching students with disabilities or with cultural/gender differences.

ADED 5234. Methods of Teaching Intermediate Adult Literacy. (1 cr; A-F or Aud. Prereq--5211, 5233)
Learning English/literacy as an adult. Intermediate approaches to teaching reading, writing, and communications skills. Emphasizes communication/comprehension in oral/written English. English reading and oral communication skills for workplace. Evaluating commercial materials/software.

ADED 5235. Methods of Teaching Advanced Adult Literacy. (1 cr; A-F or Aud. Prereq--5211, 5234)
Advanced approaches to teaching reading, writing, and communication skills. Preparing students for college and continuing education. Reading/study skills. English in workplace and on Internet. Problem solving, analytical thinking. Technology as teaching tool. Evaluating commercial material/software.

ADED 5302. Continuing Education for Professionals. (5 cr; Sdtnt Opt)
Analysis of philosophies, issues, policies, trends, professional needs and statutory requirements in continuing professional education programs. Role of the program director and organization.

ADED 5303. Working with Volunteers in Community Settings. (5 cr; Sdtnt Opt)
Uses collaborative, experiential methods to address fundamental issues and practices in volunteer development. Explore personal philosophies, staffing, and key issues and trends in the administration of volunteer programs.

ADED 5700. Special Topics in Adult Education. (1-8 cr [max 12 cr]; Sdtnt Opt)
Exploration of issues, methods, and knowledge in areas of adult education. Content varies.

Adult Psychiatry (ADPY)
Department of Psychiatry

Medical School

ADPY 5515. Neuropsychology: University Hospitals. (3-9 cr [max 9 cr]; O-N or Aud)
ADPY 8205. Special Assignments. (1-16 cr [max 16 cr]; Sdtnt Opt)
ADPY 8206. Research. (1-16 cr [max 16 cr]; Sdtnt Opt)
ADPY 8249. Clinical Neuropsychopharmacology. (1-15 cr; Sdtnt Opt. Prereq--Resident status or 3rd- or 4th-yr med student or 8248 for grad students)
The course is designed for a two-day presentation, followed by 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 anxiolytic agents; clinical picture of depression, use of antidepressants, and mechanisms of drug combinations; schizophrenia diagnosis, use of antipsychotics, and principles of dopamine uptake; Parkinson’s disease, effects of neuroleptics, and tardive dyskinesia; clinical evaluation of epilepsy and use of anticonvulsants; neurophysiology of sleep, sleep disorders, and dreaming; sleep medication; therapeutic uses of hypnotics and sedatives, and significance of over-the-counter sleep aids; use of anorexics, over-the-counter appetite suppressants, and opiate analogues; geriatric psychopharmacology; classification of drug side effects and principles of drug interaction; abused drugs; and endopharmacology.

ADPY 8970. Directed Studies. (1-24 cr [max 24 cr]; Sdtnt Opt)

Aerospace Engineering and Mechanics (AEM)
Department of Aerospace Engineering and Mechanics

Institute of Technology

AEM 5245. Hypersonic Aerodynamics. (3 cr; A-F or Aud. Prereq--4202, [grad student or upper div IIT])

AEM 5321. Modern Feedback Control. (3 cr; Sdtnt Opt. Prereq--4251 or EE 4251 or ME 5281 or equiv)
State space theory for multiple-input/multiple-output aerospace systems. Singular value decomposition technique, applications to performance/robustness. Linear quadratic gaussian and eigenspace assignment design methods. Topics in H(infinity symbol). Applications.

AEM 5401. Intermediate Dynamics. (3 cr; A-F or Aud. Prereq--IT upper div or grad, 2012, Math 2243)
Three-dimensional Newtonian mechanics, kinematics of rigid bodies, dynamics of rigid bodies, generalized coordinates, holonomic constraints, Lagrange equations, applications.

AEM 5431. Trajectory Optimization. (3 cr; A-F or Aud. Prereq--4251 or EE 4251 or ME 5281 or equiv)

AEM 5441. Structural Dynamics. (3 cr; A-F or Aud. Prereq--2012, 3031, [grad student or IT upper div])

AEM 5451. Optimal Estimation. (3 cr; A-F or Aud. Prereq--EE 5251. Prereq--[MATH 2243 or STAT 3031 or equiv], [4321 or EE 4251 or ME 5281 or equiv] or #)

AEM 5459S. Topics in Aerospace Systems. (1-4 cr [max 4 cr]; A-F or Aud. Prereq--6)
AEM 5501. Continuum Mechanics. (3 cr; Stdnt Opt. Prereq–IT upper div or grad, 3581, Math 2273 or equiv or #) 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 cr; A-F or Aud. Prereq–4501 or equiv, Math 2265 or equiv or #) Introduction to the theory of elasticity, with emphasis on linear elasticity. Linear and nonlinear strain measures, boundary-value problem for linear elasticity, plane problems in linear elasticity, three dimensional problems in linear elasticity. Topics from nonlinear elasticity, micromechanics, contact problems, fracture mechanics.

AEM 5651. Aeroelasticity. (3 cr; A-F or Aud. Prereq–4202, 4501, [grad student or IT upper div]) Static aeroelastic phenomena, torsional divergence of a lifting surface, control surface reversal. Aeroelastic flutter, unsteady aerodynamics. Problems of gust response, buffeting. Design project.

AEM 8000. Seminar: Aerospace Engineering and Mechanics. (1 cr [max 4 cr]; S–N or Aud. Prereq–DGS consent)

AEM 8201. Fluid Mechanics I. (3 cr; Stdnt Opt. Prereq–4201 or equiv, Math 2265 or equiv) 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 8212. Theory of Turbulence II. (3 cr; Stdnt Opt. 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 cr; Stdnt Opt. 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 8241. Perturbation Methods in Fluid Mechanics. (3 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq–4201 or 8201 or equiv, CSci 1107 or equiv) 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 8271. Experimental Methods in Fluid Mechanics. (3 cr; Stdnt Opt. Prereq–5501 or #) Overview of computer organization, including external communications and A/D, I/A conversion. Measurement techniques, such as pressure measurements and hot-wire and laser Doppler anemometery and uncertainty; computer control of experiments.

AEM 8295. Selected Topics in Fluid Mechanics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–#) Includes individual student projects completed under guidance of a faculty sponsor.

AEM 8333. FTE: Master's. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

AEM 8495. Advanced Topics in Aerospace Systems. (1-4 cr [max 8 cr]; A-F or Aud. Prereq–#) Individual student projects completed under guidance of a faculty sponsor.

AEM 8500. Research Seminar in Mechanics of Materials. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–#) Seminars given by students, faculty, and visitors on topics drawn from current research.

AEM 8511. Advanced Topics in Continuum Mechanics. (3 cr [max 6 cr]; A-F or Aud. 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 cr; A-F or Aud. Prereq–5503) Contact stresses, finite deformations, and other topics.

AEM 8523. Elastodynamics. (3 cr; A-F or Aud. 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 cr; A-F or Aud. Prereq–5503 or #) 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 8426. Optimization and System Sciences. (3 cr; A-F or Aud. Prereq–5521; IT grad student) Applications of modern finite dimensional optimization techniques in system/control theory. Linear/nonlinear programming, duality, complexity theory, interior point methods, matrix inequalities, convex optimization over linear matrix inequalities, rank-constrained problems.


AEM 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

AEM 8495. Advanced Topics in Aerospace Systems. (1-4 cr [max 8 cr]; A-F or Aud. Prereq–#) Individual student projects completed under guidance of a faculty sponsor.

AEM 8500. Research Seminar in Mechanics of Materials. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–#) Seminars given by students, faculty, and visitors on topics drawn from current research.

AEM 8511. Advanced Topics in Continuum Mechanics. (3 cr [max 6 cr]; A-F or Aud. 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.

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AEM 8531. Fracture Mechanics. (3 cr; A-F or Aud. Prereq–5503 or #) 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.


AFRO 5182. Contemporary Black Theatre: 1960-Present. (3 cr; Stdnt Opt. +TH 5182) 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 cr; Stdnt Opt. +HIST 5438) Ideological, political, religious, and cultural ties that have informed African American and black South African relations from late 18th century to present.

AFRO 5201. Field Studies in African American and African Studies. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq–#) Supervised field study/internship focused on African American or African studies major or minor, #.

AFRO 5240. The African American Child. (3 cr; Stdnt Opt. +AFRO 5403) Research carried out by African American psychologists and behavioral/social scientists, and by experts on African American child/youth development.

AFRO 5429. Slavery in Africa and in the Americas, 1400 to 1800. (3 cr; A-F or Aud. +AFRO 3429) History of slavery in Africa and the New World.

AFRO 5437. History of East Africa. (3 cr; A-F or Aud. +AFRO 5437, HIST 3437, HIST 5437) Major themes in history of East Africa, from era of early human cultural development to present. Methods that historians use to research history. Varying interpretations/constructions of history over time.


AFRO 5550. Methods: Use of Oral Traditions as Resources for History. (3 cr; Stdnt Opt) Use of spoken information on national/international events. Periods when it was not uncommon for black entertainers/athletes to become involved in politics and community activism.

AFRO 5564. Proseminar: African-American History. (3-4 cr [max 4 cr]; Stdnt Opt. Prereq–#) 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, sexuality, and religion.

AFRO 5565. Proseminar: African-American History. (3 cr; Stdnt Opt. +AFRO 5403) Construction of a detailed research agenda, locating appropriate depositories of primary materials and secondary sources, and developing appropriate methodologies and frameworks.


AFRO 5576. Proseminar: Approaches to African Development. (3 cr; Stdnt Opt) Study, critical analysis, and comparison of primary documents relevant to African development.


AFRO 5993. Directed Study. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq–#) Guided individual reading/study for qualified seniors and graduate students.
AFRO 8202. Seminar: Intellectual History of Race. (3 cr; Stdnt Opt)
Shifting and changing meanings of “race” from the “Age of Conquest” to the present. Starting from the proposition that race is not a fixed or stable category of social thought or being, the seminar seeks to ascertain how and why Western ideas about race have changed.

AFRO 8554. Seminar: Gender, Race, Nation, and Policy—Perspectives from Within the African Diaspora. (3 cr; Stdnt Opt. Prereq—*)
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 cr [max 9 cr]; Stdnt Opt)
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 cr; Stdnt Opt)
Recent arguments related to Orientalism as a trend in modern literary and cultural criticism.

AFRO 8910. Topics in Studies of Africa and the African Diaspora. (3 cr [max 9 cr]; Stdnt Opt)
Topics specified in [Class Schedule].

Agricultural, Food, and Environmental Education (AFEE)
Department of Work and Human Resource Education
College of Education and Human Development

AFEE 5111W. Agricultural Education: Methods of Teaching. (4 cr; Stdnt Opt)
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 cr; Stdnt Opt)
Development of community school program in agriculture, agribusiness, and environmental science. Program to meet graduation outcomes and determine student needs.

AFEE 5113. Adult Agricultural Education Program Development and Technology. (3 cr; A-F or Aud)
Organization and implementation of education programs for farmers, farm managers, and agribusiness personnel using community and environmental resources, agricultural and instructional technology, and management information systems to attain family and business goals.

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

AFEE 5116. Coordination of SAE Programs: Work-based Learning. (2 cr; A-F or Aud. Prereq—Agricultural education major or #)

AFEE 5118. Strategies for Managing and Advising the FFA Organization. (2 cr; A-F or Aud. Prereq—Agricultural education major or #)
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. (1-3 cr [max 12 cr]; Stdnt Opt)
Content varies by offering.

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

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

AFEE 5235. Advanced Supervised Agricultural Experience Programs. (2 cr; Stdnt Opt)
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 5237. Mentorship for Supervising Agricultural Education Teachers. (2 cr; Stdnt Opt)
Professional development training for experienced teachers to serve as mentors for beginning and student teachers of agricultural education. Emphasis on supervision and assessment of teaching performance. Focus on critical period of induction into the teaching profession.

AFEE 5239. Program Organization and Management in Agricultural Education. (2 cr; Stdnt Opt)
Analysis of organization, management, and assessment of agricultural education programs at the middle, high school, and adult levels.

AFEE 5280. Current Issues for the Beginning Agricultural Education Teacher. (1-3 cr [max 3 cr]; Stdnt Opt)
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. (1-3 cr [max 6 cr]; Stdnt Opt)
Exploration of current issues in agricultural education and extension, strategies of response, implications of response actions, and related leadership roles.

AFEE 5296. Professional Experience Practicum in Agricultural Education and Extension. (1-4 cr [max 4 cr]; Stdnt Opt)
Observation, study, and experience in agricultural business and industry; identification of educational problems observed in the agricultural industry; evaluation of personal experience.

AFEE 5331. History, Philosophy, and Systems of Extension. (3 cr; A-F or Aud)
History and philosophy of extension; modification and adaptation to worldwide methods and approved practices; extension methodologies; innovative approaches; systems appropriate to development environments.

AFEE 5361. World Development Problems. (3 cr; A-F or Aud)
Introduction to development problems throughout the world. Development in Third World countries. Examples of First World development problems. Interdisciplinary focus on population, health and disease, education, agriculture, industry, finance, politics, and human rights.

AFEE 5371. Farming Systems Research and Extension. (3 cr; A-F or Aud)
Introduction to the theory and practice of linking farming systems, research, and extension. An interdisciplinary and holistic approach to rural development for individuals and communities throughout the world.

AFEE 5401. Introduction to Farm Business Management Education Teaching. (3 cr; A-F or Aud)

AFEE 5405. Advanced Farm Financial Analysis Methodology and Concepts. (1 cr; Stdnt Opt)
Farm financial analysis concepts, whole entity financial analysis issues/tools/analytics/optional methodologies. Evaluation of industry standardization efforts. Analysis of where each option fits.

AFEE 5407. Application of Advanced Farm Financial Analysis Tools and Methods. (1 cr; Stdnt Opt)
Use of advanced farm financial analysis tools/methodology to analyze financial performance of actual farm businesses. Case farms are used to apply whole entity financial analysis tools/concepts and enterprise analysis methodologies.

AFEE 5409. Seminar: Teaching Strategic Farm Business Planning. (1 cr [max 4 cr]; A-F or Aud)
Teaching strategic business planning to farm managers and agricultural professionals. Philosophy of strategic management, components of a strategic business plan. Materials/tools to apply strategic farm business planning in educational programs. Students apply strategic planning methods/concepts to case farm businesses.

AFEE 5411. Seminar: Farm Financial Planning Teaching Tools and Methods. (1 cr [max 4 cr]; A-F or Aud)
Preparation to teach farm financial planning to farm managers and agricultural professionals. Principles/concepts of long range financial planning and short range cash flow planning. Farm planning software tools, case farm situations, practical farm planning experience.

AFEE 5413. Seminar: Teaching Effective Use of Commodity Marketing Tools. (1 cr [max 4 cr]; A-F or Aud)
Teaching commodity marketing tools to farm managers and agricultural professionals. Commodity marketing tools, including cash forward contracts, futures, and options, and how to use them to enhance price and protect income. How to choose marketing tools, given financial/marketing conditions.

AFEE 5415. Seminar: Teaching Commodity Marketing Strategies. (1 cr [max 4 cr]; A-F or Aud)
Teaching commodity market planning to farm managers 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 5993. Directed Study in Agricultural Education and Extension. (1-9 cr [max 9 cr]; Stdnt Opt)
Topics may be chosen to permit study of areas within education or to supplement areas of inquiry not provided in the regular course structure.
Course Descriptions

AFEE 5995. Integrating Paper--Master of Education: Agricultural and Extension Education (3 cr; A-F or Aud) Students prepare paper dealing with issues in agricultural education applied to professional responsibilities.

AFEE 8090. Seminar: Agricultural Education and Extension. (1-3 cr; max 6 cr; Stdt Opt. Prereq--AgEd grad student) (A-F or Aud) Topics on various aspects of agricultural education. Prepare, present, and critique a report.

AFEE 8049. Research in Agricultural Education and Extension. (1-6 cr; max 6 cr; A-F or Aud) Prereq--AgEd student doing Plan B research. % Select problems, prepare bibliographies, analyze and interpret data, and prepare manuscripts on studies.

Agronomy and Plant Genetics (AGRO)

Department of Agronomy and Plant Genetics

College of Food, Agricultural and Natural Resource Sciences

AGRO 5021. Introduction to Plant Breeding. (3 cr; Stdt Opt. Prereq--AGCB 3022 or equiv, background in plant science) For majors not specializing in plant breeding. How genetics is applied to plant improvement. Emphasizes sustainable-production scenarios.


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

AGRO 5321. Ecology of Agricultural Systems. (5 cr; S-N or Aud. Prereq--[3xxx or above] course in [Agro or AnSc or Ent or Hort or PLPa or Soil] or #) Ecological approach to problems in agricultural systems. Formal methodologies of systems inquiry are developed/applied.

AGRO 5999. Special Topics: Workshop in Agronomy. (1-6 cr [max 6 cr]; Stdt Opt. Prereq--Agir or grad student) Workshops on various topics in agronomy and plant genetics. Presenters/faculty may include guest lecturers/experts. Topics specified in Class Schedule.

AGRO 8005. Supervised Classroom or Extension Teaching Experience. (2 cr; S-N or Aud. =BEE 8005, HORT 8005, PLPa 8005, SOIL 8005. Prereq--Grad SENg major, #) 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 8201. Plant Breeding Principles I. (3 cr; A-F or Aud. =HORT 8201. Prereq--Stat 5301 or equiv) Principles and 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 8241. Molecular and Cellular Genetics of Plant Improvement. (3 cr; Stdt Opt. Prereq--GCB 5034 or equiv or #) Principles of genetic modification of higher plants by application of molecular and cellular biotechnology approaches. Gene isolation and transfer, tissue culture manipulations, organelle genetics, molecular markers and mapping, and discussions and lab demonstrations of current research on genetic mechanisms related to crop improvement.

AGRO 8270. Graduate Seminar. (1 cr; A-F or Aud. =HORT 8270. Prereq--Grad major in [applied plnt sci or agro or ent or hort or plnt brdg or plnt path or soil] or #) Reports/discussions of problems and investigational work.

AGRO 8280. Current Topics in Applied Plant Sciences. (1 cr; S-N or Aud. =Agro or Grad--Major in agro or applied plant sciences or ent or hort or plant brdg or plant path or soil) or # Topics presented by faculty or visiting scientists.

AGRO 8305. Physiological Ecology of Plants in Natural and Managed Ecosystems. (4 cr; A-F or Aud. =HORT 8305. Prereq--BGC 3021, [Biol 1001 or Biol 1002], Biol 1009) Introduction to plants and their reactions and responses in managed and natural ecosystems, including carbon and nitrogen allocation, root biology, microbial interaction, secondary metabolism, and plant response to biotic and abiotic stress.

AGRO 8505. Advanced Perspectives in Weed Science. (2 cr; A-F or Aud. Prereq--Grad major in agro or applied plant sciences or ent or hort or plant brdg or plant path or soil or #) Topics concerning the biochemistry and sustainability of chemical and biological weed control methods. Lecture and student-directed discussion.

AGRO 8605. Advanced Management of Agroecosystems. (3 cr; Stdt Opt. Prereq--4005 or #) Problem-based learning approach to developing a holistic approach to agroecosystem-based crop management. Field trips combined with classroom discussion and decision-focused case studies. Students conduct research and develop a decision case.

AGRO 8900. Advanced Discussions. (0-3 cr [max 12 cr]; S-N or Aud. =HORT 8900. Prereq--#) Special workshops or courses in applied plant sciences.

American Indian Studies (AMIN)

Department of American Indian Studies

College of Liberal Arts

AMIN 5107. The Structure of Anishinaabemowin, the Ojibwe Language. (3 cr; A-F or Aud. =AMIN 3107. Prereq--3104) Analysis of grammatical structures of Anishinaabemowin.

AMIN 5108. History of Anishinaabemowin, the Ojibwe Language. (3 cr; A-F or Aud. =AMIN 3109, Prereq--3107 or 3107 or #) Readings in Ojibwe oral literature.


AMIN 5303. American Indians and Photography. (3 cr; Stdt Opt. =AMIN 3303) 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 images that stand behind their making.

AMIN 5402. American Indians and the Cinema. (3 cr; A-F or Aud) 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.
American Sign Language (ASL)

Department of Educational Psychology

College of Education and Human Development

ASL 5642. Classroom Communication Through ASL. (1-2 cr [max 5 cr]; S-N or Aud. Prereq: Fluency in ASL, # required)

American Sign Language (ASL) form/function, vocabulary production, grammatical features needed by professionals working with children, storytelling strategies, technical sign language for classroom teachers. Content progresses in repeated segments.

American Studies (AMST)

Department of American Studies

College of Liberal Arts

AMST 5402. American Indians in the Cinema. (3 cr; Stdt Opt)

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 Indian Studies. (3 cr [max 12 cr]; A-F or Aud)

Various topics in American Indian studies, depending upon instructor/semester.

AMST 8232. Cultural Fallout: The Cold War and Its Legacy, Research. (3 cr; Stdt Opt; Prereq: AMST 8231)

Student produces 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 AMST 8231.

AMST 8239. Gender, Race, Class, Ethnicity, and Sexuality in the United States: Readings. (3 cr; Stdt Opt)

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 cr [max 9 cr]; Stdt Opt; Prereq: #)

Social, cultural, and artistic modes of self-expression and intellectual analysis of people in the United States identified as female or male and/or as members of group defined by race, ethnicity, class, or sexual orientation.

AMST 8249. Popular Culture and Politics in the 20th Century: Readings. (3 cr; Stdt Opt)

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 cr; Stdt Opt; Prereq: #)

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 cr; Stdt Opt; Prereq: #)

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 cr; Stdt Opt; Prereq: #)

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. (5 cr; Stdt Opt)

Debates about global economy's consequences for American culture/character. Effects of global capitalism on factory work, service sector, pink-collar, and factory work in multinational corporations and professional/managerial positions inside/outside U.S. borders. How work is lived through race, class, gender, and nation.

AMST 8289. Ethnographic Research Methods: Research Strategies in American Studies. (3 cr; Stdt Opt; Prereq: #)

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. FTE: Master's. (1 cr; No grade. Prereq: Master's student, adviser and DGS consent)

AMST 8401. Practicum in American Studies. (3 cr; S-N or Aud. Prereq: #)

Training in teaching undergraduate courses in American studies.

AMST 8444. FTE: Doctoral. (1 cr; No grade. Prereq: Doctoral student, adviser and DGS consent)

AMST 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

AMST 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; No grade. Prereq: Max 18 cr per semester or summer; 10 cr total required (Plan A only))

AMST 8801. Dissertation Seminar. (3 cr; S-N or Aud. Prereq: AmSt doctoral student beginning dissertation work)

Conceptualizing the research problem for the dissertation and structuring the process of writing a chapter of it.

AMST 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq: Max 18 cr per semester or summer; 24 cr required)

AMST 8920. Topics in American Studies. (3 cr [max 9 cr]; Stdt Opt; Prereq: #)

Topics specified in Class Schedule.

AMST 8970. Independent Study in American Studies. (1-9 cr [max 9 cr]; Stdt Opt; Prereq: #, %)

Independent study of interdisciplinary aspects of American civilization under guidance of faculty members of various departments.

Anesthesiology (ANES)

Department of Anesthesiology

Medical School

ANES 5587. Adv Clinical Physiology I for Nurse Anesthetists. (3 cr; A-F or Aud)

Cellular mechanisms underlying systems physiology. Cellular physiology, physiology of excitable tissues, renal physiology, cardiovascular physiology, hemostasis.


Respiratory physiology, acid-base physiology, gastrointestinal physiology, metabolism, endocrinology, reproductive physiology, physiology of pregnancy/labor.

ANES 5686. Chemistry and Physics for Nurse Anesthetists. (3 cr; A-F or Aud. Prereq: General chemistry or #)

Chemical equilibrium, organic chemistry, physics of fluids/gases, anesthetic applications.

ANES 8269. Research in Anesthesia. (1 cr; Stdt Opt)

Animal Science (ANSC)

Department of Animal Science

College of Food, Agricultural and Natural Resource Sciences

ANSC 5099. Special Workshop in Animal Science. (1-6 cr [max 12 cr]; A-F or Aud. Prereq: #)

Topics vary. See Class Schedule or department. Topics may use guest lectures/experts.
**Course Descriptions**

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<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSC 5200</td>
<td>Statistical Genetics and Genomics. (4 cr; Stdnt Opt. = CMG 5200. Prereq.–Stat 5201 or equiv., Biol 4003 or equiv.)</td>
</tr>
<tr>
<td>ANSC 8111</td>
<td>Genetic Improvement of Animals. (3 cr; Stdnt Opt. Prereq.–#)</td>
</tr>
<tr>
<td>ANSC 8311.1</td>
<td>Animal Bioenergetics. (3 cr; A-F or Aud. Prereq.–BioC 4351 recommended, #)</td>
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<tr>
<td>ANSC 8312.2</td>
<td>Protein Metabolism. (3 cr; A-F or Aud. Prereq.–BioC 4351)</td>
</tr>
<tr>
<td>ANSC 8330.1</td>
<td>Concepts and Developments in Nutritional Physiology. (3 cr [max 6 cr]; A-F or Aud. Prereq.–#)</td>
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<tr>
<td>ANSC 8330.3</td>
<td>Concepts and Developments in Animal Nutrition. (1-2 cr [max 2 cr]; A-F or Aud. Prereq.–#)</td>
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<tr>
<td>ANSC 8334.3</td>
<td>Mechanisms of Hormone Action. (1 cr; Stdnt Opt. –Course in biochemistry or cell biology or #)</td>
</tr>
<tr>
<td>ANSC 8344.1</td>
<td>Physiology of Reproduction. (3 cr; A-F or Aud. Prereq.–#)</td>
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<tr>
<td>ANSC 8411.1</td>
<td>Physiology of Fertilization and Gestation. (3 cr; Stdnt Opt. Prereq.–#)</td>
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<tr>
<td>ANSC 8451.1</td>
<td>Reproductive Endocrinology. (2 cr; A-F or Aud. Prereq.–#)</td>
</tr>
<tr>
<td>ANSC 8494.1</td>
<td>Research in Animal Physiology. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq.–#)</td>
</tr>
<tr>
<td>ANSC 8510.1</td>
<td>Graduate Seminar. (1-2 cr [max 12 cr]; S-N or Aud. Prereq.–#)</td>
</tr>
<tr>
<td>ANSC 8594.1</td>
<td>Research in Animal Science. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq.–#)</td>
</tr>
<tr>
<td>ANSC 8666.1</td>
<td>Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)</td>
</tr>
<tr>
<td>ANSC 8777.1</td>
<td>Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq.–Max 18 cr per semester or summer; 10 cr total required [Plan A only])</td>
</tr>
<tr>
<td>ANSC 8888.1</td>
<td>Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq.–Max 18 cr per semester or summer; 24 cr required)</td>
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</tbody>
</table>

**Anthropology (ANTH)**

Department of Anthropology

College of Liberal Arts

ANTH 5008. Advanced Flintknapping. (3 cr; A-F or Aud. Prereq.–#) Hands-on training in techniques of advanced stone tool production, artifact reproduction, and lithic experimental design for academic/artistic purposes.


ANTH 5021W. Anthropology of the Middle East. (3 cr; Stdnt Opt. = ANTH 5021W) Anthropological field methods of analyzing/interpreting Middle Eastern cultures/societies.

ANTH 5025W. Cultural Semantics. (3 cr; Stdnt Opt) Understanding cultures and cognitive classification systems through lexical semantics.


ANTH 5029. Philosophical Anthropology. (3 cr; A-F or Aud. Prereq.–#) Advanced survey of traditional problems associated with broad-ranging views on human nature and culture. Specific arguments of relativists, behaviorists, phenomenologists, and others in relation to social life. Structuralist and post-structuralist approaches.

ANTH 5033. Feminist Anthropology. (3 cr; Stdnt Opt. 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 cr; Stdnt Opt. =ANTH 3041, ANTH 8213. Prereq–grad or #)
Concepts, theories, and methods of ecological anthropology (cultural ecology) show how humans interact with the biophysical environment. Compare biological and cultural interactions with the environment; examine adaptive strategies cross-culturally.

ANTH 5043. Colonialism and Culture. (3 cr; A-F or Aud. =GLOS 5643)
Making of culture as colonial/anthropological object of knowledge. Relationship between colonial knowledge/formation of academic disciplines (especially anthropology). Colonial/postcolonial transformations of colony, nation, and metropole.

ANTH 5045. Urban Anthropology. (3 cr; Stdnt Opt. Prereq–4003 or grad or #)
Anthropological approaches to urban life in Western and non-Western settings. Topics include social networks and voluntary organizations; class, ethnicity, gender and power; migration and immigration; urban labor and economies; and urban “problems.”

ANTH 5128. Anthropology of Learning. (3 cr; Stdnt Opt. =EDPA 5128)
Cross-cultural perspectives in examining educational patterns, and the implicit and explicit cultural assumptions underlying them; methods and approaches to cross-cultural studies in education.

ANTH 5221. Anthropology of Material Culture. (3 cr; A-F or Aud)
Material culture as a social creation, studied from multiple perspectives (e.g., social anthropology, archaeology, primatology). Conceptions of how humans articulate with material world they construct.

ANTH 5244. Skeletal Materials for Archaeologists. (4 cr; A-F or Aud. =ANTH 8244. Prereq–1001)

ANTH 5255. Archaeology of Religion. (3 cr; Stdnt Opt)

ANTH 5269. Analysis of Stone Tool Technology. (4 cr; A-F or Aud. 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. (4 cr; Stdnt Opt. =ARTH 5325)
Art/architecture of Nahautli-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 cr; A-F only; =ANTH 3401. Prereq–1001 or #)
Fossil evidence and 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 5403. Quantitative Methods in Biological Anthropology. (3 cr; A-F only. Prereq. Basic univariate statistics course or #)
Quantitative methods used by biological anthropologists. Applying these methods to real anthropological data. Lectures, complementary sessions in computer lab.

ANTH 5405. Human Skeletal Analysis. (3 cr; A-F only. =ANTH 3405. Prereq–1001 or #)

ANTH 5422. Anthropologies of Citizenship and Nationalism. (3 cr; A-F only. Prereq–3xxx course in [anthropology or related discipline])
Why/how citizenship and nationalism have been constructed over time as a force of cultural identity/behavior. Recent developments in citizenship theory. Defining an anthropological approach to citizenship.

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

ANTH 5446. Archaeology of Representation as Communication. (3 cr; A-F only)
Seminar. Uses of paintings, sculptures, drawings, and photographs as means of communication, from earliest representations of 30,000 years ago to present day.

ANTH 5525. Understanding Cultures for Social Science Professionals. (3 cr; A-F only)
Culture in a globalized world. How anthropological concept of culture can help social service professionals understand and engage with people from diverse backgrounds.

ANTH 5980. Topics in Anthropology. (3 cr [max 6 cr]; Stdnt Opt)
Topics specified in Class Schedule.

ANTH 5990. Topics in Anthropology. (3 cr [max 9 cr]; A-F or Aud. Prereq–#)
Topics specified in Class Schedule.

ANTH 8001. Ethnography, Theory, History. (5 cr; A-F or Aud)
Introduction to foundational concepts, methods, and theoretical works. 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. (5 cr; A-F or Aud)

ANTH 8004. Foundations of Anthropological Archaeology. (3 cr; Stdnt Opt. Prereq–8001, 8002)
Theoretical foundations of anthropological archaeology in historical and contemporary perspective.

ANTH 8005. Linguistic Anthropology. (3 cr; Stdnt Opt)
Introduction to literature of anthropological linguistics.

ANTH 8120. Problems in Culture Change and Applied Anthropology. (3-6 cr [max 6 cr]; Stdnt Opt)
Comparative studies of change in cultural systems. Impact of global processes on local cultures. Roles of anthropology and anthropologists in policy, planning, implementation, and evaluation.

ANTH 8201. Humans and Nonhumans: Hybrids and Collectives. (3 cr; Stdnt Opt)
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 cr; Stdnt Opt. Prereq–Grad anth major or #)
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 cr; Stdnt Opt. =ANTH 4055)
Theoretical foundations of economic anthropology examined through critical readings of traditional, classical, and contemporary authors. Ethnographic puzzles of material life and issues of ecological degradation, development, market expansion, gender, and transglobal processes.

ANTH 8207. Political and Social Anthropology. (3 cr; Stdnt Opt)
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 8209. Psychological Anthropology. (3 cr; Stdnt Opt. =ANTH 4021)
Self, emotion, cognitive processes, and child development in cross-cultural perspective.

ANTH 8211. Symbolic Anthropology. (3 cr; Stdnt Opt. =ANTH 4019)
Advanced introduction to semiotic, structuralist, and interpretivist approaches in anthropology. Reviews classic foundations and recent developments.

ANTH 8213. Ecological Anthropology. (3 cr; Stdnt Opt. =ANTH 3041, ANTH 5041)
Seminar on method, theory, and key problems in ecological anthropological research. Examines approaches in light of human practices, interactions between culture and the environment, global environmental change, and our understanding of human dimensions of ecosystem-based management.

ANTH 8215. Anthropology of Gender. (3 cr; Stdnt Opt. Prereq–Grad anth major)
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 cr; Stdnt Opt. Prereq–Grad anth majors preparing to submit research grant proposals next academic yr)
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 cr; Stdnt Opt. Prereq–Grad anth major)
Advanced archaeological field method, survey, and research. Intensive training in excavation techniques, recordation, analysis, and interpretation of archaeological materials.

ANTH 8250. Development and Management of Anthropological Research Projects. (1 cr [max 4 cr]; A-F or Aud. Prereq–Anth grad student or #) Training seminar on research development, coordination, grant management, field/laboratory research management, and fundraising.


ANTH 8333. FTE: Masters. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

ANTH 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

ANTH 8510. Topics in Archaeology. (3-9 cr [max 9 cr]; Stdnt Opt) Seminar examines particular aspects of archaeological methods and/or theory. Topics vary according to student and faculty interests.

ANTH 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

ANTH 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

ANTH 8810. Topics in Sociocultural Anthropology. (3-9 cr [max 9 cr]; Stdnt Opt) Seminar examines particular aspects of method and/or theory. Topics vary according to student and faculty interests.

ANTH 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

ANTH 8991. Independent Study. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq–#) Under special circumstances and with instructor approval, qualified students may register for a listed course on a tutorial basis.

ANTH 8992. Directed Reading. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq–#)

ANTH 8993. Directed Study. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq–#) Directed Study

ANTH 8994. Directed Research. (1-18 cr [max 18 cr]; Stdnt Opt. Prereq–#)

Applied Economics (APEC)

Department of Applied Economics

College of Food, Agricultural and Natural Resource Sciences


APEC 5151. Applied Microeconomics: Firm and Household. (3 cr; Stdnt Opt. Prereq–[5031 or Math 1271 or Math 2243] or equiv or grad student or #) Quantitative techniques for analysis of economic problems of firms and households. Links between quantitative tools and economic analysis Regression analysis, mathematical programming, and present value analysis.

APEC 5152. Applied Macroeconomics: Income and Employment. (3 cr; Stdnt Opt. Prereq–[5031 or Math 1271 or Math 2243] or equiv or grad student or #) 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 cr; A-F or Aud. Prereq–[5001 or Econ 3101 or PA 5021]) 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 5511. Labor Economics. (3 cr; Stdnt Opt. Prereq–[[3001 or Econ 3101 or PA 5032] or equiv], grad student) or #) Theoretical foundations of labor markets. Intertemporal/household labor supply. Demand for labor, efficiency wages. Human capital theory, unemployment, migration decisions. Analysis of economic research applied to labor policy issues such as minimum wage, tax policy, social insurance, education.

APEC 5581. Human Capital and Household Economics. (3 cr; Stdnt Opt. Prereq–[5001 or Econ 3101] or #) Household economics and investment in human capital (e.g., children, education, health and nutrition); labor force participation, lifetime earnings, and nonmarket work; time allocation and substitution of capital for labor in the household in the western and third world.

APEC 5611. Economic Aspects of Environmental Management. (3 cr; A-F or Aud. Prereq–[5 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 #) Environmental 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 cr; Stdnt Opt. Prereq–[3001 or Econ 3101, 1261 or Econ 3611 or NRES 3261WJ] or #) Economic analyses, including project evaluation of current natural resource/environmental issues. Emphasizes intertemporal use of natural resources, economic scarcity/adequacy, environmental quality, and mechanisms for pollution control and their implications for public policy.

APEC 5711. U.S. Agricultural and Environmental Policy. (3 cr; Stdnt Opt. Prereq–[3001 or Econ 3101] or #) 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 promotion; functioning of markets; roles of public interest groups and future of American agricultural policy.

APEC 5721. Economics of Science and Technology Policy. (3 cr; Stdnt Opt. Prereq–[3001 or Econ 3101, 3611 or Econ 3611 or NRES 3261W] or #) Economics of technical change, research, and technology. Productivity. Methods for evaluating impacts of R&D. Intellectual property rights.


APEC 5751. Global Trade and Policy. (3 cr; Stdnt Opt. Prereq–[3001 or Econ 3101 or PA 5021]) 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 cr; Stdnt Opt. Prereq–[3001 or Econ 3101 or PA 5021] or #) Application of economic analysis to cooperative form of organization. Producer/consumer cooperatives used to examine economic issues such as changing market organization, financing, management incentives, taxation, and antitrust regulations. Cooperatives as a tool for economic development.

APEC 5891. Independent Study: Advanced Topics in Farm and Agribusiness Management. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq–#) Special topics or individual work suited to the needs of particular groups of students.
APEC 5991. Special Topics and Independent Study in Applied Economics. (1-4 cr; [max 12 cr]; Stdnt Opt. Prereq—#). Special classes, independent study, and supervised reading/research on subjects/problems not covered in regularly offered courses.

APEC 8202. Mathematical Optimization in Applied Economics. (3 cr; Stdt Opt. Prereq—[5151, Econ 5151] or equiv or #). Economic foundations and applications of mathematical and dynamic programming and optimal control. Mathematical optimization concepts; structure and economic interpretations of various models of the firm, consumer, household, sector, and economy. Model building and solution techniques.


APEC 8205. Applied Game Theory. (3 cr; Stdnt Opt. Prereq—[8010, 8110, 8103, 8004] or [Econ 8001, Econ 8002, Econ 8003, 8004] or #). 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. (0-3 cr [max 3 cr]; A-F or Aud. Prereq—[5151, Econ 5151] or equiv or #). Formulation/solution of dynamic optimization problems using optimal control theory and dynamic programming. Analytical/numerical solution methods to solve certain types of stochastic problems for various economic applications.


APEC 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent). Conceptual consumer behavior and household decisions. Types of data available to analyze consumer behavior and household decisions.

APEC 8401. Consumer Behavior and Policy. (2 cr; A-F or Aud. Prereq—Econ 5151 or [Econ 8001, Econ 8002] or [Econ 8101, Econ 8102] or #). Analytical/empirical treatments of consumer behavior. Demand for quality characteristics. Review of basic consumer theory, policy-related issues, experimental economics, consumer-survey techniques. Types of data available to analyze consumer behavior and household decisions.

APEC 8402. Information and Behavioral Economics. (2 cr; A-F or Aud. Prereq—[8401, Econ 8002, Econ 8101, Econ 8102] or [Econ 8101, Econ 8102] or equiv or #). New theories of consumer behavior that combine economic and psychological models. Influence of information on consumer choice over time and under uncertainty. Expected, nonexpected utility theory, information economics, bounded rationality, prospect theory, choice over time, and rational addiction with applications to empirical work.

APEC 8403. Demand Analysis and Household Economics. (2 cr; A-F or Aud. Prereq—[8211, 8212, Econ 5151] or [Econ 8001, Econ 8002] or [Econ 8101, Econ 8102] or [Econ 8201, Econ 8202, Econ 8203, Econ 8204] or #). Household/individual behavior. Consumer demand analysis, education, and other issues. Static demand theory/estimation, dynamic demand theory/estimation, equivalence scales, intrahousehold allocation of consumption, analysis of education issues.

APEC 8404. Labor Economics and Human Capital. (2 cr; A-F or Aud. Prereq—[8403, Econ 8001, Econ 8002, Econ 8003, Econ 8004] or #). Topics in applied microeconomics related to labor supply and human capital. Focuses on household decisions and labor market issues 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 cr; No grade. Prereq—Doctoral student, adviser and DGS consent).


Applied Plant Sciences (APSC)

College of Food, Agricultural and Natural Resource Sciences

APSC 8123. Research Ethics in the Plant and Environmental Sciences. (3 cr; S-N or Aud. = PLPA 8123, SOIL 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 8355. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

APSC 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

APSC 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

APSC 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

APSC 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

Arabic (ARAB)

Department of African American and African Studies

College of Liberal Arts

ARAB 5001. Research Methods in Arabic Studies. (3 cr; Stdt Opt) Skills and techniques required to deal with medieval and modern works in Arabic literature and Islam. A survey of the most important research bibliographies in Arabic and Islamic studies. Bibliographic references in English and, when appropriate, Arabic.


ARAB 5036. Islam: Religion and Culture. (5 cr; Stdt Opt) Religion of Islam, faith, practices, sectarian splintering, expansion outside original home to status of world religion, institutions, status in world societies - Asia, Europe, Americas.

ARAB 5010. Advanced Arabic I. (3 cr [max 4 cr]; Stdt Opt. Prereq—Stdt Opt or equiv or #) Advanced readings in classical and modern Arabic. Compositions based on texts.

ARAB 5020. Advanced Arabic II. (3 cr [max 4 cr]; Stdt Opt. Prereq—Stdt Opt or #) Readings of Arabic texts. Writing compositions based on texts. Continuation of 5010.

ARAB 5491. Classical Islamic Civilization. (3 cr; Stdt Opt. = ARAB 5491, HIST 5491, MELC 5491) Islamic legacy in the classical age (800-1400), including medical/natural sciences, mathematics, philosophy, literature, and their transmission to Europe.

ARAB 5501. Modern Arabic Poetry in Translation. (3 cr; Stdt Opt) Free verse movement and its major trends: post-romantic, social realist, symbolism, existence, prose poem. Emphasizes leading poets such as al-Mala’ika, al-Sayyab, al-Bayati, and Adonis. Theoretical/critical essays. All readings in English.


ARAB 5503. Arabic Drama in Translation. (3 cr; Stdt Opt) Emergence and development of drama as a European-inspired genre in Arabic literature. Emphasizes major trends and playwrights. All readings in English.

ARAB 5505. Survey of the Middle East. (3 cr; Stdt Opt. = ARAB 5505, HIST 5505, MELC 5505) Peoples, lands, and cultures of the Middle East. Historical survey from earliest civilizations to the present.


ARAB 5542. Medieval Islam. (3 cr; Stdt Opt. = HIST 5542, MELC 5542) Islamic dynasties, Mamlik, and Mongols, and Crusaders and Assassins. Abbasid Caliphate’s disintegration and rise of Seljuk Turks.

ARAB 5543. Arabs Under Mamluks and Ottomans: 1300-1920. (3 cr; Stdt Opt. = ARAB 5543, HIST 5543, MELC 5543) Struggle against Crusaders and Mongols. Disintegration and reemergence under Muhammad Ali of Egypt; dynamic struggles in Syria; rise of Young Turks; Arab revolt.

ARAB 5544. Arab World 1920 to the Present. (3 cr [max 4 cr]; Stdt Opt. = ARAB 5544, HIST 5544, MELC 5544) Struggle in the Arab world for independence and its course since independence. Emphasis on development, political stability and unity; political structures; the Arab-Israeli conflict.


ARAB 5900. Topics in Arabic Literature and Culture. (5 cr [max 9 cr]; Stdt Opt. Prereq—5910 or #) Readings and discussion of selected works in Arabic. Topics specified in Class Schedule.


ARAB 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

Aramaic (ARM)

Department of Classical and Near Eastern Studies

College of Liberal Arts

ARM 5011. Biblical Aramaic and Old Aramaic Inscriptions. (3 cr; Stdt Opt. Prereq—1 yr Hebrew or Arabic or #) Biblical Aramaic -- grammar, fluency in reading Biblical Aramaic and Old Aramaic inscriptions.

ARM 5012. Syriac. (3 cr; Stdt Opt. Prereq—1 yr Hebrew or Arabic or #) Emphasis on fundamentals of grammar and reading Syriac texts fluently.

School of Architecture

College of Design


ARCH 5110. Architecture as Catalyst. (1-3 cr [max 5 cr]; S-N only. Prereq—M.Arch) Topical workshops on design methods, theories, or emerging practices.

ARCH 5123. Architectural Thesis. (8 cr; A-F or Aud. Prereq—5122, 5241, BA Arch major; students must submit thesis plan in semester before writing thesis) Student’s choice, study and solution of an architectural problem to demonstrate proficiency in all phases of design.


ARCH 5291. Accelerated Undergraduate Architecture Studio I. (9 cr; A-F or Aud. Prereq—#) Selected architectural problems developed by faculty to deepen/enrich ideas introduced in required architectural studio sequence.

ARCH 5292. Accelerated Undergraduate Architecture Studio II. (6 cr; A-F or Aud. Prereq—[5291, accelerated status] or #) Architectural problems. Emphasizes development of structures as integral part of design, site planning, design process.

ARCH 5301. Conceptual Drawing. (3 cr; A-F only. Prereq—MArch major or #) 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 cr; A-F or Aud. = ARCH 4311, Prereq—[5371, 5372, M Arch] or instr consent) 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 cr; A-F or Aud. = ARCH 4313, Prereq—M Arch major or instr consent) Delineation, presentation, and design techniques. Various visual media and methods of investigation.
ARCH 5321. Architecture in Watercolor. (3 cr; A-F or Aud. =ARCH 4321. Prereq—M Arch grad student or #) Watercolor as a tool in design process. Foundation principles, techniques, medium, tools, materials. Color relationships, mixing, composition, applications to design.

ARCH 5350. Topics in Architectural Representation. (1-3 cr; max 3 cr; A-F or Aud. Prereq—[5321, Arch major or M. Arch major]) Selected topics in architectural representation.

ARCH 5361. 3-D Computer Architectural Modeling and Design. (3 cr; A-F or Aud. =ARCH 4361. Prereq—M Arch major) 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 5371. Computer Methods I. (1 cr; S-N or Aud. =LA 5371. Prereq—Concurrent enrollment 8251, M Arch major or #) Introduction to current techniques, computer programs, and their application to architectural computing.

ARCH 5372. Computer Methods II. (1 cr; S-N or Aud. =LA 5372. Prereq—5371, &8252 and M Arch major or #) Current techniques, computer programs, and their application to architectural computing and design.

ARCH 5373. Computer Methods III. (1 cr; S-N or Aud. =LA 5373. Prereq—5372, &8253, M Arch major or #) Advanced techniques, computer programs, and their application to formal/abstract computing in design, theory, and technology.

ARCH 5374. Computer Methods IV. (1 cr; Stdnt Opt. Prereq—5373, &8254, M Arch major or #) Advanced architectural computing applications in design, history, theory, representation, and technology.

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

ARCH 5423. Gothic Architecture. (5 cr; A-F or Aud. =ARCH 4423. Prereq—M Arch major or #) History of architecture and urban design in Western Europe, from 1150 to 1400.

ARCH 5424. Renaissance Architecture. (3 cr; A-F or Aud. =ARCH 4424. Prereq—M Arch major or instr consent) 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 cr; A-F or Aud. =ARCH 4425. Prereq—M Arch major or instr consent) Architecture and urban design in Italy from 1600 to 1750. Emphasizes major figures (Bernini, Borromini, Cortona, Guarini) and evolution of major cities (Rome, Turin).


ARCH 5431. Eighteenth-Century Architecture and the Enlightenment. (3 cr; A-F or Aud. =ARCH 4431W. Prereq—M Arch grad student or #) Architecture, urban planning, and garden design in Europe and America from 1650 to 1850.

ARCH 5432. Modern Architecture. (3 cr; A-F or Aud. =ARCH 4432. Prereq—M Arch major or instr consent) Architecture and urban design in Europe and the United States from early 19th century to World War II.

ARCH 5434. Contemporary Architecture. (3 cr; A-F or Aud. =ARCH 4434. Prereq—M Arch major or instr consent) Developments, theories, movements, and trends in architecture and urban design from World War II to present.

ARCH 5439. History of Architectural Theory. (3 cr; A-F or Aud. =ARCH 4439. Prereq—M Arch major or instr consent) History of architectural theory from antiquity to 20th century.

ARCH 5445. Suburbia. (3 cr; A-F only. =ARCH 4445W) Suburbia, from origins in 18th-century England to present. Historical changes and present challenges, especially in American culture. 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 cr; A-F only. Prereq—5441 or #) Avant-garde responses to post-war consciousness of social issues/meaning in architecture. Eroding communal identity, common man, architectural symbolism and spatiality, critical regionalism, place/technology in form making, popular culture, rise of theory.

ARCH 5450. Topics in Architectural Theory. (1-3 cr; max 9 cr; A-F or Aud. Prereq—Arch or M Arch major or #) Selected topics in architectural theory and criticism.

ARCH 5451. Architecture: Defining the Discipline. (3 cr; A-F or Aud. Prereq—M Arch major or #) Architecture as a discipline: its nature, role, purpose, and meaning discussed within a general, philosophical, and theoretical framework. Investigation and discussion of paradigms defining architectural theory and practice.

ARCH 5452. Architecture: Design, Form, Order, and Meaning. (4 cr; A-F or Aud. Prereq—M Arch major or #) 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 5455. Typology and Architecture: Theories of Analysis and Synthesis. (3 cr; A-F or Aud. Prereq—5411, M Arch major, #) Theoretical traditions and development of typology’s role in architecture. Investigates works of Laugier, Quantremeure de Quincy, Viollet-Le Duc, Ledoux, Durand, Camillo Sitte, and Le Corbusier. Recent developments and theoretical positions of rational and contextual arguments for contemporary applications of the idea of type.

ARCH 5458. Architecture and Culture. (3 cr; A-F or Aud. Prereq—5412, Arch major or grad student or #) Architecture as a cultural medium. Relationships among architecture, people, and culture; research findings and design; vernacular and high style architecture. Physiological and symbolic receptions; reception theory in architecture; cultural critique and change; implications for architectural practice.

ARCH 5459. Gender and Architecture. (3 cr; Stdnt Opt. Prereq—Arch or WoSt major or M Arch major or #) Examination of ideas related to gender and architecture, gendered and non-gendered places and practices, and their relations to cultural norms and change.


ARCH 5468. Constructing Sacred Space. (4 cr; A-F only. Prereq—Arch or MS) Speculative understandings of space, form, and expression of sacred space in historic/contemporary cultural/social contexts, using Islamic art/architecture. Language of architecture.


ARCH 5512. Building Methods in Architecture. (3 cr; A-F or Aud. Prereq—5511, M Arch major or #) Analysis of architectural materials, building systems, and construction operations related to enclosure systems design, building infrastructure, and detailing. Application of legal constraints and regulations (e.g., ADA, building codes, life-safety issues) in preparation of drawings, specifications, and construction documents for building design.

ARCH 5513. Environmental Technology I: Thermal Design in Architecture. (3 cr; A-F or Aud. Prereq—M Arch major or #) 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 cr; A-F or Aud. Prereq—M Arch major or #) 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 5521. Material Investigation: Concrete. (4 cr; A-F only. Prereq—M Arch or MS) 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 cr; A-F only. Prereq—Grad student) Design projects identify common problems and improvements, investigate alternatives, and develop solutions where steel and glass are the primary building materials.

ARCH 5525. Design in Masonry. (3 cr; A-F or Aud. Prereq—5512, M Arch major or #) Design principles, construction methods, and document production for masonry structures.

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

ARCH 5539. Daylighting and Architecture Design. (3 cr; A-F or Aud. Prereq—5514, M Arch major or #) Role of daylighting in architectural design: principles, strategies, energy and environmental issues, psychology of light, color, and integration of electric lighting. Design projects investigate qualitative and quantitative issues through drawing, physical models, and photometric analysis.

ARCH 5550. Topics in Technology. (1-4 cr [max 12 cr]; A-F only. Prereq—M Arch major) Selected topics in architecture technology, e.g., construction, environmental management, energy performance, lighting, materials.


ARCH 5572. Architectural Structures II: Concrete and Masonry Design. (3 cr; A-F or Aud. Prereq—5571, M Arch major or #) Overview of advanced materials: reinforced fiberglass, structural glass, and structural textile fabrics. Impact of construction technology on architecture and methods of integrating knowledge of structural materials and construction methods into the design process.

ARCH 5611. Design in the Digital Age. (3 cr; A-F or Aud. Prereq—Grad student or upper level undergrad student) 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 cr; A-F or Aud. Prereq—M Arch major or #) 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 5631. Legal Contracts in Architecture. (3 cr; A-F or Aud. Prereq—M Arch major or #) Legal subject matter relevant to the work of architects and design professionals.

ARCH 5645. Real Estate Development in Architecture. (3 cr; Stdnt Opt. Prereq—For undergrads BA Arch major; for grad M Arch major or #) Fundamentals of real estate development and investment building. Processes and rules of specialists in development of investment projects. Topics include pro forma value and depreciation, tax shelter, feasibility, market analysis, appraisal equity financing, design, construction, leasing, and property management.

ARCH 5650. Topics in Architectural Practice. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq—5621, Arch major or #) Topics in architectural practice, methods of design production, marketing, operation, and relationships among clients, architects, and society.

ARCH 5670. Topics in Historic Preservation. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq—Arch or M Arch major or #) Selected topics in the theory, philosophy, research, and methods of architectural historic preservation.

ARCH 5671. Historic Preservation. (3 cr; Stdnt Opt. Prereq—5412 or #) Philosophy, theory, and origins of historic preservation. Historic architecture and research, descriptive analysis, and documentation of historic buildings. Government’s role in historic preservation, preservation standards and guidelines, preservation and building codes, neighborhood preservation, preservation advocacy, and future directions for historic preservation. Research on architectural and historical aspects of historic sites using primary and secondary resources and on controversial aspects of preservation.


ARCH 5673. Historic Building Research and Documentation. (3 cr; Stdnt Opt. Prereq—5412, 5672 or #) Philosophy, theory, and methods of historic building research, descriptive analysis of buildings, building documentation, historical archaeology, and architectural history.

ARCH 5711. Design Principles of the Urban Landscape. (3 cr; A-F or Aud. Prereq—BED major or M Arch major or LA grad major or grad student or #) Art/design of creating city, neighborhood, and development plans. Public policies, planning tools/processes, and typical models used by design professionals and private/civic institutions to shape physical environment.

ARCH 5721. Proseminar in Metropolitan Design. (3 cr; A-F or Aud. LA 5721. Prereq—[(5711 or equiv), enrollment in CMD prog] or #) Reading seminar. Evolution of the contemporary city. Dynamics that created contemporary urban spatial patterns. Planning/design theories that have guided public interventions in the built environment. Thematic texts, classroom discussions.

ARCH 5750. Topics in Urban Design. (1-4 cr [max 4 cr]; A-F or Aud. Prereq—Arch major) Special topics in theory/practice of urban design.

ARCH 5770. Field Studies in Urban Design. (2-6 cr [max 6 cr]; A-F only) Travel study of urbanism through guided field trips and lectures by local experts. Relationship between built environment, land, water, and transit. Planning and development policies. On-site graphic documentation and analysis. Design or written papers.

ARCH 5790. Special Topics in Metropolitan Design. (3 cr [max 6 cr]; A-F or Aud. Prereq—Enrollment in CMD prog or #) Travel study of urbanism through guided field trips and lectures by local experts. Relationship between built environment, land, water, and transit. Planning and development policies. On-site graphic documentation and analysis. Design or written papers.

ARCH 8101. Subjects and Methods in Architecture. (2 cr; S-N or Aud. Prereq—Grad Arch major or #) The discipline of architecture.

ARCH 8250. Graduate Architectural Design I. (9 cr; A-F or Aud. Prereq—Arch major or #) Design projects focus on fundamental issues of space/forms/light/materiality in relation to human habitation. Design as a process of exploration/inquiry. Modes of media/representation, their critical impact.

ARCH 8252. Graduate Architectural Design II. (6 cr; A-F or Aud. Prereq—8251, grad Arch major or #) Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

ARCH 8253. Graduate Architectural Design III. (9 cr; A-F or Aud. Prereq—8251, MArch or #) Issues of design process, representation, programming, technology, and urban relations.

ARCH 8254. Technical Applications in Design. (4 cr [max 8 cr]; A-F or Aud. Prereq—8252, MArch major or #) 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 cr; max 12 cr; A-F or Aud. Prereq—[8254, grad Arch major]: Grad Arch major or #) Fundamental architectural problems involving design as a creative inquiry. Individual/collaborative effort.

ARCH 8295. Directed Graduate Architectural Design. (6 cr; A-F or Aud. Prereq—8251, grad Arch major or #)

ARCH 8299. Master’s Design Project. (10 cr; A-F only. Prereq—Plan C, MArch) 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 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

ARCH 8350. Advanced Topics in Representation. (1-3 cr [max 3 cr]; A-F or Aud. Prereq—Grad Arch major or #) Theory and practice of visual representation in architecture.

ARCH 8450. Topics in Theory. (1-3 cr [max 3 cr]; A-F or Aud. Prereq—Grad Arch major or #) Topics vary

ARCH 8494. Directed Research in Architectural History. (1-3 cr [max 3 cr]; A-F or Aud. Prereq—Grad Arch major or #)

ARCH 8550. Topics in Technology. (1-3 cr [max 3 cr]; A-F or Aud. Prereq—Grad Arch major or #) Special topics in theory/practice of architecture technologies.


ARCH 8565. Energy and Indoor Environmental Quality Issues in Sustainable Design. (3 cr; A-F or Aud. Prereq—[5513, [grad MS or MArch]] or #) 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 8566. Materials Performance in Sustainable Building. (3 cr; A-F only. Prereq—[5512, grad MS or March] or #) 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 cr; A-F only. Prereq—[5512, [grad MS or MArch student]] or #) Site, water and site/building integration aspects of sustainable design. Ecology, hydrology, stormwater management, 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. (1-3 cr [max 3 cr]; A-F or Aud. Prereq—Grad Arch major or #)

ARCH 8750. Topics in Urban Design. (1-3 cr [max 3 cr]; A-F or Aud. Prereq—Grad Arch major or #)

ARCH 8777. Thesis Credits: Master’s. (1-10 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Art (ARTS)

Department of Art
College of Liberal Arts

ARTS 5104. The Nature of Abstraction. (4 cr; Stdnt Opt. Prereq—5101 or #) Exploration of abstraction as concept. Studio practice with attention to developing individual work. Emphasizes understanding topics relevant to abstraction. Approached from discipline of painting, open to various material sensibilities.


ARTS 5106. Advanced Drawing: Interpreting the Site. (4 cr; Stdnt Opt. Prereq—5106 or #) 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.


ARTS 5120. Advanced Painting. (4 cr [max 12 cr]; Stdnt Opt. Prereq—5108 or #) Developing personal vision/content through painting. Emphasizes critical thinking, self-evaluation, and independent pursuit of ideas.


ARTS 5320. Advanced Sculpture: Spatial Problems. (4 cr [max 12 cr]; Stdnt Opt. Prereq—5320 or #) Sculptural practice outside traditional media/approaches. Installation, theater, public art, architecture as topics for individual investigations into spatial organization.


ARTS 5403. Women’s Images and Images of Women. (5 cr [max 5 cr]; Stdnt Opt. ARTS 5403. Prereq—1001 or #) 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 5411. Professional Practices. (3 cr; Stdnt Opt. Prereq—Grad or #) Intensive writing seminar provides a context for theoretical issues, business practices, and professional skills required for career management and development in the visual arts.

ARTS 5444. Bachelor of Fine Arts Exhibition. (1 cr; S-N only. Prereq—5400, BFA candidate, sr) 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.


For definitions of course numbers, symbols, and abbreviations, see page 214. 229


ARTS 5550. Advanced Papermaking. (4 cr [max 12 cr]; Stdnt Opt. Prereq-3505 or #) Distinct expressive qualities of handmade paper, its versatility as contemporary art form. Independent research pursued in consultation with instructor.


ARTS 5660. The Body Electric: Sensing New Domains for Creative Expression. (4 cr [max 12 cr]; S-N or Aud) Cultural conceptions of the most personal of new media's hybrid domains of physical/virtual interplay. Readings of contemporary/historic conceptions of body/machine. Boundaries/membranes, response/reaction. The biological, the computational, the bionic. Advanced projects with interactive, sensing, and programmable technologies.

ARTS 5670. Interdisciplinary Media Collaborations. (3 cr [max 9 cr]; Stdnt Opt. Prereq—Upper-division undergraduate or graduate student in art, creative writing, dance, music or theater) Interdisciplinary, collaborative artist teams explore modes of creative expression at intersections of the arts. Students collaborate to co-author/produce works of art for public presentation. Explores integration of media arts with visual art, music, dance, and theater to produce interdisciplinary/collaborative art.

ARTS 5701. Performed Photography: Documentation of Artistic Acts and Social Interventions. (4 cr; Stdnt Opt. Prereq-Two 3xxx [photography or video] courses) Studio course. Use of image-based media to document various artistic, site-specific acts that may otherwise go unnoticed. Relating practices of original events (performance, social intervention, sculptural prop, ephemeral gesture) and memory trace left in image/record.


ARTS 5821. Ceramic Materials Analysis. (4 cr; Stdnt Opt. Prereq-3801 or 3802 or #) 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. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq—Major, completed regular course with instructor, #) Independent study, projects designed by student in consultation with instructor.


ARTS 8300. Sculpture: Theory and Analysis. (3 cr [max 6 cr]; Stdnt Opt) Theoretical issues of sculpture as understood by practicing sculptors. Research on and discussion of current sculpture in light of historical precedent; personal work relative to contemporary practice.

ARTS 8333. FTE: Master’s. (1 cr; No grade) Prereq—Master’s student, adviser and DGS consent


ARTS 8401. Studio and Pedagogy: Philosophy and Practice. (3 cr [max 6 cr]; Stdnt Opt) 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. (3 cr [max 6 cr]; A-F or Aud; Prereq—8400) Studio based critique to foster critical dialogue about art practice across media/disciplines. Colloquium for ideas/theories that migrate between artistic practices and influence studio work.


ARTS 8800. Ceramics: Theory and Practice. (3 cr [max 12 cr]; A-F or Aud) Tutorial emphasizing individual goals and directions. Discussion of aesthetics, history, theory, contemporary issues in clay, and criticism.


Art History (ARTH) Department of Art History

College of Liberal Arts

ARTH 5101. Myths in Art: Cross-Cultural Comparison. (3 cr; A-F or Aud) Relationships of text/image, efficacy of each in conveying meaning. Properties of visual/verbal communication. Ways in which artists convey mythological meanings, how and why these ways differ according to place/time. Students prepare/critique visual presentations through Web pages.

ARTH 5103. Hellenistic and Early Roman Art and Archaeology. (3 cr; Stdnt Opt. +CNES 5103. Prereq—Clas/Arth 3008 or jr or sr) Sculpture, architecture, painting, and topography in developing centers of Hellenistic culture in the eastern Mediterranean, and in Etruscan and Roman towns from 400 B.C. to the beginnings of the Roman Empire.

ARTH 5108. Greek Architecture. (3 cr; Stdnt Opt. +CNES 5108. Prereq—Arth/Clas 3008, jr or sr or grad, or #) Geometric through classical examples of religious and secular architecture and their setting at archaeological sites in Greece, Asia Minor, and Italy.

ARTH 5111. Prehistoric Art and Archaeology of Greece. (3 cr; Stdnt Opt. +CNES 5111. Prereq—Jr or sr or grad student, Greek art/archaeology course or #) Artistic and architectural forms of Neolithic period in Aegean area and Cycladic, Minoan, and Mycenaean cultures. Aims and methods of modern field archaeology; the record of human habitation in the Aegean area. Archaeological evidence as a basis for historical reconstruction.

ARTH 5112. Archaelic and Classical Greek Art. (3 cr; Stdnt Opt. Prereq—Jr, Clas/Arth 5111) 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 the production of art in the Aegean area.

ARTH 5120. Field Research in Archaeology. (3-6 cr [max 6 cr]; Stdnt Opt. +CLCV 5120, CNES 5120. Prereq—#) Field excavation, survey, and research at archaeological sites in the Mediterranean area. Techniques of excavation and exploration; interpretation of archaeological materials.
ARTH 5172. House, Villa, Tombs: Roman Art in the Private Sphere. (3 cr; Stdnt Opt. =CNES 5172. Prereq: One intro art history course or #) The architecture, painting, and sculpture of urban houses, country estates, and tombs in the Roman World. Relationships between public and private spheres, literary and physical evidence: usefulness of physical evidence in illuminating gender roles.

ARTH 5182. Art and the State: Public Art in the Roman Empire. (3 cr; Stdnt Opt. = CNES 5182. Prereq: One intro art history course or #) Origins of Roman public art; use in maintaining community; exploitation by the first Emperor, Augustus; development and diffusion through the later Empire; varying capabilities to adjust to the demands of a Christian Empire.

ARTH 5244. Gothic Sculpture. (3 cr; Stdnt Opt. Prereq: Jr or Sr or grad or #) The origin, character, and development of Gothic sculpture in France, the German empire, and the Netherlands, 1150-1400. Emphasis on French sculpture of the cathedral age and the emergence of a court style in France and elsewhere in Europe (e.g. London, Prague).

ARTH 5252. History of Early Christian Art in Context. (4 cr; Stdnt Opt. = CNES 5252. Prereq: One 3xxx ARTH course or #) The role played by art in the formation of early Christian and Byzantine communities, and in establishing their relationships with the Pagan world and early Islam.

ARTH 5301. Visual Culture of the Atlantic World. (3 cr; A-F or Aud) 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 cr; A-F or Aud) Cultural history of printed images in Europe from their emergence in 15th 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 5324. 15th-Century Painting in Northern Europe. (3 cr; Stdnt Opt. Prereq: Jr or Sr or grad or #) The origin, character, and development of painting in France, the Netherlands area, and the German Empire during the years 1430 to 1500. Emphasis on the Flemish school (e.g., Van Eyck brothers, Campin, Van der Weyden) and its influences.

ARTH 5335. Art of the Aztec Empire. (3 cr; Stdnt Opt. =ANTH 5335) Art/architecture of Nahautl-speaking Aztecs of Central Mexico, from first appearance in archaeological record in 1325 to 1521. Major scholarly problems, theoretical/methodological approaches. Analysis of scholarly writing, what constitutes evidence.


ARTH 5340. Practicum in Archaeological Field and Computer Techniques. (3 cr; Stdnt Opt. = ARTH 5340. CLCV 5340. CNES 5340. Prereq: One course in ancient art/archaeology or #) Methods for excavation of Old/New World sites. Meets at archaeology computer lab for part of semester and at selected site in Minnesota for day-long sessions for 9 to 10 weeks.

ARTH 5411. Gender and Sexuality in Art Since 1863. (3 cr; Stdnt Opt) 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 5463. Early 20th-Century Painting and Sculpture. (3 cr; Stdnt Opt) Primary movements of early 20th century: fauvism, German expressionism, cubism, futurism, dadaism, surrealism, non-objective painting, constructivism, Orphism, early abstraction. Framed against postimpressionism and internationalism at turn of century.


ARTH 5535. Style, Tradition, and Social Content in American Painting: Colonial Era to 1876. (3 cr; Stdnt Opt) 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 chronicles of the Western frontier.

ARTH 5536. Topical Studies in American Art. (3 cr; Stdnt Opt) Course description varies from year to year, depending on the current research interests of the instructor and the needs and interests of advanced undergraduate and graduate students in modern and American art.

ARTH 5536. American Architecture: 1840 to 1914. (3 cr; Stdnt Opt) 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, vennacular vs. “high” architecture of technology, economics, urbanism, and social reform.


ARTH 5725. Ceramics in the Far East. (3 cr; Stdnt Opt) Selective examination of representative pottery and ceramic wares produced in China, Korea, and Japan from the Neolithic era to modern times. Nearly every major ceramic type is represented.

ARTH 5765. Early Chinese Art. (3 cr; Stdnt Opt) Develop a more effective way to understand the unique qualities of an individual work of art. Concentration is on accessible works of art in local private and museum collections.

ARTH 5766. Chinese Painting. (3 cr; Stdnt Opt) Major works from the late bronze age to the modern era that illustrate the development of Chinese landscape painting and associated literary traditions.

ARTH 5767. Japanese Painting. (3 cr; Stdnt Opt) Japanese pictorial arts from the late tomb period to the modern era; special attention to the development of indigenous traditions.

ARTH 5769. Connoisseurship in Asian Art. (3 cr; Stdnt Opt) A selective examination of representative works of art produced in China from the Neolithic era to the Han Dynasty. Major archaeological sites and examples of art in local collections.

ARTH 5775. Formation of Indian Art: 3500 BCE to 500 CE. (3 cr; Stdnt Opt) Sculpture/architecture, from Indus Valley civilization through Kushana period.

ARTH 5776. Redefining Tradition: Indian Art, 400 to 1300. (3 cr; Stdnt Opt) India’s art/architecture, from earliest free-standing temples through 13th century. Focuses on temples, associated sculpture. Mural painting, beginnings of Islamic architecture in India.

ARTH 5777. The Diversity of Traditions: Indian Art 1200 to Present. (3 cr; Stdnt Opt) 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 cr; Stdnt Opt) 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 cr; Stdnt Opt) 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 5940. Topics: Art of the Film. (3 cr; Stdnt Opt) Topics in film history including 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 cr [max 9 cr]; Stdnt Opt) Topics specified in Class Schedule.

ARTH 5993. Directed Study. (1-4 cr [max 12 cr]; A-F or Aud. Prereq.—#) ARTH 5994. Directed Research. (1-4 cr; A-F or Aud. Prereq.—#)

ARTH 8000. Art Historiography: Theory and Methods. (3 cr; A-F or Aud) 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 cr; Stdnt Opt) 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 cr [max 12 cr]; Stdnt Opt. +CINES 8190. Prereq.—#) Selected topics, with special attention to current scholarly disputes. Topics specified in [Class Schedule].

ARTH 8200. Seminar: Medieval Art. (3 cr [max 12 cr]; Stdnt Opt) Focus on a major art historical theme, artist, period, or genre.


ARTH 8444. FTE: Doctoral. (1 cr; No grade. Prereq.—Doctoral student, adviser and DGS consent)

ARTH 8520. Seminar: American Art and Material Culture. (3 cr [max 12 cr]; Stdnt Opt. +AMST 8520. Prereq.—#) 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. (1-6 cr [max 12 cr]; No grade. 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)

ARTH 8710. Seminar: Islamic Art. (3 cr [max 12 cr]; Stdnt Opt. Prereq.—#) Research focuses on current research interests of the professor and needs and interests of graduate students in Islamic and Asian art history.

ARTH 8920. Seminar: East Asian Art. (3 cr [max 12 cr]; Stdnt Opt. Prereq.—#) Research focuses on current research interests of the professor and needs and interests of graduate students in Islamic and Asian art history.

ARTH 8970. Directed Studies. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq.—#)
ALL 5357. Chinese Cinematic Realisms. (3 cr; Stdnt Opt)
Various styles of realism in Chinese cinema (mainland, Taiwan) from silent era to present. Theories of realism, conceptions of “the Real” applied in close readings of major films, placed in historical context. China’s negotiation of modernity during 20th century.

ALL 5358. Chinese Revolutionary Cinema. (3 cr; Stdnt Opt)

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

ALL 5366. The Nation in Modern Chinese Film and Drama. (3 cr; Stdnt Opt. Prereq: Jr or sr or grad student)
Chinese nationhood as represented/negotiated in film/literature from early 20th Century to present. How China was re-imagined as a modern nation in culture, from republic to the era to the reform era. How alternative national visions of nationhood arose in Hong Kong and Taiwan.

ALL 5374. Representing the Past: Chinese Myth, Legend, and Ideology. (5 cr; Stdnt Opt)
Analysis of texts that contain early Chinese myths, legends, and historical narratives in their construction of an understandable world. How such materials have been incorporated into different cultural formations from different periods, influencing contemporary popular culture. How they have figured into the construction of China and Chineseness in 20th Century.

ALL 5433. Women’s Writing in Premodern Japan in Translation. (3 cr; A-F or Aud)

ALL 5436. Literature by 20th-Century Japanese Women in Translation. (3 cr; Stdnt Opt)
Literary and historical exploration of selected works by Japanese women writers in a variety of genres. All literary texts read in English.

ALL 5466. Japanese Popular Culture in a Global Context. (3 cr; Stdnt Opt)
What happens when one nation’s popular culture begins to permeate others. Japanimation, manga, anime, influence of Japanese music, fashion, and music. Relationship of popular culture to nation(alism), ethnicity, gender, and identity. Effects of popular culture on consumers, socialization. Ways that consumption affects us personally.


ALL 5477. Kurosawa, Masculinity, and Cold War. (3 cr; Stdnt Opt. Prereq: Advanced undergrad or grad student)

ALL 5636. South Asian Women Writers. (3 cr; A-F or Aud. Prereq: Grad student or advanced undergrad)
Survey of South Asian women’s writing, from early years of nationalist movement to present. Contemporary writing includes works by immigrant writers. Concerns, arguments, and nuances in works of women writing in South Asia and diaspora.

ALL 5671. Hinduism. (3 cr; Stdnt Opt. + ALL 5671)
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 5672. Buddhism. (3 cr; Stdnt Opt. + ALL 5672, RELS 3571, RELS 5371)
Historical account of Buddhist religion in terms of its rise, development, various schools, and common philosophical concept. Indian Buddhism compared with Hinduism; Buddhism’s demise and revival on the Indian subcontinent.

ALL 5682. Romanticism and Empire: Britain and India. (3 cr; Stdnt Opt)

ALL 5900. Topics in Asian Literature. (3 cr [max 12 cr]; Stdnt Opt)
Topics specified in Class Schedule.

ALL 5920. Topics in Asian Culture. (3 cr [max 12 cr]; Stdnt Opt)
Topics specified in Class Schedule.

ALL 5990. Directed Study. (1-4 cr [max 16 cr]; Stdnt Opt. Prereq: %, @)
Individual reading/study, with guidance of a faculty member, on topics not covered in regular courses.

Energetic phenomena in the universe. Radiative processes in high energy regimes; supernovae, pulsars, and X-ray binaries; radio galaxies, quasars, and active galactic nuclei.

Astronomy (AST)
Department of Astronomy
Institute of Technology
AST 5012. The Interstellar Medium. (4 cr; Stdnt Opt. Prereq: 2001, Phys 2501 or #)
Survey of physical processes in the interstellar medium. Dynamic processes, excitation processes, emission and absorption by gas and dust. Hot bubbles, HI regions, molecular clouds.

Large-scale structure/history of universe. Introduction to Newtonian relativistic world models. Physics of early universe, cosmological tests, formation of galaxies.

AST 5201. Methods of Experimental Astrophysics. (4 cr; Stdnt Opt. Prereq: Upper div IT or grad or #)
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.

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. Stellar Astrophysics. (4 cr; Stdnt Opt. Prereq: #)
Stellar structure, evolution, and star formation. Emphasizes contemporary research.


AST 8041. Comparative Planetology. (4 cr; Stdnt Opt. 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.

Content, structure, evolution, and dynamics of Milky Way Galaxy. Emphasizes recent observations from space-ground-based telescopes.

Course Descriptions


AST 8081. Cosmology. (4 cr; Stdnt Opt. Prereq—#) Role of gravity in cosmology. Background, recent research advances.

AST 8110. Topics in Astrophysics. (2-4 cr [max 4 cr]; Stdnt Opt. Prereq—#)

AST 8120. Topics in Astrophysics. (2-4 cr [max 4 cr]; Stdnt Opt. Prereq—#)

AST 8200. Astrophysics Seminar. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq—#)

AST 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

AST 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

AST 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

AST 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

AST 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

AST 8990. Research in Astronomy and Astrophysics. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq—#) Research under supervision of a graduate faculty member.

Biochemistry (BIOC)

Department of Biochemistry, Molecular Biology, and Biophysics

College of Biological Sciences


BIOC 5225. Graduate Laboratory in NMR Techniques. (4 cr; S-N only. Prereq—BIOC 8001 or #) Practical aspects of nuclear magnetic resonance (NMR) spectrometry. Hands-on experience with 500/600 MHz instruments. Sample preparation/ handling, contamination sources, tube/probe options, experiment selection, experimental procedures, software, data processing.

BIOC 5309. Biocatalysis and Biodegradation. (5 cr; Stdnt Opt. = MICE 5309. Prereq—chemistry through organic chemistry, knowledge of wordprocessing, e-mail, access to World Wide Web, access to college-level science library) Assess validity of information on biocatalysis and biodegradation; learn fundamentals of microbial catalytic metabolism as it pertains to biodegradation of environmental pollutants; biocatalysis for specialty chemical synthesis; display of this information on the Web.

BIOC 5332. Biotechnology and Bioengineering for Biochemists. (3 cr; A-F or Aud. = MICE 5332. Prereq—[BIOC 5301 or Biol 3011 or MIB 4111; BIO 5301 or MIB 5301] or #) 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 biotechnology. Formulation of therapeutic biopharmaceuticals.


BIOC 5401W. Advanced Metabolism and Its Regulation. (3 cr; Stdnt Opt. Prereq—5302 or 4331 or Biol 3011) Underlying principles that determine metabolism of common/unusual compounds in plants, animals, microorganisms. Regulation of carbon, energy flow in whole organisms.

BIOC 5444. Muscle. (3 cr; Stdnt Opt. =PHSL 5444. Prereq—Biol/BIOC 5302 or 4331 or Phys 3061 or #) Muscle structure/function: molecular mechanism by which force is generated.

BIOC 5527. Introduction to Modern Structural Biology. (4 cr; Stdnt Opt. Prereq—[intro biochemistry, intro physics] or physical chemistry or #) 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 function/structure relationships.


BIOC 5551. Macromolecular Crystallography I: Fundamentals and Techniques. (1 cr; S-N or Aud. Prereq—[One organic chemistry or biochemistry course], [two calculus or college physics courses] or inst instruct approv) Macromolecular crystallography for protein structure determination. Determining macromolecule structure by diffraction.


BIOC 8001. Biochemistry: Structure, Catalysis, and Metabolism. (3 cr; Stdnt Opt. Prereq—BMBB or MCDB&G grad student or #) Protein structure, methods to determine structure, protein folding, forces stabilizing macromolecular structure, protein engineering, design. Dynamic properties of proteins, enzyme substrate complexes, mechanisms of enzyme catalysis. Enzymology of metabolic regulation and cell signaling.


BIOC 8084. Research and Literature Reports. (1 cr [max 5 cr]; S-N or Aud. Prereq—Grad BMBB major or #) Current developments.

BIOC 8184. Graduate Seminar. (1 cr [max 5 cr]; S-N or Aud. Prereq—Grad BMBB major or DGS consent) Reports on recent developments in the field and on research projects in the department.

BIOC 8213. Selected Topics in Molecular Biology. (4 cr; Stdnt Opt. =GCD 8213. Prereq—5002 or #) 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 cr; Stdnt Opt. Prereq—5002 or #) Cell signaling, metabolic regulation in development. Prokaryotic/eucaryotic systems used as models for discussion. Literature-based course.

BIOC 8290. Current Research Techniques. (1-3 cr [max 9 cr]; S-N or Aud. Prereq—Grad BMBB major) Research project carried out in laboratory of a staff member.

BIOC 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

BIOC 8401. Ethics, Public Policy, and Careers in Molecular and Cellular Biology. (1 cr [max 2 cr]; S-N or Aud. Prereq—Grad student in [BMBB or MCDB&G]) 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 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

BIOC 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)
Bioethics, Center for (BTHX)

Center for Bioethics

BTHX 5000. Topics in Bioethics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–Grad student or #) Bioethics topics of contemporary interest. Topics specified in Class Schedule.

BTHX 5010. Bioethics Proseminar. (2 cr; A-F only. Prereq–Bioethics grad student or grad minor) Introduction to topics in bioethics.

BTHX 5100. Introduction to Clinical Ethics. (3 cr; Stdnt Opt. Prereq–Jr or sr or grad student or #) Most frequent ethical problems faced by clinicians, patients/families, and ethics consultants. Forgoing life sustaining treatment, decisional capacity, informed consent, treatment refusal, death/dying, pediatric ethics, reproductive issues, research ethics, psychiatric illness. Real cases.


BTHX 5300. Foundations of Bioethics. (3 cr; Stdnt Opt. Prereq–Grad student or #) Overview of major contemporary frameworks, foundational issues in bioethics.

BTHX 5325. Biomedical Ethics. (3 cr; Stdnt Opt. Prereq–Grad student or #) Major topics/issues in biomedical ethics. Patients’ rights/duties, informed consent, confidentiality, ethical issues in medical research, initiation/termination of medical treatment, euthanasia, abortion, allocation of medical resources.

BTHX 5400. Introduction to Bioethics in Health Policy. (3 cr; Stdnt Opt. Prereq–Grad student or professional student or #) Topics vary to reflect issues of current significance. Relates to law/politics as appropriate but focuses on moral analyses of policy issues.

BTHX 5453. Law, Biomedicine, and Bioethics. (3 cr; A-F only. Prereq–Grad student or #) Law/bioethics as means of controlling important biomedical developments. Relationship of law and bioethics. Role of law/bioethics in governing biomedical research, reproductive decisionmaking, assisted reproduction, genetic testing/screening, genetic manipulation, and cloning. Definition of death. Use of life-sustaining treatment. Organ transplantation.


BTHX 5620. Social Context of Health and Illness. (3 cr; Stdnt Opt. Prereq–Grad student or #) Social context in which contemporary meanings of health and illness are understood by providers/patients. Ethical implications. Readings from history, social science, literature, and first-person accounts.

BTHX 5900. Independent Study in Bioethics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–#) 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 progress.

BTHX 8000. Advanced Topics in Bioethics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–4xxx or 5xxx ethics course or #) Topics of contemporary interest. Topics specified in Class Schedule.

BTHX 8114. Ethical and legal Issues in Genetic Counseling. (3 cr; A-F or Aud. Prereq–[MCVD MS, genetic counseling specialization] or #) Professional ethics. Ethical/legal concerns with new genetic technologies.

BTHX 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser consent, DGS consent) 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 8510. Gender and the Politics of Health. (3 cr; Stdnt Opt. Prereq–#) Significance of gender to health and health care. Feminist analysis regarding moral/political importance of gender, possibly including contemporary western medicine’s understanding of the body, childbirth, and reproductive technologies; cosmetic surgery; chronic illness; disability; participation in research; gender and classification of disease. Care work, paid/non-paid. Readings from feminist theory, history, social science, bioethics, and moral philosophy.

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

BTHX 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade)

BTHX 8900. Advanced Independent Study in Bioethics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–#) 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.

BTHX 5620. Social Context of Health and Illness. (3 cr; Stdnt Opt. Prereq–Grad student or #) Social context in which contemporary meanings of health and illness are understood by providers/patients. Ethical implications. Readings from history, social science, literature, and first-person accounts.

BTHX 5900. Independent Study in Bioethics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–#) 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 progress.

BTHX 8000. Advanced Topics in Bioethics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–4xxx or 5xxx ethics course or #) Topics of contemporary interest. Topics specified in Class Schedule.

BTHX 8114. Ethical and legal Issues in Genetic Counseling. (3 cr; A-F or Aud. Prereq–[MCVD MS, genetic counseling specialization] or #) Professional ethics. Ethical/legal concerns with new genetic technologies.

BTHX 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser consent, DGS consent) 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 8510. Gender and the Politics of Health. (3 cr; Stdnt Opt. Prereq–#) Significance of gender to health and health care. Feminist analysis regarding moral/political importance of gender, possibly including contemporary western medicine’s understanding of the body, childbirth, and reproductive technologies; cosmetic surgery; chronic illness; disability; participation in research; gender and classification of disease. Care work, paid/non-paid. Readings from feminist theory, history, social science, bioethics, and moral philosophy.

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

BTHX 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade)

BTHX 8900. Advanced Independent Study in Bioethics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–#) 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.

BIO 5000. Special Topics in Biology for Teachers. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq–BA or BS in science or science education or elementary education or K-12 licensed teacher) 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.

BIO 5010. Bioethics Journal Club. (1 cr [max 12 cr]; S-N or Aud) Two-week summer workshop. Week one focuses on monarch butterfly biology taught through fieldwork, labs, lecture, and research projects. A 2- to 3-week break follows, when students raise monarchs, conduct simple experiments. Week two focuses on designing classroom activities/projects based on monarch biology. Follow-up meetings held during academic year.

BIO 5990. Special Topics in Biology. (1-3 cr [max 6 cr]; Stdnt Opt) In-depth study of special topic in life sciences.
Biomedical Engineering (BMEN)

Biomedical Engineering

Institute of Technology

BMEN 5001. Advanced Biomaterials. (3 cr; A-F or Aud. Prereq–5301 or MatS 3011 or grad student or #)

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 cr; Stdt Opt. Prereq–IT upper div or grad student or med student or #)

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 cr; Stdt Opt. Prereq–[IT upper div, grad student] or #)

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 5102. Bioelectric Measurements and Therapeutic Devices II. (3 cr; Stdt Opt. Prereq–5101 or #)

Theory/application of electrical stimulation in areas of therapeutic/function-nervous stimulation and pain control, cardiac pacing, defibrillation, tissue healing, and electrotherapy. Safety of electric fields. Electrical tissue impedance measurements.

BMEN 5151. Introduction to BioMEMS and Medical Microdevices. (2 cr; A-F or Aud. Prereq–IT or grad student or med student or #)

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 cr; Stdt Opt. Prereq–[IT upper div or grad student] or #)


BMEN 5312. Tissue Mechanics. (2 cr; A-F or Aud. Prereq–5201 or AEM 5501)

Fundamental principles of continuum mechanics applied to physiological systems. Systematic consideration of individual tissues and organs. Relationships among histology, anatomy, physiology, and mechanical function in these tissues. Changes in mechanical properties related to pathology. Emphasizes tissues in the cardiovascular system.

BMEN 5311. Advanced Biomedical Transport Processes. (3-4 cr [max 4 cr]; Stdt Opt. +CHEN 5753, ME 5381. Prereq–IT upper div or grad student or #; [ChEN 5103 or ME 5342] recommended)


BMEN 5351. Cell Engineering. (3 cr; Stdt Opt. Prereq–[2501 or 5501], CSCI 1107, [Math 2243 or Math 3773]. [IT upper div or grad student or #]) 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 Functional Biomedical Imaging. (3 cr; A-F or Aud. Prereq–IT upper div or grad student or #)

Functional biomedical imaging modalities. Principles/applications of representative functional imaging technologies that offer high spatial resolution or temporal resolution. Emphasizes principles and methodological foundations of bioelectromagnetic imaging and magnetic resonance imaging. Other functional biomedical imaging modalities.

BMEN 5411. Neural Engineering. (3 cr; A-F or Aud. Prereq–3401 recommended)


BMEN 5421. Introduction to Biomedical Optics. (3 cr; A-F only. Prereq–IT or grad student)

Biomedical optical imaging/sensing principles, laser-tissue interaction, detector design, noise analysis, interferometry, spectroscopy. Optical coherence tomography, tomography, polarization, birefringence, flow measurement, fluorescence, nonlinear microscopy. Tours of labs.

BMEN 5444. Muscle. (3 cr; Stdt Opt)

Muscle structure/function: molecular mechanism by which force is generated.


BMEN 5502. Pathobiology of Medical Devices. (3 cr; A-F or Aud. Prereq–IT upper division or grad student) Biological response to biomaterials presented in context of fundamental principles of cell injury, adaptation, repair, or death. Diversity of medical uses of biomaterials, by organism system. Unique features of specific biological systems in which medical devices are used.

BMEN 5910. Special Topics in Biomedical Engineering. (3 cr [max 6 cr]; Stdt Opt)

BMEN 5920. Special Topics in Biomedical Engineering. (2-3 cr [max 6 cr]; Stdt Opt)

BMEN 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

BMEN 8401. New Product Design and Business Development. (4 cr; A-F or Aud. =ENTR 6041, ENTR 6087, ME 8221, OMS 6061. Prereq–[IT grad student or CSOM grad student], some design experience; 8401, 8402 must be taken same yr)

Student teams work with IT 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 cr; A-F or Aud. =ME 8222. Prereq–ME 8222; 8401)

Student teams work with IT 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 8431. Controlled Release: Materials, Mechanisms, and Models. (3 cr; A-F or Aud. =PHM 8431. Prereq–Differential equations course including partial differential equations or #)

Physical, chemical, physiological, and mathematical principles underlying design of delivery systems for drugs. Small molecules, proteins, genes. Temporal controlled release.

BMEN 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

BMEN 8601. Biomedical Engineering Seminar. (1 cr; S-N or Aud)

Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEN 8602. Biomedical Engineering Seminar. (1 cr; S-N or Aud)

Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEN 8630. Biomedical Engineering Graduate Student Seminar. (1 cr (max 5 cr); S-N or Aud. Prereq–Grad BMEn major) Student presentations of current thesis research or other areas of biomedical engineering.

BMEN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

BMEN 8710. Directed Research. (1-3 cr [max 3 cr]; Stdt Opt)

BMEN 8720. Internship in Biomedical Engineering. (3 cr; S-N or Aud. Prereq–Grad BMEn major) Supervised transfer or industrial experience unrelated to student’s normal academic or employment experience.

BMEN 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

236 University of Minnesota 2009–10 Graduate School Catalog
Course Descriptions

BEB 5305. Pulp and Paper Technology. (3 cr; Stdnt Opt. Prereq-Grad student or #)

BEB 5312. Pulp and Paper Unit Operations. (4 cr; Stdnt Opt. Prereq-Grad student or #)
Application of principles of momentum, heat, and mass transfer to unit operations in pulp/paper industry. Fluid transport, filtration, sheet formation, sedimentation, drainage, pressing, heat exchange, evaporation, washing, bleaching, humidification/drying, chemical/energy recovery. Computer simulation of multiple-stage systems. Online course.

BEB 5314. Papermaking Processes and Process Engineering Laboratory. (3 cr; Stdnt Opt. Prereq-Grad student or #)

Presented through the Internet. Basic concepts and most frequently used methods in statistical process control, analysis of variances, experiment design, and regression analysis. Online course.

BEB 5333. Off-road Vehicle Design. (3 cr; A-F only. =BBE 4333. Prereq-[(3001, 4303) or [AEM 2021, AEM 3031], [CE 3502 or &CE 3502], upper div IT] or #)
Mechanics involved in designing/testing off-road vehicle. Vehicle mechanics, traction, and performance. Complexity/modeling of vehicle interaction with soil, muskeg, and snow. Students conduct case study or literature review and develop paper for publication.

BEB 5362. Pulping and Bleaching. (4 cr; Stdnt Opt. Prereq-Grad student or #)
Chemistry/technologies in producing paper-making raw material. Focuses on wood pulping/bleaching, including non-wood fibers and recycled fiber materials. Online course.

BEB 5401. Bioproducts Engineering. (3 cr; A-F or Aud. Prereq-Grad student or #)
Unit operations of bioproducts engineering/manufacture. Project required.

BEB 5402. Bio-based Products Engineering Lab I. (1 cr; A-F or Aud. =BBE 4402. Prereq-Grad student or #)
Laboratory exercises in bio-based products engineering.

BEB 5403. Bio-based Products Engineering Lab II. (1 cr; A-F or Aud. =BBE 4403. Prereq-Grad student or #)
Laboratory exercises in bio-based products engineering.

BEB 5404. Bio-based Composites Engineering. (3 cr; A-F or Aud. =BBE 4404. Prereq-Grad student or #)
Properties of bio-based composites.

BEB 5407. Bio-based Products Manufacturing and Applications I. (3 cr; Stdnt Opt. =BBE 4407. Prereq-Grad student or #)

BEB 5412. Manufacturing and Applications of Bio-based Products. (4 cr; Stdnt Opt. =BBE 4412W. Prereq-Grad student or #)
Manufacturing processes, end-use applications of bio-based products.

BEB 5413. A Systems Approach to Residential Construction. (3 cr; Stdnt Opt. Prereq-Grad student or #)
Dynamic/interrelated issues of energy, moisture control, indoor air quality in residential buildings. Emphasizes design, construction, and operational aspects to provide an energy efficient, durable structure, and healthy living environment. Interaction between moisture and wood products within building system.

BEB 5414. Advanced Residential Building Science. (3 cr; Stdnt Opt. =BBE 4414. Prereq-Grad student or #)
Building science theory, advanced applications for residential buildings. Focuses on heat/mass transfer.

BEB 5415. Advanced Residential Building Science Lab. (1 cr; A-F or Aud. =BBE 4415. Prereq-Grad student or #)
Concurrent with 4414. Exercises on advanced applications of heat/mass transfer to predict performance of residential buildings.

BEB 5416. Building Testing & Diagnostics. (2 cr; Stdnt Opt. =BBE 4416. Prereq-Grad student or #)
Theoretical basis for performance testing. Diagnostics applications for residential structures. Focuses on existing structures and retrofit/remodel applications. Digital differential pressure gauges, blower doors, airflow hoods/ducts, duct pressure testing, infrared thermography. Hands-on sessions for equipment use, problem solving.

BEB 5480. Special Topics. (3-4 cr [max 12 cr]; Stdnt Opt. =BBE 5480. Prereq-5 or grad student)
Topics specified in Class Schedule.

BEB 5503. Marketing of Bio-based Products. (4 cr; A-F or Aud. =BBE 5503. Prereq-Grad student or #)
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.

BEB 5504. Bio-based Products Development and Management. (3 cr; A-F or Aud. Prereq-Grad student or #)
Concepts of new product development and product management and their application to bio-based products.

BEB 5513. Watershed Engineering. (3 cr; A-F or Aud. Prereq-5033, upper div IT)
Application of engineering principles to managing between moisture and wood products within building structure, and healthy living environment. Interaction between moisture and wood products within building system.

BEB 5514. Advanced Residential Building Science Lab. (1 cr; A-F or Aud. =BBE 4414. Prereq-Grad student or #)
Theoretical basis for performance testing. Diagnostics applications for residential structures. Focuses on existing structures and retrofit/remodel applications. Digital differential pressure gauges, blower doors, airflow hoods/ducts, duct pressure testing, infrared thermography. Hands-on sessions for equipment use, problem solving.

Presented through the Internet. Basic concepts and most frequently used methods in statistical process control, analysis of variances, experiment design, and regression analysis. Online course.

BEB 5533. Off-road Vehicle Design. (3 cr; A-F only. =BBE 4333. Prereq-[(3001, 4303) or [AEM 2021, AEM 3031], [CE 3502 or &CE 3502], upper div IT] or #)
Mechanics involved in designing/testing off-road vehicle. Vehicle mechanics, traction, and performance. Complexity/modeling of vehicle interaction with soil, muskeg, and snow. Students conduct case study or literature review and develop paper for publication.

BEB 5562. Pulping and Bleaching. (4 cr; Stdnt Opt. Prereq-Grad student or #)
Chemistry/technologies in producing paper-making raw material. Focuses on wood pulping/bleaching, including non-wood fibers and recycled fiber materials. Online course.

BEB 5401. Bioproducts Engineering. (3 cr; A-F or Aud. Prereq-Grad student or #)
Unit operations of bioproducts engineering/manufacture. Project required.

BEB 5402. Bio-based Products Engineering Lab I. (1 cr; A-F or Aud. =BBE 4402. Prereq-Grad student or #)
Laboratory exercises in bio-based products engineering.

BEB 5403. Bio-based Products Engineering Lab II. (1 cr; A-F or Aud. =BBE 4403. Prereq-Grad student or #)
Laboratory exercises in bio-based products engineering.

BEB 5404. Bio-based Composites Engineering. (3 cr; A-F or Aud. =BBE 4404. Prereq-Grad student or #)
Properties of bio-based composites.

BEB 5407. Bio-based Products Manufacturing and Applications I. (3 cr; Stdnt Opt. =BBE 4407. Prereq-Grad student or #)

BEB 5412. Manufacturing and Applications of Bio-based Products. (4 cr; Stdnt Opt. =BBE 4412W. Prereq-Grad student or #)
Manufacturing processes, end-use applications of bio-based products.

BEB 5413. A Systems Approach to Residential Construction. (3 cr; Stdnt Opt. Prereq-Grad student or #)
Dynamic/interrelated issues of energy, moisture control, indoor air quality in residential buildings. Emphasizes design, construction, and operational aspects to provide an energy efficient, durable structure, and healthy living environment. Interaction between moisture and wood products within building system.

BEB 5414. Advanced Residential Building Science. (3 cr; Stdnt Opt. =BBE 4414. Prereq-Grad student or #)
Building science theory, advanced applications for residential buildings. Focuses on heat/mass transfer.

BEB 5415. Advanced Residential Building Science Lab. (1 cr; A-F or Aud. =BBE 4415. Prereq-Grad student or #)
Concurrent with 4414. Exercises on advanced applications of heat/mass transfer to predict performance of residential buildings.

BEB 5416. Building Testing & Diagnostics. (2 cr; Stdnt Opt. =BBE 4416. Prereq-Grad student or #)
Theoretical basis for performance testing. Diagnostics applications for residential structures. Focuses on existing structures and retrofit/remodel applications. Digital differential pressure gauges, blower doors, airflow hoods/ducts, duct pressure testing, infrared thermography. Hands-on sessions for equipment use, problem solving.

BEB 5480. Special Topics. (3-4 cr [max 12 cr]; Stdnt Opt. =BBE 5480. Prereq-5 or grad student)
Topics specified in Class Schedule.

BEB 5503. Marketing of Bio-based Products. (4 cr; A-F or Aud. =BBE 5503. Prereq-Grad student or #)
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.

BEB 5504. Bio-based Products Development and Management. (3 cr; A-F or Aud. Prereq-Grad student or #)
Concepts of new product development and product management and their application to bio-based products.

BEB 5513. Watershed Engineering. (3 cr; A-F or Aud. Prereq-5033, upper div IT)
Application of engineering principles to managing between moisture and wood products within building structure, and healthy living environment. Interaction between moisture and wood products within building system.
BIE 8303. Machinery Modeling. (3 cr; Stdnt Opt. Prereq-AEM 2021, CE 3502) Machinery systems modeling using multibody dynamics simulation software (MBS). Students review models presented in the literature and report on limitations of modeling approaches used. Models are developed in the students' areas of interest.


BIE 8306. Graduate Seminar. (2 cr [max 6 cr]; Stdnt Opt) Communication of scientific knowledge related to wood and paper science through the media of poster sessions, oral presentations, and the Internet.


BIE 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

BIE 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)


BIE 8523. Coupled Heat, Moisture, and Chemical Transport in Porous Media. (3 cr; A-F or Aud. Prereq-[CSci 5301 or equiv], [Math 5512, Math 5515 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.

BIE 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

BIE 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

Business Administration (BA)

Curtis L. Carlson School of Management

BA 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

BA 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

BA 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

Business and Industry Education (BIE)

Department of Work and Human Resource Education

College of Education and Human Development

BIE 5001. Teaching Marketing Promotion. (3 cr; A-F or Aud) 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.

BIE 5011. Introduction to Computer Applications. (3 cr; Stdnt Opt) Instructional uses of computers and representative business/marketing education applications, including word processing, databases, spreadsheets, and graphics.

BIE 5012. Advanced Word Processing. (3 cr; Stdnt Opt. Prereq-5011 or equiv) Develop/apply solution methods for office problems using word processing software including advanced editing, printing, and desktop publishing capabilities.

BIE 5013. Spreadsheet Analysis Using Computers. (3 cr; Stdnt Opt. Prereq-5011 or equiv) Using spreadsheets to analyze data, monitor business records, and create models.

BIE 5014. Database Computer Applications. (3 cr; Stdnt Opt. Prereq-5011 or equiv) Business needs for computerized databases. Using database software to develop, maintain, and prepare reports.

BIE 5015. Integrated Computer Applications in Business and Marketing Education. (3 cr; Stdnt Opt. Prereq-[3111, 3112, 3121, 3122] or equiv) Realistic business computer problems requiring integration of two or more application packages. Pedagogical issues of learning/teaching advanced computer applications.

BIE 5016. Web Development in Business. (3 cr; A-F or Aud. Prereq-[3101, 3102, 3103, 3104] or equiv, CI 5362) Introduction to developing interactive informational, instructional, and e-commerce sites. Basic Web development tools, including scripting languages.

BIE 5080. Special Topics in Business and Industry Education. (1-4 cr [max 4 cr]; Stdnt Opt) Content varies by offering.
BIE 5596. Occupational Experience in Business and Industry. (1-10 cr; max 10 cr); S-N or Aud. Prereq.—#)
Observation/employment in business/industry to develop technical/occupational competencies. Includes 100 clock hours of supervised work experience per credit.

BIE 5597. Internship: Business and Industry Education. (1-8 cr; max 12 cr); S-N or Aud. Prereq.—#)
Practical experience in business or industry as a professional educator or supervisor. Requires an integrative paper.

BIE 5605. Critical Issues in Business and Industry. (3 cr; Stdnt Opt)
Identification and analysis of major current issues in business and industry education.

BIE 5662. Computer Training in School and Industry Settings. (3 cr; Stdnt Opt. + HRD 5662. Prereq.—5011 or equiv)
Alternative teaching practices for business applications software: word processors, spreadsheets, graphics, desktop publishing, databases, and communications; public school and industry settings.

BIE 5796. Field Based Projects in Business and Industry. (1-4 cr; max 4 cr); S-N or Aud)
Curricular, instructional, developmental, or evaluative problems and projects applicable to local school or business and industry situations.

BIE 5801. The Business of Tourism. (3 cr; A-F or Aud)
Introduction to major theories, concepts, skills, and techniques influencing tourism business/industry.

BIE 5802. Education and Human Resource Development Through Tourism. (3 cr; A-F or Aud)
Policies/practices of education and human resource development in tourism industry.

BIE 5803. Tourism Studies Capstone Seminar. (3 cr; S-N or Aud. Prereq.—Tourism studies major)
Students present, critique, and discuss implications of supporting programs for tourism.

BIE 5993. Directed Study in Business and Industry. (1-4 cr; max 4 cr); Stdnt Opt)
In-depth individual inquiry in the content areas related to business and industry.

BIE 5995. Research Problems: Business and Industry. (3-6 cr; max 6 cr); S-N or Aud. Prereq—Adviser approval
Individual research in business and industry education.

Center for Spirituality and Healing (CSPH)

BIE 5102. Art of Healing: Self as Healer. (1 cr; Stdnt Opt. Prereq.—Jr or sr or grad student or #)
Introduction to personal 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 and others on psychoneuroimmunology, mind-body-spirit approaches. Lecture, scientific literature, meditation, imagery, drawing, group interaction.

BIE 5111. Ways of Thinking about Health. (2 cr; max 4 cr); S-N only. Prereq.—Jr or sr or grad student or #; instructor permission required for second enrollment in course

CSPH 5115. Cultural Knowledge, Health, and Contemporary Cultural Communities. (3 cr; Stdnt Opt. Prereq.—Jr or sr or grad student or #)
How personal cultural experience affects one’s view of health, illness, and healing and one’s professional practice. Wisdom of cultural communities. Cultural construct underpinning the medical system. Role of culture in interaction between practitioner and patient. Reconnecting to cultural heritage in healing.

CSPH 5201. Spirituality and Resilience. (2 cr; Stdnt Opt. Prereq.—Jr or sr or grad student or #)
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. (2-3 cr; max 3 cr; A-F or Aud. Prereq.—Jr or sr or grad student or #)
Influence of spirituality upon process of resolving conflict and making peace in intense interpersonal/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 5215. Forgiveness and Healing: A Journey Toward Wholeness. (3 cr; Stdnt Opt. Prereq.—Jr or sr or grad student or #)
Impact of forgiveness on process of inter/intra-personal healing. Forgiveness/healing in health care and social work settings from multiple spiritual/sectarian traditions.

CSPH 5221. Significant Spiritual Texts of the 20th Century. (3 cr; Stdnt Opt. Prereq.—Jr or sr or grad student or #)
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 cr; Stdnt Opt. 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 cr; Stdnt Opt. 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, mind, brain, and universe. Mind-body interactions in health. “Hard problem” of emergence of consciousness in brain science. Emergence of compassion, wisdom, and healing in non-discursive awareness.

CSPH 5301. Cultures, Faith Traditions, and Health Care. (2 cr; A-F or Aud. Prereq.—Jr or sr or grad student or #)
Culturally/spiritually based health care practices of selected native/immigrant populations in Minnesota. Clinical implications. Personal/professional conflicts for delivery of competent care to diverse groups by those trained in Western health care.

CSPH 5311. Introduction to Traditional Chinese Medicine. (2 cr; A-F or Aud. Prereq.—Jr or sr or grad student or #)
Philosophical roots of Shamanism, Confucianism, Taoism, and Buddhism. Influence of these philosophies on Chinese medicine. Evolution of concepts of the tai, 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 5315. Traditional Tibetan Medicine: Ethics, Spirituality, and Healing. (2 cr; Stdnt Opt. Prereq.—Jr or sr or grad 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 cr; Stdnt Opt)
Students test claim that systematic yoga practice leads to optimal health. Yoga’s philosophy, scientific evidence, practical application. Students propose research-based programs for integrating yoga into personal/professional life.

CSPH 5318. Tibetan Medicine, Ayurveda, and Yoga in India. (4 cr Prereq—[5315, 5317] or #)
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 cr; Stdnt Opt. + INMD 7567. Prereq.—Jr or sr or grad student or #)
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 cr; Stdnt Opt. Prereq.—Jr or sr or grad student or #)
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 cr; S-N or Aud. Prereq.—Jr or sr or grad student or #)
3 2-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: Amazonia Plant Spirit Medicine. (2 cr; S-N or Aud. 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 5401. People, Plants, and Drugs: Introduction to Ethnopharmacology. (3 cr; Stdnt Opt. Prereq=Jr or sr or grad student or #) 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 cr; Stdnt Opt. Prereq=Jr or sr or grad student or #) Twelve-semester, intensive course. Introduction to ethno-botany/ethnopharmacology. Lectures, field trips, presentations by local experts.


CSPH 5421. Botanical Medicines in Complementary Healthcare. (3 cr; Stdnt Opt. Prereq=Jr or sr or grad student or #) 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 cr; Stdnt Opt. Prereq=Jr or sr or grad student 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 optimal health. Emphasizes importance of nutrition as a component of self-care.


CSPH 5505. Foundations of Homeopathic Practice. (1 cr; S-N only. Prereq=Jr or sr or grad student) designed for students in health sciences or practicing health professionals) Homeopathic philosophy, core principles, homeopathic materia medica. Review of research on utilization/efficacy of homeopathy. How to use common homeopathic remedies in acute situations. When/how to refer patients for homeopathic treatment. Issues of co-management with allopathic health care providers.

CSPH 5511. Interdisciplinary Palliative Care: An Experiential Intensive in a Community Setting. (2 cr; Stdnt Opt. Prereq=Jr or sr or grad student) 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. (5 cr; Stdnt Opt. Prereq=Jr or sr or grad student) in health sciences or therapeutic recreation or horticulture or landscape architecture) or health professional or #) 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 cr; Stdnt Opt. Prereq-S5101 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 cr) 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 cr; Stdnt Opt. Prereq=Jr or sr or grad student or #) 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 cr; S-N only. Prereq=Jr or sr or grad student or #) 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 cr; S-N only. Prereq=5535, #) 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 cr; Stdnt Opt. Prereq=Jr or sr or grad student or #) Experiential 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 cr; A-F or Aud. 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 cr; Stdnt Opt. 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 approaches. Demonstrations of techniques. Application of techniques to specific populations/settings.


CSPH 5611. Healthy Humor. (1 cr; Stdnt Opt. 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.


Chemistry (CHEM)

For definitions of course numbers, symbols, and abbreviations, see page 214.
CHEM 5502. Introduction to Quantum Mechanics and Spectroscopy. (3 cr; A-F or Aud. Prereq–[CHEM 2022 or MATH 2265 or MATH 2267 or MATH 2269 or MATH 2265 or MATH 2374] or [PHYS 1302 or PHYS 1402]) Microscopic descriptions of chemical systems. Quantum theory of applications to atomic/molecular structure. Molecular spectroscopy. Quantum statistical mechanics. Discussion of solutions to several differential equations.


CHEM 5755. X-Ray Crystallography. (4 cr; A-F or Aud. Prereq–Chem grad student or #) 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 solution, generation of publication materials, use of Cambridge Crystallographic Structure Database.


CHEM 8025. Introduction to Graduate Research. (1-2 cr [max 2 cr]; A-F or Aud. Prereq–Grad student in chem) New area 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 cr; S-N or Aud. Prereq–Chem grad student) Builds sensitivity to ethical issues in chemical research. Readings/case studies, small-group/large-group discussion, synthesizing comments from instructors/guests/panels having special expertise. Weekly seminar.

CHEM 8081. M.S. Plan B Project I. (1-4 cr [max 4 cr]; A-F or Aud. Prereq–Grad chem major) Satisfies project requirement for Plan B master’s degree. May apply 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. (1-4 cr [max 4 cr]; A-F or Aud. Prereq–Grad chem major) 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 8152. Analytical Spectroscopy. (4 cr; Stdt Opt. Prereq–grad chem major or #) 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 cr; A-F or Aud. Prereq–[4101 or equiv]) Differential equations course) 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 cr; Stdt Opt. Prereq–Chem grad student or #) Thermodynamics/kinetics of electron/ion transfer, electric double layer, mass transfer by diffusion/migration. Ion-selective potentiometry, chromoanometry, chronocoulometry, cyclic voltammetry, pulse voltammetry, ion-transfer voltammetry, impedance spectroscopy, bioelectroanalysis, rotating disk electrodes, microelectrodes, chemically modified electrodes. Scanning electrochemical microscopy, EC-STM, quartz crystal microbalance.


CHEM 8159. Nuclear Magnetic Resonance Spectroscopy. (4 cr; Stdt Opt. Prereq–Sem of organic chem) Detailed understanding of relaxation processes, chemical exchange, quadrupolar effects, N0, 2NMR, NMR hardware, and solid state NMR. NMR imaging and Pulsed Field Gradient (PGF) NMR are discussed.

CHEM 8180. Special Topics in Analytical Chemistry. (2-4 cr [max 4 cr]; Stdt Opt. Prereq–Grad chem major or #) Topics (and availability) vary by year depending on instructor and development of the field.


CHEM 8221. Synthetic Polymer Chemistry. (4 cr; Stdt Opt. =CHEM 8221; MATS 8221. Prereq–[MATS 8211 or MATS 8221]. Prereq–[Undergraduate organic chemistry course, undergrad physical chemistry course] or #) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain configuration, solution thermodynamics, molecular weight characterization, physical properties.

CHEM 8280. Special Topics in Materials Chemistry. (2-4 cr [max 4 cr]; Stdt Opt. Prereq–Grad chem major or #) Topics (and availability) vary by year depending on instructor and development of the field.

CHEM 8315. Organic Synthesis. (4 cr; Stdt Opt. Prereq–2302 or equiv) Core course; fundamental concepts, reactions, reagents, structural and stereochemical issues, and mechanistic skills necessary for understanding organic chemistry.

CHEM 8322. Advanced Organic Chemistry. (4 cr; Stdt Opt. Prereq–2302 or equiv) Modern studies. Topics, which vary by year, include natural products, heterocycles, asymmetric synthesis, organometallic chemistry, and polymer chemistry.

CHEM 8333. FTE: Master’s. (1 cr; No grade. Prereq–[Master’s student, adviser and DGS consent])


CHEM 8380. Special Topics in Organic Chemistry. (2-4 cr [max 4 cr]; Stdt Opt. Prereq–Grad chem major or #) Topics (and availability) vary by year depending on instructor and development of the field.

CHEM 8411. Introduction to Chemical Biology. (4 cr; Stdt Opt. Prereq–2302 or equiv) 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 8480. Special Topics in Biological Chemistry. (2-4 cr [max 4 cr]; Stdnt Opt. Prereq-Grad chem major or #) Topics (and availability) vary by year, depending on instructor and development of the field.

CHEM 8541. Dynamics. (4 cr; Stdnt Opt. = CHEM 5541. Prereq-Undergrad physical chem course) Mathematical methods for physical chemistry. Classical mechanics/dynamics, normal modes of vibration. Special topics such as rotational motion, Langevin equation, Brownian motion, time correlation functions, collision theory, cross sections, energy transfer, molecular forces, potential energy surfaces, classical electrodynamics, Shannon entropy.


CHEM 8580. Special Topics in Physical Chemistry. (2-4 cr [max 4 cr]; Stdnt Opt. Prereq-grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.

CHEM 8601. Seminar: Modern Problems in Chemistry. (1 cr; S-N or Aud. Prereq-grad chem major or #) Weekly seminar series on modern chemical topics.

CHEM 8602. Seminar Presentation: Modern Problems in Chemistry. (1 cr; A-F or Aud. Prereq-grad chem major or #) Weekly seminar series on modern chemical topics presented by students.

CHEM 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]); No grade. 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


CHEM 8715. Physical Inorganic Chemistry. (4 cr; Stdnt Opt. Prereq-4701 or equiv, grad chem major or #) Physical methods and concepts applied to inorganic and organometallic systems, including many of the following methods: NMR, IR, UV-VIS, ESR, M"{o}ssbauer and mass spectroscopy, magnetic measurements, X-ray diffraction.

CHEM 8725. Organometallic Chemistry. (4 cr; Stdnt Opt. 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 homogenous catalytic reagents in organic and inorganic systems.

CHEM 8735. Bioinorganic Chemistry. (4 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq-8715, grad chem major or #) Survey of topics in main group and transition metal chemistry; emphasizes synthesis, structure, physical properties, and chemical reactivity.

CHEM 8777. Thesis Credits: Master's. (1-16 cr [max 50 cr]; No grade. Prereq-Max 16 cr per semester or summer; 10 cr total required [Plan A only])

CHEM 8780. Special Topics in Inorganic Chemistry. (2-4 cr [max 4 cr]; Stdnt Opt. 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. (2-4 cr [max 4 cr]; Stdnt Opt. Prereq-Grad chem major or #) Topics (and availability) vary depending on instructor and development of the field.

CHEM 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

CHIC 5993. Directed Studies. (1-3 cr [max 16 cr]; Stdnt Opt. Prereq-#) Guided individual reading, research, and study for completion of the requirements for a senior paper or honors thesis.

Child and Adolescent Psychiatry (CAPY)

Department of Psychiatry

Medical School


CAPY 5629. Treatments for Children and Adolescents With ADHD and Disruptive Behavior Disorders. (1 cr; S-N only) Mechanisms, treatments. Behavioral management, cognitive-behavioral therapy, classroom accommodations, social skills training, coaching, pharmacological management.


CAPY 5632. Workshop: Competence Enhancement Training Programs for Children with Disruptive Behavior. (1 cr; Stdnt Opt)


CAPY 5634. Workshop: Developmental Dyslexia: Theory, Research, and Clinical Differentiation. (1 cr; Stdnt Opt)


CAPY 5636. Workshop: Disruptive Behavioral Disorders III. (1 cr; Stdnt Opt)

CAPY 5637. Workshop: Prevention Science II. (1 cr; Stdnt Opt)

CAPY 5639. Workshop: Behavior Problems in Preschool Children. (1 cr; Stdnt Opt)

CAPY 5641. Workshop: Prevention Science I--Risk Factors, Protective Factors, and Models of Disorder. (1 cr; Stdnt Opt)


CAPY 5645. Workshop: Innovative Methods in Psychotherapy. (1 cr; Stdnt Opt)

CAPY 5646. Workshop: Methods of Measurement and Assessment in Psychopathology. (1 cr; Stdnt Opt)

CAPY 5647. Workshop: Prevention Science III. (1 cr; Stdnt Opt) Behaviors/mechanisms related to peer rejection. Social skills interventions for promoting positive relationships and for building meaningful friendships.

CAPY 5648. Workshop: Prevention Science IV. (1 cr; Stdnt Opt)

CAPY 5649. Workshop: Personality and Social Development. (3 cr; Stdnt Opt)


CAPY 5653. Introduction to Play Therapy. (1 cr; S-N only) Play explored from normal developmental perspective. Play as a powerful modality in treatment of mental health problems in children and in families. Play Therapy with adults. Case Studies, group participation.

CAPY 5654. Summer Practicum in Prevention Science II: Building Friendships and Peer Relationship Skills. (1 cr; A-F or Aud. Prereq—#) Behaviors/mechanisms related to peer rejection. Social skills interventions for promoting positive relationships and building meaningful friendships. Assignment worked out with instructor. Final exam.

CAPY 5660. ADHD Throughout the Life Span: Perspectives on Diagnosis, Assessment, and Developmental Course. (1 cr; Stdnt Opt. =CAPY 5620; CAPY 5669. Prereq—Upper div) 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 5671. Suicide Prevention: Examining What Interventions May Alter Suicide Risk. (1 cr; Stdnt Opt) Suicide is examined from a range of perspectives by understanding differences across sex, development, and culture. Suicide prevention techniques are discussed and controversies in the field will be highlighted. Group participation is encouraged.

CAPY 5672. Children’s Exposure to Domestic Violence: Effects on Child Functioning, Treatment Implications. (1 cr; S-N only) Effects of exposure to domestic violence in context of development, from infancy to late adolescence. Assessment strategies, best practices in intervention/prevention for vulnerable children and adolescents. Multidisciplinary approaches to working with children exposed to violence (e.g., judicial, medical, law enforcement partnerships).

CAPY 5673. Prevention Programming: Learning the Skills to Implement a Preventive Intervention. (1 cr; Stdnt Opt) Early intervention to reduce antisocial and risk-taking behaviors (e.g., suicide, unsafe sex) in teenagers. “Early Riser Skills for Success” program as model for teaching techniques of early prevention. Social/emotional skill training, academic enrichment, monitoring/mentoring, behavioral management techniques group settings, techniques to support/educate parents of a risk children.


Child Psychology (CPSY) Institute of Child Development

College of Education and Human Development

CPSY 5251. Social and Philosophical Foundations of Early Childhood Education. (3 cr; A-F only. Prereq—[MED student in ECE or ECSE] or #) Surveys imagery, history, philosophy, and psychology of early childhood education. Analyzing/interpreting trends in early education, including diversity, special needs, legislation, public policy, and educationally appropriate practice.

CPSY 5252. Facilitating Social and Physical Learning in Early Childhood Education. (1 cr; A-F only. Prereq—Student in early childhood ed or early childhood special ed) Current theoretical/empirical literature and developmental knowledge as basis for planning, implementing, and evaluating social/physical growth/development of young children. For students obtaining ECE/ECSE licensure.

CPSY 5253. Facilitating Cognitive and Creative Learning in Early Childhood Education. (1 cr; A-F only. Prereq—MED student in early childhood ed or early childhood special ed, or #) Overview of cognitive, creative, 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 5281. Student Teaching in Early Childhood Education. (3 cr; max 6 cr; S-N or Aud. Prereq—MED student in early childhood ed or early childhood special ed) Application of theory/research relating to teaching preschool children. For individuals obtaining ECE licensure.

CPSY 5413. Early Childhood and Public Policy. (3 cr; Stdnt Opt) State, federal, and international policies and legislative activity touching first five years of a child’s life. Family, community, and institutional roles in promoting children’s social, cognitive, and emotional development. Issues related to health, mental health, poverty, developmental delays, and special needs.

CPSY 5414. Individualized Learning Experience in Early Childhood and Public Policy. (1-3 cr [max 5 cr]; Stdnt Opt. Prereq—Early Childhood Policy Certificate student) # 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 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) History, theory, research, concepts, and issues in infant mental health. Issues pertinent to difficulties in development. Readings, visual material. Expert guest lectures.


CPSY 5506. Infant Observation Seminar I. (1 cr Prereq-[5501]) How an infant develops in context of family relationships over a 9-12 month period. Students observe an infant for one hour a week, write a narrative, and discuss observations.

CPSY 5508. Infant Observation Seminar II. (1 cr Prereq-[5506]) 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 cr Prereq-[5506]) 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 cr; Stdnt Opt. Prereq-[Baccalaureate degree in early-childhood-related field from accredited U.S. institution or documented equiv], [experience in early childhood research or practice]) 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 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]) 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 cr; A-F only. Prereq-[5501, 5503, 5506, 5508]) 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 cr; A-F only. Prereq-[5518]) Students design prevention/intervention programs and apply evidence-based strategies in workplace/practicum settings. Readings, in-class reflective practice groups.

CPSY 5523. Reflective Supervision in Infant and Early Childhood Mental Health: Community-based. (1 cr; S-N only. Prereq-[5518 or 5521]) Principles/strategies of reflective supervision consultation. Discussion, final assignment designated by instructor.
Civil Engineering (CE)

Department of Civil Engineering

Institute of Technology

CE 5094. Civil Engineering Research. (1-4 cr [max 4 cr]; Stdt Opt. Prereq-#) Research or independent study in concrete, structural steel, soils, hydraulics, hydrology/municipal, environmental, or transportation problems. Investigations, reports, tests, designs.

CE 5170. Internet Based Study. (1-5 cr [max 15]; A-F or Aud. Prereq. Upper div IT or grad) Internet based teaching with bi-weekly exercises on topic of concern.

CE 5180. Special Topics. (1-4 cr [max 4 cr]; A-F or Aud. Prereq-#) Topics vary depending on faculty and student interests.

Course Descriptions

CHN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

CHM 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq.-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

CHM 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq.-Max 18 cr per semester or summer; 24 cr required)

CE 5311. Experimental Geomechanics. (3 cr; A-F or Aud. +GEOE 5311. Prereq. Upper div IT or grad, 4301. GEOE 4301 or #) Machine stiffness, closed-loop testing. Small-strain theory. Measurement of deformation: strain gages, LVDTs, accelerometers, and associated circuits. Direct and indirect testing of materials in uniaxial, triaxial, and fluid-filled solids.


CE 5331. Geomechanics Modeling. (3 cr; A-F or Aud. +GEOE 5331. Prereq.-Upper div IT or grad, 4301 or #) Soil and rock response in triaxial testing; drained and undrained behavior; elastic and plastic properties. Modeling stresses, strains, and failure in geomechanics problems.

CE 5341. Wave Methods for Nondestructive Testing. (4 cr; A-F or Aud. Prereq. [AEM 2021, AEM 3031] or #) Introduction to contemporary methods for nondestructive characterization of objects of civil engineering (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 cr; A-F or Aud. 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 cr; A-F or Aud. Prereq. [Grade of at least C- in 4401, upper div IT or grad student]] or #) Principal stresses and failure criteria in 3 dimensions. Introduction to plasticity, strain energy methods, torsion of beams, and bending of unsymmetrical beams.

CE 5541. Environmental Water Chemistry. (3 cr [max 4 cr]; A-F or Aud. Prereq. 3501, Chem 1021, Chem 1022) 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 cr; A-F or Aud. Prereq. [upper div IT or grad student] or #) 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 5551. Environmental Microbiology. (3 cr; A-F or Aud. Prereq. [Upper div IT or grad student]) Role of microorganisms in environmental bioremediation, pollution control, water/wastewater treatment, biosensors, and biofilm control. Lecture.

CE 5552. Environmental Microbiology Laboratory. (1 cr; A-F only. Prereq. 5551 or #) Basic microbiological techniques: isolation, identification, experimental design, BOD, biodegradable kinetics, disinfection. Lab.

CE 5581. Water Resources: Individuals and Institutions. (3 cr; A-F or Aud. Prereq-#) Control of water resources by natural system functions, user actions. Influence of social, economic, and political institutions. Water resource policy in the United States. Case studies (e.g., flood/drought management).

CE 8022. Numerical Methods for Free and Moving Boundary Problems. (3 cr; A-F or Aud. Prereq-#) 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. (1-4 cr [max 12 cr]; Stdt Opt. Prereq-#) Research or independent study in concrete, structural steel, soils, hydraulics, hydrology, and municipal, environmental, or transportation problems. Investigations, reports, designs, or Aud. Prereq-#)

CE 8200. Seminar: Transportation. (1 cr [max 3 cr]; S-N or Aud) 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 cr; A-F or Aud) 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 cr; Stdt Opt. Prereq. 8211 or equiv, Stat 3021) Application of random utility theory to model travel demand; deterministic and stochastic trip assignment; network design problems; transportation planning software.

CE 8213. Advanced Transportation Technologies Seminar. (1 cr; S-N or Aud. +ME 8772) Advantaged techniques specifically related to transportation. Topics drawn from core science/technology areas of human factors, intelligent vehicles, traffic modeling/management, sensing, communications, and controls.


CE 8215. Transportation Data Analysis. (3 cr; Stdt Opt. Prereq.-8210 or 8211, [Stat 3021 or equiv]) 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 cr; Stdnt Opt.)
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 using computer program packages in traffic engineering practice. Freeway operations/ control.

CE 8217. Transportation Network Analysis. (4 cr; A-F only)

CE 8231. Advanced Pavement Engineering. (3 cr; Stdnt Opt. Prereq. 4231 or #)
Advanced concepts in pavement analysis and design; computation of stresses and strains in flexible and rigid pavement systems; review of Boussinesq theory, Burmister model, and Westgaard model; load transfer in rigid pavements; temperature induced stresses; mechanics of drainage.

CE 8233. Advanced Bituminous Materials Characterization. (3 cr; Stdnt Opt. Prereq. [3402, grad student] or #)
Applications of viscoelasticity, rheology, elastoplasticity, and fracture mechanics to bituminous materials characterization. Lectures, discussions of advanced research reading assignments, laboratory assignments.

CE 8300. Seminar: Geomechanics. (1-3 cr [max 4 cr]; S-N or Aud. +GEOE 8300)
Presentations on various topics.

CE 8301. Fracture of Geomaterials. (3 cr; A-F or Aud. +GEOE 8301. Prereq.-IT grad student, 5321, GeoE 5321 or #)

CE 8302. Soil/Rock Plasticity and Limit Analysis. (4 cr; A-F or Aud. +GEOE 8302. Prereq.-IT grad student, CE 4500 or #)

CE 8311. Advanced Rock Mechanics. (3 cr; A-F or Aud. +GEOE 8311. Prereq.-IT grad student, 4311 or GeoE 4311 or #)

CE 8321. Thermoporomechanics. (4 cr; A-F or Aud. +GEOE 8321. Prereq.-IT grad student, 5321 or GeoE 5321 or #)

CE 8322. Storage and Flow of Granular Materials. (3 cr; A-F or Aud. +GEOE 8322. Prereq.-IT grad student, 4301 or #)

CE 8331. Modeling Geomechanical Processes. (3 cr; A-F or Aud. +GEOE 8331. Prereq.-IT grad student, 5321 or GeoE 5321)

CE 8333. FTE: Master’s. (1 cr; No grade. Prereq.-Master’s student, adviser and DGS consent)

CE 8336. Boundary Element Methods I. (3 cr; A-F or Aud. +GEOE 8336. Prereq.-IT grad student)
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 cr; A-F or Aud. +GEOE 8337. Prereq.-IT grad student or #)
Transient and nonlinear problems.

CE 8341. Dynamics of Soils and Foundations. (4 cr: A-F or Aud. Prereq.-Basic courses in soil mechanics/dynamics or #)

CE 8351. Advanced Groundwater Mechanics I. (5 cr; A-F or Aud. +GEOE 8351. Prereq.-IT grad student, 4311 or GeoE 4311 or #)
Solute transport; shallow flow in leaky aquifers; complex variable methods in groundwater flow. Analytic element method: potentials for line sinks, line doublets, line dipoles, area sinks, and special analytic elements; singular Cauchy integrals; analytic elements in domains with closed boundaries.

CE 8352. Advanced Groundwater Mechanics II. (3 cr; A-F or Aud. +GEOE 8352. Prereq.-IT grad student or #)
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 cr; A-F or Aud. +GEOE 8361. Prereq.-IT grad student or #)
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. (1-3 cr [max 3 cr]; S-N or Aud.)
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 cr; A-F or Aud. Prereq.-4411 or #) Elements of calculus of variations; weak and strong formulations of linear continuum and structural problems. Isoparametric and numerical integration. Basic concepts of error analysis and convergence. Analysis of plates and shells. Introduction to mixed methods and time dependent problems.


CE 8411. Plate Structures. (3 cr; A-F or Aud. Prereq.-5411 or #; offered alt yrs)

CE 8412. Shell Structures. (3 cr; A-F or Aud. Prereq.-IT grad or #)

CE 8421. Structural Dynamics. (3 cr; A-F or Aud. Prereq.-3401, AEM 2012 or #; 8411 recommended)

CE 8422. Earthquake Engineering. (3 cr; A-F or Aud. Prereq.-8421 or #)
Introduction to earthquake engineering; response spectra; energy absorption capacity of structures; earthquake resistant design; seismic design codes; base isolation; soil-structure interaction. Blast resistant design. Wind effects on structures.

CE 8431. Structural Stability. (3 cr; A-F or Aud. Prereq.-8431 or #)
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 cr; A-F or Aud. 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 melastic material behavior on buckling.

CE 8441. Ductile Behavior of Steel Structures. (3 cr; A-F or Aud. Prereq.-4441 or equiv)

CE 8442. Nonlinear Analysis of Structural Systems. (3 cr; A-F or Aud. Prereq.-4441, 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 cr; A-F or Aud. Prereq.-4401 or #)

CE 8444. FTE: Doctoral. (1 cr; No grade. Prereq.-Doctoral student, adviser and DGS consent)
Course Descriptions

CE 8451. Behavior of Reinforced Concrete Structures. (3 cr; A-F or Aud. Prereq—4412 or #) 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 8490. Special Topics. (1-4 cr max 8 cr; A-F or Aud. Prereq—#) Topics vary depending on faculty and student interests.

CE 8500. Environmental Seminar. (1 cr max 3 cr; S-N or Aud. Prereq—Grad CE major or #) 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 8503. Environmental Mass Transport. (4 cr; A-F or Aud. Prereq—3502, 3501 or equiv or #) Principles of interphase and interface chemical transport and fate in the environment, specifically the processes of diffusion, dispersion, and convection. Application to surface water and atmospheric mixing, dispersion in groundwater, and transport between these media.

CE 8504. Theory of Unit Operations. (4 cr; A-F or Aud. Prereq—4541, 4531) Theoretical basis, design, and operation of chemical and physical processes used in treating and controlling water quality, including adsorption, ion exchange, sedimentation, thickening, filtration, gas transfer, coagulation, flocculation, membrane processes, and disinfection.

CE 8505. Biological Processes. (3 cr; A-F or Aud. Prereq—4502, 5501 or #) 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 cr; A-F or Aud. 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 8521. The Atmospheric Boundary Layer. (4 cr; A-F or Aud. Prereq—IT or COAFES grad student or #) 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 and field measurements. Flow over homogeneous and heterogeneous surfaces. Atmospheric stability, measurement, simulation of turbulent fluxes.

CE 8541. Aquatic Chemistry. (3 cr; A-F or Aud. Prereq—4541 or #) Advanced course on water chemistry; physical chemical principles and geochemical properties 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 8551. Environmental Microbiology: Molecular Theory and Methods. (4 cr; A-F or Aud) Introduction to microbial genetics and molecular phylogeny. Application of nucleic-acid techniques in environmental microbiology and microbial ecology.

CE 8552. Groundwater Microbiology: Laboratory. (4 cr; A-F or Aud. Prereq—Grad CE major or #, exposure to basic environ eng and microbial) Subsurface microbial ecology, biogeochemical cycling, metabolic classification of subsurface bacteria, modeling bacterial transport, diagnosis of microbial induced fouling (MIF) events, bio remediation of contaminated aquifers. Lectures and four lab hours per week.


CE 8562. Analysis and Modeling of Aquatic Environments II. (3 cr max 6 cr; Stdhnt Opt. Prereq—One sem grad work or #) Models for transport/transformation of pollutants, nutrients, particulates, ecosystems, etc., from recently completed theses, articles, or research in progress. Students review assigned recent papers, make presentations, and analyze a topic of their choice.

CE 8563. Industrial Waste Treatment. (3 cr; A-F or Aud. Prereq—3502 or #) Lab and field methods and instruments for measuring hydraulic pressure, velocity, and discharge.

CE 8572. Computational Environmental Fluid Dynamics. (4 cr; A-F or Aud. Prereq—grad student in IT or COAFES or #) 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. (3 cr; S-N or Aud. +WRS 8581. Prereq—[Environmental engineering or water resource science] grad student or #) 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 cr; A-F or Aud) 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 cr; S-N only. +EEB 8602, GEO 8602. Prereq—8601 or Geo 8601) 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. (1-6 cr max 12 cr) No grade. 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.)
Course Descriptions

**CNES 5940. Topics in Classical Literature.** (3 cr [max 9 cr]; Stdt Opt. Prereq-Two literature courses or #) Additional work for graduate credit. Topics specified in Class Schedule. Meets with 3940.


**CNES 5993. Directed Studies.** (1-4 cr [max 12 cr]; Stdt Opt. Prereq-, %, @) Guided individual research or study.

**CNES 5994. Directed Research.** (1-12 cr [max 12 cr]; Stdt Opt. Prereq-, %, @) Guided individual research.

**CNES 8100. Seminar: Issues in Ancient Art and Archaeology.** (3 cr [max 12 cr]; Stdt Opt. +ARTH 8190) Selected issues, with special attention to current scholarly disputes. Topics specified in [Class Schedule].

**CNES 8333. FTE: Master’s.** (1 cr; No grade. Prereq-Master’s% student, adviser and DGS consent)

**CNES 8444. FTE: Doctoral.** (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

**CNES 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. 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)

**CNES 8777. Thesis Credits: Master’s.** (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required (Plan A only))


**CNES 8888. Thesis Credits: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

**CNES 8950. Topics in Classical & Near Eastern Studies.** (3 cr [max 12 cr]; Stdt Opt) Topics such as slavery, women in antiquity, pagans and Jews, the taboo, and modern study of myth.

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**Clinical Laboratory Science (CLS)**

**Department of Laboratory Medicine and Pathology Medical School**

**CLS 5090. Special Laboratory Methods.** (1-2 cr [max 2 cr]; A-F or Aud. Prereq-) Assignment on an individual basis to one of a variety of special areas of experience in the clinical lab.

**CLS 5102. Techniques of Diagnostic Microbiology.** (2 cr; A-F only. +MEDT 4102. Prereq-) Techniques used in lab diagnosis of infectious disease. Isolating/identifying bacteria/yeast. Antimicrobial susceptibility testing. Lecture.

**CLS 5103. Diagnostic Microbiology: Laboratory.** (2 cr; A-F only. Prereq-One microbiology course with lab, one biochemistry course, #) Techniques used in lab diagnosis of infectious disease. Isolating/identifying bacteria/yeast. Antimicrobial susceptibility testing. Lab

**CLS 5120. Seminar: Clinical Laboratory Science.** (1 cr [max 3 cr]; S-N or Aud. Prereq-#) Current literature. Presentation/discussion of research.

**CLS 5121. Journal Presentations.** (1 cr [max 2 cr]; S-N or Aud. Prereq-CLS 5090) Critical analysis, evaluation, discussion of current journal articles in student’s specialty area.

**CLS 5125. Practicum Teaching.** (1-2 cr [max 2 cr]; A-F or Aud. Prereq-) Supervised teaching experience, develop skills using instructional materials, tests, and measurements.

**CLS 5129. Elements of Laboratory Administration.** (2 cr; A-F or Aud. Prereq-) 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 cr; A-F or Aud. Prereq-) Supervised experience and assignment of specific problems related to lab service and management in health care institutions.

**CLS 5140. Techniques for Teaching.** (2 cr; A-F or Aud. Prereq-) Developing objectives, classroom activities, and evaluation criteria for medical technology education.

**CLS 5165. Advanced Clinical Immunohematology.** (3 cr; A-F or Aud. Prereq-) Observation, study, and practice in special problems, advanced techniques, and methodology.

**CLS 5201. Hematology I: Basic Techniques.** (3 cr; A-F only. Prereq-#) Theory/application of basic principles in clinical Hematology. Lecture, lab.

**CLS 5202. Hematology II.** (3 cr; A-F only. Prereq-5201 or CLSP 4201 or #) Fundamentals of examining blood and bone marrow. Identification of normal, immature, and abnormal cells. Correlation of clinical and lab findings. Lecture, lab.

**CLS 5203. Hemostasis.** (1 cr; A-F only. Prereq-5201 or CLSP 4201 or #) Theory/application of concepts/techniques in hemostasis/coagulation. Lecture online, lab.

**CLS 5301. Urinalysis.** (1 cr; A-F only. Prereq-#) Procedures for physical, chemical, and microscopic examination of urine. Lecture, lab.

**CLS 5302. Clinical Chemistry I: Lecture and Lab.** (3 cr; A-F only. Prereq-Two organic chem courses with lab, one biochem course, #) Principles/theory of clinical chemistry. Assessing renal/metabolic disease/dysfunction, electrolyte/acid-base quality management. Lecture, online, lab.

**CLS 5304. Clinical Chemistry II: Lecture.** (2 cr; A-F only. Prereq-[4502 or 5502], two organic chem courses with lab, one biochem course, #) Principles/application of clinical chemistry. Correlation of clinical lab findings.

**CLS 5305. Clinical Chemistry II: Laboratory.** (2 cr; A-F only. Prereq-[4502 or 5502], two organic chem courses with lab, one biochem course, #) Principles/application of lab procedures in clinical chemistry.

**CLS 5402. Molecular Diagnostics.** (1 cr; A-F only. Prereq-#) Basic theory/application of molecular diagnostics in clinical lab. Lecture, lab.

**CLS 5501. Introduction to Transfusion Medicine.** (2 cr; A-F only. Prereq-#) Principles of blood grouping, antibody identification, compatibility testing, and donor testing.

**CLS 5502. Introduction to Transfusion Medicine: Laboratory.** (2 cr; A-F only. Prereq-#) Exercises illustrating basic techniques in blood grouping, antibody identification, compatibility testing, and donor testing.

**CLS 5601. Management and Professional Issues.** (2 cr; A-F only. Prereq-#) Basic concepts in professional issues/management as applied to clinical lab.

**CLS 5602. Basic Concepts in Education and Research as Applied to the Clinical Laboratory..** (1 cr; A-F only. Prereq-#)

**CLS 5768. Advanced Hematology.** (5-10 cr [max 30 cr]; A-F or Aud. Prereq-#) 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 cr [max 10 cr]; S-N or Aud. Prereq-#) Departmental research seminar series.

**CLS 5865. Departmental Seminar.** (1 cr [max 10 cr]; S-N or Aud. Prereq-#) Departmental clinical lab research seminar series.

**CLS 8193. Advanced Topics in Clinical Chemistry.** (2 cr; Stdt Opt. Prereq-#) Includes use of molecular approaches to diagnosis and risk assessment of selected diseases.

**CLS 8194. Research on Clinical Laboratory Problems.** (1-3 cr [max 3 cr]; Stdt Opt. Prereq-#) Individual research project in a selected area.

**CLS 8293. Educational Administration in Medical Technology.** (2 cr; Stdt Opt. Prereq-#) 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.
Cognitive Science (CGSC)

College of Liberal Arts

CGSC 8000. Seminar: Philosophy of the Cognitive Sciences. (3 cr; max 6 cr); Stdnt Opt. 
Graduate level, and open to students with permission of the instructor. 
Prereq: Philosophy 4000, or permission of the instructor. 
This course introduces students to the major philosophical issues in the philosophy of cognitive science, with a focus on the relationship between the mind and the brain. 

CGSC 8231. Critical Communication Studies: History, Theory, Method. (3 cr; Stdnt Opt) 
Prereq: CGSC 8211 or permission of the instructor. 
This course provides an overview of the development of critical communication studies, including key theoretical and methodological frameworks. 

Communication Studies (COMM)

Department of Communication Studies

College of Liberal Arts

COMM 5110. Seminar: Advanced Speech Problems. (3 cr; max 15 cr); Stdnt Opt. 
Prereq: Undergraduate degree in speech comm or equiv. 
This seminar is designed for advanced students interested in gaining experience in speech communication. 

COMM 5200. Television Genres. (3 cr; Stdnt Opt) 
This course explores the major genres of television programming, including soap operas, situation comedies, and dramas. 

COMM 5220. Television Genres. (3 cr; Stdnt Opt) 
This course examines the historical development of television genres and their influence on contemporary culture. 

COMM 5233W. Electronic Media and National Development. (3 cr; Stdnt Opt) 
This course explores the role of electronic media in shaping national identity and development. 

COMM 5261. Political Economy of Media Culture. (3 cr; Stdnt Opt. Prereq: 5231 or #) 
This course examines the political economy of media culture, focusing on issues of ownership, regulation, and access. 

COMM 5271. Media Historiography. (3 cr; A-F only. Prereq: 5261 or #) 
This course provides an overview of the history of media studies, with a focus on key developments and debates. 

COMM 5401. Advanced Theories of Communication. (3 cr; Stdnt Opt. Prereq: 5401 or grad) 
This course introduces students to advanced theories of communication, with a focus on contemporary perspectives. 

COMM 5402. Advanced Interpersonal Communication. (3 cr; Stdnt Opt. Prereq: 5401 or #) 
This course explores advanced topics in interpersonal communication, including nonverbal communication, conflict resolution, and power dynamics. 

COMM 5404. Language and Culture. (3 cr; Stdnt Opt. Prereq: 5401 or #) 
This course examines the relationship between language and culture, with a focus on linguistic diversity and social identity. 

COMM 5406. Communication and Gender. (3 cr; Stdnt Opt. Prereq: 5401 or #) 
This course explores the role of communication in shaping gender identities and relationships. 

COMM 5411. Communication in Human Organizations. (3 cr; Stdnt Opt. Prereq: 4950 or #) 
This course examines the role of communication in human organizations, with a focus on leadership, teamwork, and conflict resolution. 

COMM 5441W. Intercultural Communication Processes. (3 cr; Stdnt Opt) 
This course explores the complexities of intercultural communication and the challenges of cross-cultural understanding. 

COMM 5461. Conversation Analysis. (3 cr; Stdnt Opt. Prereq: 5461 or #) 
This course provides an introduction to conversation analysis, a linguistic approach to studying social interaction. 

This course examines the historical development of public discourse in the United States, focusing on key periods and events. 

This course continues the examination of public discourse, focusing on the post-World War II period. 

COMM 5930. Directed Study. (1-3 cr; max 6 cr); S-N or Aud. Prereq: Nine 3xxx-5xxx Spch cr, #, @, %, @. 
Guided individual study or reading. 

COMM 5994. Communication Research Practicum. (1-3 cr; max 9 cr); S-N or Aud. Prereq: #. 
Students participate in research group. 

COMM 8110. Seminar: Advanced Speech Problems. (3 cr; max 15 cr); Stdnt Opt. Prereq: Undergraduate degree in speech comm or equiv. 
Evaluation of research methods in speech communication. 

COMM 8210. Seminar: Selected Topics in U.S. Electronic Media. (3 cr; max 6 cr); Stdnt Opt. Prereq: 5210 or #; offereed when and if feasible. Literature survey, evaluating research on topics; conducting independent research project on a particular topic. 

COMM 8211. Critical Communication Studies: History, Theory, Method. (3 cr; Stdnt Opt) 
Prereq: Undergraduate degree in speech comm or equiv. Qualitative research methods for analyzing media institutions, texts, audiences, and contexts. 

Prereq: Undergraduate degree in speech comm or equiv. Historical and contemporary aspects of national and international electronic media systems. Roles of national and international regulatory bodies. Approaches to programming and evidence of effectiveness. 

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

COMM 8333. FTE: Master's. (1 cr; No grade. Prereq–Master's student, adviser and DGS consent)

COMM 8402. Seminar: Interpersonal Communication. (3 cr; Stdnt Opt. Prereq–5402 or #) Evaluate and develop new perspectives for analyzing, diagnosing, and managing interpersonal communication problems.


COMM 8406. Seminar: Language and Gender Research. (3 cr; Stdnt Opt. Prereq–5406) Readings and research on current issues. Data collected to test hypotheses and apply theory.


COMM 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)


COMM 8452. Seminar: Methods of Intercultural/Diversity Facilitation. (3 cr; Stdnt Opt. Prereq–4451 or 5452 recommended) Theories of and techniques for managing effective intercultural communication and diversity. Intercultural training.

COMM 8502. Seminar: Communication Theory Construction. (3 cr; Stdnt Opt. Prereq–5421 or #) Logic of communication theory development and modification from a social scientific perspective. Types of communication theories.

COMM 8503. Historical and Descriptive Research in Speech–Communication. (3 cr; Stdnt Opt) Elements involved in conducting and analyzing historical and descriptive research; approaches to historical research, assessing primary and secondary sources; completing a major research project.

COMM 8504. Seminar: Rhetorical Criticism. (3 cr; Stdnt Opt. Prereq–5615 or #) Rhetorical criticism theories and methods. Rhetoric as applied to literary studies and the growth of hermeneutics as vantage points for reassessing rhetorical methods.

COMM 8606. Seminar: Rhetorical Analysis of Campaigns and Movements. (3 cr; Stdnt Opt. Prereq–5431, 5617 or 5618, 10 cr soc sci or #) Literature and methodology in historical and contemporary rhetorical campaigns and movements.


COMM 8625. Seminar: Communication Ethics. (3 cr; A-F or Aud. Prereq–Ethics course or #) Independent research on communication ethics in interpersonal, group, organizational, intercultural, and media settings. Theories of ethics and methods of analysis.

COMM 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

COMM 8777. Thesis Credits: Master's. (1-18 cr [max 18 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

COMM 8888. Thesis Credit: Doctoral. (1-24 cr [max 24 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

COMM 899A. Directed Research. (1-3 cr [max 6 cr]; S-N or Aud) Supervised research project.

Comparative and Molecular Biosciences (CMB)

College of Veterinary Medicine

CMB 5180. Ecology of Infectious Diseases. (3 cr; A-F only. =PHUB 6180. Prereq–MVMB or CMB or VMEd grad student or #) Ways in which host, agent, and environmental interactions influence transmission of infectious agents. Environmental dissemination, eradication/ control, evolution of virulence, analytical/molecular techniques.

CMB 5200. Statistical Genetics and Genomics. (4 cr; A-F or Aud. =ANSC 5200) 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 5335. Molecular Biotechnology Laboratory for the Novice. (2 cr; S-N only) Five day course. Understanding/applying basic concepts of biotechnology. Lectures, hands-on lab experiments.

CMB 5381. Pathogenesis of Infectious Zoonotic Diseases. (3 cr; A-F only. Prereq–[Microbiology, biochemistry] courses or #) Introduction to mechanisms of transmission/pathogenesis for zoonotic infectious diseases. Lectures, review of current literature, student presentations, written reports.

CMB 5594. Directed Research in Comparative and Molecular Biosciences. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq–Jr) Independent study as determined by instructor. Usual activity includes conduct of research in instructor’s lab.


CMB 8333. FTE: Master's. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

CMB 8355. Molecular Biology Techniques. (3 cr; Stdnt Opt. =ANSC 8131. Prereq–Biol 5001, Biol 5003 or equiv or #) Basic theory and current methodologies of molecular biology and recombinant DNA technology. Lab work includes DNA and RNA hybridization, gene transfer, and polymerase chain reaction techniques. Primarily for students with limited exposure to molecular biology.


CMB 8361. Neuro–Immunne Interactions Intcr. (3 cr; Stdnt Opt. =NSC 8026. PHCL 8026, PSY 8026. Prereq–[MicB 5218 or equiv], [NSC 5561 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 communication. Course is offered fall of even-numbered years.

CMB 8371. Mucosal Immunobiology. (3 cr; A-F or Aud. =MIC 8371, OBIO 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. (1-6 cr [max 18 cr]; Stdnt Opt. Prereq–Grad CMB major) Directed research determined by student’s interests, in consultation with faculty mentor.

COMM 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

COMM 8481. Advanced Neuropharmacologics. (4 cr; A-F or Aud. =NSC 8481. PHM 8481. Prereq–#) 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.
Comparative Studies in Discourse and Society (CSDS)
Department of Cultural Studies and Comparative Literature
College of Liberal Arts
CSDS 5301. Society, Ideology, and the Production of Art. (3 cr; Stdt. Opt. = CSCL 5301) Recent critical theories of relation of arts to social/ideological forces. Selected artifices from Western culture (e.g., Renaissance to 20th century; high, popular, mass culture). Music, visual art, literature.
CSDS 5555. Introduction to Semiotics. (3 cr; Stdt. Opt) 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 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)
CSDS 8384. International Hierarchy. (3 cr; Stdt. Opt = POL 8404) Asymmetric structures and processes of international relations; systemic conditions and implications of informal empire and structures of dependency and hegemony.
CSDS 8404. International Hierarchy. (3 cr; Stdt. Opt = POL 8404) Asymmetric structures and processes of international relations; systemic conditions and implications of informal empire and structures of dependency and hegemony.
Course Descriptions

CSDS 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 16 for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 50 combined cr)
CSDS 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

CSDS 8901. Pedagogy of Cultural Studies and Comparative Literature. (3 cr; Stndt Opt. + CSCI 8901. Prereq–Grad CSDS major)
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 cr [max 2 cr]; S-N only. Prereq–CSDS grad major or #)

CSDS 8910. Advanced Topics in Comparative Studies in Discourse and Society. (3 cr [max 24 cr]; Stndt Opt)
Theories in comparative, sociohistorical analysis of discursive practices. Individually or team taught. Topics vary by instructor and semester.

CSDS 8920. Advanced Topics in Comparative Studies in Discourse and Society. (3 cr [max 15 cr]; Stndt Opt)
Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

CSDS 8955. Directed Study in Comparative Studies in Discourse and Society. (1-4 cr [max 12 cr]; Stndt Opt. Prereq–#)

CSDS 8994. Directed Research in Comparative Studies in Discourse and Society. (1-4 cr [max 4 cr]; Stndt Opt. Prereq–#)

Computer Engineering (CMPE)
Department of Electrical and Computer Engineering
Institute of Technology
CMPE 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)
CMPE 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Computer Science (CSCI)
Department of Computer Science
Institute of Technology
CSCI 5103. Operating Systems. (3 cr; Stndt Opt. Prereq–4061 or #)
Conceptual foundation of operating system designs and implementations. Relationships between operating system structures and machine architectures. UNIX implementation mechanisms as examples.

CSCI 5104. System Modeling and Performance Evaluation. (3 cr; Stndt Opt. Prereq–5103 or #)
Techniques for modeling computing systems for performance evaluation through analytical/simulation techniques. How to model computing systems and communications protocols to evaluate their performance under different operating conditions.

CSCI 5105. Foundations of Modern Operating Systems. (3 cr; Stndt Opt. Prereq–5103 or #)
Advanced concepts that build foundations of modern operating systems. Advanced scheduling algorithms, distributed communication/synchronization, consistency/replication models, security, protection/virtualization, OS architectures.

CSCI 5106. Programming Languages. (3 cr; Stndt Opt. Prereq–4201 or #)
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.

Fluency in C/C++, mastery of basic concepts in linear algebra
Fundamental algorithms in computer graphics. Emphasizes programming projects in C/C++. Scan conversion, hidden surface removal, geometrical transformations, projection, illumination/shading, parametric cubic curves, texture mapping, antialiasing, ray tracing. Developing graphics software, graphics research.

CSCI 5108. Fundamentals of Computer Graphics II. (3 cr; Stndt Opt. Prereq–5107 or #)
Advanced topics in image synthesis, modeling, and rendering. Image processing, image warping, global illumination, nonphotorealistic rendering, texture synthesis. Parametric cubic surfaces, subdivision surfaces, acceleration techniques, advanced texture mapping. Programming is in C/C++.

CSCI 5109. Visualization. (3 cr; Stndt Opt. Prereq–1902, 4041 or equiv or #)
Fundamental theory/practice in data visualization. Emphasizes programming applications. Volume visualization, vector field visualization, information visualization, multivariate visualization, visualization of large datasets, visualization in immersive virtual environments, and perceptual issues in effective data representation. Projects are implemented in C++ using VTK or similar visualization API.

CSCI 5115. User Interface Design, Implementation and Evaluation. (3 cr; Stndt Opt. Prereq–4202 or #)
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 5116. GUI Toolkits and Their Implementation. (3 cr; Stndt Opt. Prereq–5115 or 5107 or #)
Structure and design of user interface toolkits and frameworks. Aspects of GUI toolkits (e.g., window system protocols, event processing, geometry management, resource management, data management, constraints). Course is built around implementation assignments and case studies of toolkits.

CSCI 5125. Collaborative and Social Computing. (3 cr; Stndt Opt. Prereq–5115 or #)
Introduction to computer-supported cooperative work, social computing. Technology, research methods, theory, case studies of group computing systems. Readings, hands-on experience.

CSCI 5131. Advanced Internet Programming. (3 cr; Stndt Opt. + CSCI 4311. Prereq–5106 or #)
Issues in Internet programming: Java programming, concurrent programming, workflow, distributed databases, security, collaborative computing, object-oriented architecture/design, network publishing, messaging architecture, distributed object computing, internets.

CSCI 5143. Real-Time and Embedded Systems. (3 cr; A-F only. Prereq–[4061 or #], experience with C language)
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 cr; Stndt Opt. Prereq–[2011, 5106] or #)
Techniques for translating modern programming languages to intermediate forms or machine-executable instructions, and their organization into compiler. Lexical analysis, syntax analysis, semantic analysis, data flow analysis, code generation. Compiler project for prototypical language.

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 cr; Stndt Opt. + CSCI 4211. Prereq–[4061 or #], basic knowledge of [computer architecture, operating systems, probability], grad student)
Concepts, principles, protocols, and applications of computer networks. Layered network architectures, data link protocols, local area networks, network layer/routing protocols, transport, congestion/flow control, emerging high-speed networks, network programming interfaces, networked applications. Course studies using Ethernet, Token Ring, FDDI, TCP/IP, ATM, Email, HTTP, and WWW.

CSCI 5221. Foundations of Advanced Networking. (3 cr; Stndt Opt. Prereq–4211 or 5211 or equiv; intro course in computer networks recommended)

CSCI 5231. Wireless and Sensor Networks. (3 cr; Stndt Opt. Prereq–4211 or 5211 or #)
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 cr; Stndt Opt. Prereq–4061 or equiv or #)
Concepts of computer, network, and information security. Risk analysis, authentication, access control, security evaluation, audit trails, cryptography, network/database/application security, viruses, firewalls.

CAD for digital systems. Emphasizes VLSI. Hardware description languages, synthesis, simulation, test generation.


CSCI 5403. Computational Complexity. (3 cr; Stdnt Opt. Prereq-4041 or #). Computational models, complexity measures in each model, and related complexity classes.


CSCI 5471. Modern Cryptography. (3 cr; Stdnt Opt. Prereq-[5011, 4041], [familiarity with number theory or finite fields]) or #). 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 5523. Introduction to Data Mining. (3 cr; Stdnt Opt. Prereq-4041 or equiv or #). 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. Classification algorithms (supervised, unsupervised, 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 cr; Stdnt Opt. Prereq-Grad student or #). 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.


CSCI 5551. Introduction to Intelligent Robotic Systems. (3 cr; Stdnt Opt. Prereq-[2031 or #]). Transformations, kinematics/inverse kinematics, dynamics, control (motion/force/touch, task/kinesthetic), applications of sensor-based control, robot programming, mobile robotics, microrobotics.


CSCI 5802. Software Engineering II. (3 cr; Stdnt Opt. Prereq-5801 or #). 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. (1-3 cr [max 9 cr], Stdnt Opt. Prereq-/ may be repeated for cr). Lectures and informal discussions on current topics in computer science.

CSCI 5991. Independent Study. (1-3 cr [max 9 cr], Stdnt Opt. Prereq- may be repeated for cr). Independent study arranged with CS faculty member.

CSCI 5994. Directed Research. (1-3 cr [max 9 cr], Stdnt Opt. Prereq- may be repeated for cr). Directed research arranged with faculty member.

CSCI 5996. Curricular Practical Training. (1 cr [max 3 cr]), S-N or Aud. Prereq-[CSCI or CompE major, #]. 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 cr, A-F only. Prereq-1st yr CS PhD student). 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 cr, A-F only. Prereq-8001, 1st yr CS PhD student). 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 cr; Stdnt Opt. Prereq-5105 or #). 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 cr; Stdnt Opt. Prereq-8101 or #). 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 cr; Stdnt Opt. Prereq–5115 or #) 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 8161, Advanced Compiler Techniques. (3 cr; Stdnt Opt. Prereq–4061 or #) Techniques for unprocessors 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 cr; Stdnt Opt. Prereq–5211 or #) Current research issues in traffic and resource manager, quality-service provisioning for integrated services networks (such as next-generation Internet and ATM networks) and multimedia networking.

CSCI 8271, Security and Privacy in Computing. (3 cr; A-F or Aud. Prereq–[5211, 5103] or #; 5471 or EE 5246 or Math 5248 or equiv recommended) Recent security/privacy issues in computer systems/networks. Threats, attacks, countermeasures. Security research, authentication, network security, wireless security, computer system security, anonymous system, pseudonym, access control, intrusion detection system, cryptographic protocols. How to pursue research in security and design secure systems.

CSCI 8283, Research Problems in Computer-Aided Design for Electronic Design. (3 cr; Stdnt Opt. Prereq–5201 or 5283 or equiv or #) Open research problems in contemporary CAD for electronic design, approaches to their solution.


CSCI 8333, FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)


CSCI 8404, Design and Analysis of Approximation Algorithms. (3 cr; Stdnt Opt. Prereq–54303 or 54211 or #) Because an exact solution is often unfeasible for computationally difficult problems in important applications, approximation algorithms are a significant area of study. Introduces techniques for design of approximation algorithms; theory for evaluating the algorithms’ performance.

CSCI 8442, Computational Geometry and Applications. (3 cr; Stdnt Opt. Prereq–5421 or #) Designing efficient algorithms and data structures for geometric problems. Models of computation, convex hulls, geometric duality, multidimensional search, Voronoi diagrams and Delaunay triangulations, linear programming in fixed dimensions, lower bound techniques. Applications, advanced topics.

CSCI 8444, FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

CSCI 8511, Intelligent Agents. (3 cr; Stdnt Opt. Prereq–5511 or #) Theories of intelligent agents. Agent architectures; knowledge representation, communication, cooperation, and negotiation among multiple agents; planning and learning; issues in designing agents with a physical body; dealing with sensors and actuators; world modeling.

CSCI 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed preliminary examination 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)

CSCI 8701, Overview of Database Research. (3 cr; Stdnt Opt. Prereq–5706 or #) 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 8703. Distributed and Parallel Databases. (3 cr; Stdnt Opt. Prereq–5708 or #) Distributed database management systems (DBMS) architecture, including client-server, distributed DB design, distributed query optimization and processing, distributed transaction management (concurrency control and recovery), federated/multibases (definition and issues); database machines (concepts, successes, and failures); parallel databases.

CSCI 8715. Spatial Databases and Applications. (3 cr; Stdnt Opt. Prereq–4707 or 5707 or GIS 5571 or GIS 5573) 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 cr; Stdnt Opt. Prereq–4707 or 5707 or #) DBMS support for biological databases, data models. Searching integrated public domain databases. Queries/analyses, DBMS extensions, emerging applications.

CSCI 8735. Advanced Database Systems. (3 cr; A-F or Aud. Prereq–4707 or 5707 or 5708) Database systems for emerging applications, nontraditional query processors, multi-dimensional data indexing. Current research trends.

CSCI 8760. Plan B Project. (5 cr; S-N or Aud. Prereq–CSCI MS student, #) Project arranged between student and faculty.

CSCI 8777, Thesis Credits: Master’s. (1-18 cr; max 56 cr; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])


CSCI 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

CSCI 8970. Computer Science Colloquium. (1 cr; max 5 cr; S-N or Aud) Recent developments in computer science and related disciplines. Students must attend 13 of the 15 lectures.

CSCI 8990. Special Advanced Topics in Computer Science. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq–#) Lectures and informal discussions.

CSCI 8991. Independent Study. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq–#) Independent study with professor.


Conservation Biology (CBIO)

College of Biological Sciences

CBIO 8001. Conservation Biology Seminar. (1 cr; max 6 cr; S-N or Aud. Prereq–#) Topics vary.


CBIO 8095. Directed Study Experience. (1-5 cr [max 6 cr]; S-N or Aud. Prereq–#) Directed Study Experience


CBIO 8103. Research in Support of Resource Management: a Dialog With Land Managers. (2 cr; S-N only) 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. (1 cr [max 4 cr]; S-N only) Overview of history/philosophy of science as framework for writing thesis or dissertation. How to conduct research. Time management.

CBIO 8333, FTE: Master’s. (6 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

CBIO 8444, FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)
Control Science and Dynamical Systems (CSDY)

Institute of Technology
CSDY 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

CSDY 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

CBI 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

CBI 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Coptic (COPT)

Department of Classical and Near Eastern Studies

College of Liberal Arts

COPT 5001. Elementary Coptic. (3 cr; Stdnt Opt) Introduction to Coptic grammar and vocabulary, chiefly in the Sahidic dialect.

COPT 5002. Elementary Coptic. (3 cr; Stdnt Opt. Prereq–5001 or equiv) Reading a variety of Coptic literature, such as Gnostic, martyrological, or monastic texts.

Cultural Studies and Comparative Literature (CSCL)

Department of Cultural Studies and Comparative Literature

College of Liberal Arts

CSCL 5147. Teaching as Dialogue. (3 cr; Stdnt Opt) Teaching and the teacher are the subject. Entering into dialogue is the method. Issues with the politics of teaching, strategies 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 cr; Stdnt Opt) Inquiry into theoretical 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 cr; Stdnt Opt) 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 cr; Stdnt Opt. +CSDS 5301) 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 cr; Stdnt Opt. +CSDS 5302) 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 5333. Discourse of the Novel. (3 cr; Stdnt Opt. +CL 5333) 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 cr; A-F only. Prereq–1921 or ARTH 1921W or equiv) History/theory of avant-garde cinema, from classical period (1920s) to post-WWII.

CSCL 5415. Cinema and Society in the Arab World. (4 cr; A-F only. Prereq–1921 or ARTH 1921W or equiv) Focuses on Egypt, Algeria, and Syria, against background of European colonialism, loss of Palestine, Arab-Israeli wars, rise of Arab nationalism, and Algerian War.

CSCL 5555. Introduction to Semiotics. (3 cr; Stdnt Opt. +CL 5555) Problems of the nature of the sign; sign function; sign production; signifying systems as articulated in philosophy, linguistics, anthropology, psychology, and art theory. Application of semiotics to various signifying practices (literature, cinema, daily life).

CSCL 5711. Sociocriticism. (3 cr; Stdnt Opt) 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 5910. Topics in Cultural Studies and Comparative Literature. (3 cr [max 24 cr] Stdnt Opt) Topics specified in Class Schedule.

CSCL 5993. Directed Study. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq–4, %, @) Guided individual reading or study.

Curriculum and Instruction (CI)

Department of Curriculum and Instruction

College of Education and Human Development

CI 5008. Theory and Practice of Teaching Art in Elementary Schools. (1-2 cr [max 3 cr]; A-F or Aud) 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 cr; A-F or Aud) In-depth experiences in craft techniques, including ceramic creations, jewelry, metal design, with emphasis on design analysis, understanding of materials, and mastery of processes.

CI 5049. Art Media Techniques. (1-4 cr [max 4 cr]; A-F or Aud) Lectures, demonstrations, studio labs and critique session on creative processes; handling specific media. Topic varies.

CI 5050. Issues in Art Education. (1-12 cr [max 12 cr]; Stdnt Opt) Issues/trends, current practices, recent research.

CI 5055. Postmodern Visual Culture and Global Education. (5 cr; A-F or Aud. Prereq–Grad student only) Representations of knowledge. Postmodern conditions of education and relationships to the influences of visual culture. Introduction to issues concerning the value and importance of visual imagery; influence of computer networking, mass communication, and other image sources.

CI 5065. Improving Art Programs in the Schools. (3 cr; A-F or Aud. Prereq–Initial lic students majoring in art ed) 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 cr; A-F or Aud) Study and analysis of innovations; evaluation of materials for teaching units and projects.

CI 5075. The Social and Historical Foundations of Art Education. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–Grad student) 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 cr; A-F or Aud) 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. (1-6 cr [max 6 cr]; A-F or Aud) 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.
Course Descriptions

CI 5097. Student Teaching in Art Education. (8 cr; S-N or Aud. Prereq–Licenses student in art ed) Observation of, participation in, and supervisory experiences with various types and levels of art classes.

CI 5111. Introduction to Elementary School Teaching. (3 cr; A-F or Aud. Prereq–Foundations of ed major or elem ed initial lic) Curriculum organization, instruction, management, assessment, professional decision making.

CI 5113. Classroom Management in the Elementary School. (3 cr; Stdnt Opt) 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 cr; A-F or Aud) Issues in diversity and culture in educational contexts. Rationale for multicultural/gender-fair curriculum. Cultural issues inherent in curricular change. Language, culture, sexual preference, special needs students. Conflicts between culture and curriculum.

CI 5138. Multicultural and Moral Perspectives on Classroom Instruction. (3 cr; Stdnt Opt. 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. (3-4 cr [max 4 cr]; Stdnt Opt. Prereq–Teaching license and one yr teaching exper) 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 cr; A-F or Aud) 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 5149. Issues of Diversity in Schools and Classrooms. (5-8 cr [max 4 cr]; Stdnt Opt. Prereq–Grad student or Teacher Leadership program) Examination of issues in schools and classrooms that affect people from diverse groups, using historical, communication, value, and intercultural frameworks.

CI 5150. Curriculum Topics. (1-6 cr [max 12 cr]; Stdnt Opt) Special topics, current trends in curriculum. Subject integration, curriculum contexts, development, implementation, evaluation.

CI 5155. Contemporary Approaches to Curriculum: Instruction and Assessment. (3 cr; A-F or Aud. Prereq–Grad students only) Current research/issues that cross disciplinary boundaries in curriculum development, instructional practices, and assessment methods. Interrelations among curriculum, instruction, and assessment within frameworks of constructivist learning theory. Individual classroom practices/theories.

CI 5162. Peer Coaching for Teachers. (1-2 cr [max 2 cr]; A-F or Aud. Prereq–Teaching experience cr #) Teachers coaching teachers; acquiring concepts, skills, and dispositions necessary for observing classroom instruction and providing constructive feedback.

CI 5177. Practical Research. (3 cr; A-F or Aud. Prereq–CI MEd student, or CI or EdPA Teacher Leadership MEd student) 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. (3-6 cr; Stdnt Opt. eEDA 5361. Prereq–CI or EdPA teacher leadership MEd student) 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. (3-8 cr [max 16 cr]; S-N or Aud. Prereq–Foundations of education and elem ed initial licensure only) Students spend full days in the elementary classroom gradually assuming responsibility for teaching the class. Students prepare a portfolio based on criteria given. One seminar per week.

CI 5183. Applying Instructional Methods in the Elementary Classroom. (1-2 cr [max 8 cr]; S-N or Aud. Prereq–Foundations of major or elem ed initial licensure only) Supervised experiences in elementary classrooms.

CI 5186. School-Related Projects. (3-4 cr [max 4 cr]; A-F or Aud. Prereq–MED student) Research or evaluation project related to teaching, curriculum, or other aspect of schooling. Approved and supervised by faculty advisor.

CI 5187. Practicum: Improvement of Teaching in Elementary or PreKindergarten Schools. (2-3 cr [max 3 cr]; S-N or Aud. Prereq–MED student in elem or early childhood ed) Elementary school classroom teaching project designed to improve specific teaching skills. Approved and directed by adviser.


CI 5234. Kindergarten Methods. (2 cr; A-F or Aud. Prereq–Foundations of Education/Elementary Education or M.Ed./ILP Elementary Education) Purpose of kindergarten, its place in elementary program. Curriculum appropriate for needs of age group, including children with special needs. Assessment procedures, role of classroom teacher.

CI 5231. Foundations of Distance Education. (3 cr; A-F or Aud) History, philosophies, technologies, and best practices related to distance learning environments. Distance education theories. Issues in distance education.

CI 5233. Online Learning Communities. (3 cr; A-F or Aud) Students design/research an online learning environment that promotes community. What community is, how learning occurs in educational environments. Theories of distance learning instruction. Community models. Technological tools to develop online communities.

CI 5235. Designing and Developing Online Distance Learning. (3 cr; A-F or Aud. Prereq–5331 or 5362 recommended) Students research, use, and evaluate technologies for distance learning and design their own learning environments.

CI 5237. Developing Online Adventure Learning. (3 cr; A-F or Aud) Designing, developing, and integrating adventure learning environments in K-16. Examples of effective adventure learning environments.

CI 5330. Topics in Instructional Systems and Technology. (1-5 cr [max 12 cr]; Stdnt Opt) Topics related to needs of in-service teachers. Topics, location, credits, and duration are flexible.

CI 5331. Introduction to Learning Technologies. (3 cr; Stdnt Opt) 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 cr; A-F or Aud) 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 5342. School Technology Planning. (1 cr; A-F or Aud) How to establish plans for use of technology that support K-12 instruction and student learning. Facilitating ongoing comprehensive planning for technology integration. Identifying priorities for technology planning.

CI 5343. School Technology Funding. (1 cr; A-F or Aud. Prereq–[5344 or #] and [5330 or #]) Developing multi-year funding strategy for establishing K-12 technology integration in accordance with a technology vision/plan.

CI 5344. Practicum: Improvement of Teaching in Elementary or Prekindergarten Schools. (2-3 cr [max 3 cr]; S-N or Aud. Prereq–MED student in elem or early childhood education) Elementary school classroom teaching project designed to improve specific teaching skills. Approved and directed by adviser.

CI 5345. Technology Planning. (3 cr; A-F or Aud. Prereq–[5332 or #]) Technology-supported teaching/learning at one’s educational site. Preparing a vision statement for technology roles in student learning. How to assume an advocacy role in establishing technology use for instruction/learning.

CI 5442. Literature for Adolescents. (3 cr; A-F or Aud)
Characteristics of literature written for adolescents; rationale for using adolescent literature; adolescents’ reading interests and attitudes; analysis of quality and appeal; individualized reading programs; methods of promoting reading; multicultural literature; developing teaching activities.

CI 5451. Teaching Reading in Middle and Secondary Grades. (3 cr; A-F or Aud)
Methods of accommodating to students’ abilities and facilitating reading in regular content classes.

CI 5452. Reading in the Content Areas for Initial Licensure Candidates. (1 cr; A-F only. Prereq—Enrolled in Initial Licensure Program, concurrent enrollment in licensure area methods course(s), Internet access, basic understanding of [computer use, Web browsers, e-mail, word-processing software])
Web-based course for content disciplines whose primary responsibility is to foster students reading related to learning in their content area.

CI 5461. Teaching Composition in the Secondary School. (2 cr; A-F or Aud)

CI 5462. Evaluating and Assessing Writing. (3 cr; A-F or Aud)

CI 5463. Minnesota Writing Project Annual Invitational Summer Institute. (3 cr; A-F only. Prereq—Licensed teacher or administrator or [space available, faculty letter of recommendation])
Workshop. Participants reflect on their own literacy processes, participate in a writing group, discuss current reading texts, and demonstrate best practices in classroom.

CI 5472. Teaching Film, Television, and Media Studies. (3 cr; A-F or Aud)
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 5475. Teaching Digital Writing: Blogs, Wikis, Online Talk, Podcasting, and E-Portfolios to Teach Writing. (3 cr; A-F or Aud. Prereq—Elem ed licensure only)

CI 5481. Developments in Teaching English and Speech. (3 cr; A-F or Aud)

CI 5482. Reading, Language Arts, and Literature: Intermediate. (3 cr; A-F or Aud. Prereq—Elem ed licensure only)
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. (6 cr; S-N or Aud. Prereq—MED/initial licensure students in English ed only)
Student teaching/clinical experience for English post-baccalaureate students only.

CI 5500. Special Topics: Outdoor Science Education. (1-8 cr [max 12 cr]; Stdtm Opt. Prereq—Elem tchg exper)
Classroom and fieldwork activities aimed at increasing the knowledge and interest of students in teaching outdoor in all seasons. Topics include snow and ice ecology, the timber wolf and white-tailed deer, pond ecology, Twin Cities’ geography, trees and plants of Minnesota, and stargazing.

CI 5501. Teaching Science and Health in the Elementary School. (2 cr; A-F or Aud. Prereq—Elem ed initial licensure only)
Methods and materials for teaching science and health at the elementary school level.

CI 5504. Elementary School Science: Materials and Resources. (3 cr; Stdtm Opt. Prereq—Elem tchg exper or #)
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 cr; A-F only. Prereq—Elem ed licensure student)

CI 5530. Secondary Science Teaching: Laboratory-based Instruction. (3 cr; A-F only. Prereq—Science ed MED ILP student)
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. (4 cr; A-F or Aud. Prereq—Initial licensure student in science ed)
Methods of planning/teaching science to middle school students.

CI 5532. Teaching Secondary School Science. (4 cr; A-F or Aud. Prereq—Admission to initial licensure program in science)
Methods of planning and teaching science for secondary school students.

CI 5533. Current Developments in Science Teaching. (3 cr; A-F or Aud. Prereq—MED, initial licensure, grad student) or #)
Using curriculum standards to design science courses.

CI 5534. Studies in Science Education. (3 cr; A-F or Aud. Prereq—MED, init lic, or #)
Improvement of science teaching through the application of research findings.

CI 5535. Foundations of Science Education. (3 cr; A-F or Aud. Prereq—MED, grad student, or #)
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 cr; A-F only. Prereq—MED or grad student or #)
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 cr; A-F or Aud. Prereq—Undergrad in NRES or M.Ed. or grad student in education or #)

CI 5538. Research-based Decision-making in Science Education. (3 cr; A-F only. Prereq—MED or grad student or #)
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 cr; A-F only. Prereq—MED science education student, in first three years of teaching)
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. (1-8 cr [max 12 cr]; Stdtm Opt)
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 5596. Clinical Experience in Middle School Science. (4 cr; A-F or Aud. Prereq—initial licensure in science ed)
Supervised clinical experience in middle school science teaching.

CI 5597. Clinical Experience in Secondary School Science Teaching. (4-8 cr [max 8 cr]; S-N or Aud. Prereq—initial licensure or #)
Supervised clinical experience in secondary school science teaching.

CI 5619. Teaching Second Languages and Cultures in Elementary Schools. (3 cr; Stdtm Opt)
Methods and materials for ESL and foreign languages; development of oral and written communication in a second language; alternatives in second-language program format; global awareness and cross-cultural experience; assessment of children’s language; children’s literature, games, and songs; planning and development of units and lessons.

CI 5631. Second Language Curriculum Development and Assessment. (3 cr; A-F or Aud. Prereq—SLC initial licensure only)
Developing skills for selecting, organizing, providing, and assessing effective second language learning opportunities through study, practice, and reflection.

CI 5632. Communication and Comprehension in Second Language Classrooms. (3 cr; A-F or Aud. Prereq—SLC initial licensure only)
Comprehension and communication processes in a second language focus on listening, speaking, reading and writing; techniques for initial to advanced literacy instruction; fundamental principles of effective second language instruction; the relationship of culture to proficiency in the four modalities; traditional and alternative approaches to assessing language proficiency; use of technology to enhance instruction.
CI 5634. Content-Based Instruction in Second Language Settings. (3 cr; A-F or Aud. Prereq-SLC initial licensure program only) Content-based language instruction: principles, models and methods; reading strategy instruction; developing content-based language curriculum; traditional and alternative approaches to assessing cognitive-academic language proficiency; use of technology to enhance content-based instruction.

CI 5635. Culture and Diversity in Second Language Classrooms. (3 cr; Stndt Opt. Prereq-initial licensure program only) Developing skills for teaching a diverse student population in both foreign language and English as a second language instructional settings through study, practice, and reflection.

CI 5641. Language, Culture, and Education. (3 cr; A-F or Aud. Prereq-MED or grad student) 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; learners and second and heritage language use; and educational policies on literacy/second-language instruction.

CI 5642. The Assessment of Learners with Limited English Proficiency. (3 cr; A-F or Aud) Explores policies, procedures, and instruments in use in assessing the English language proficiency and academic readiness of limited English proficient students in American public schools; academic competence, bilingualism and special needs populations; alternative assessment; preparation of students for mainstream classrooms.

CI 5644. Working with Linguistically and Culturally Diverse Students in the Mainstream Classroom. (1 cr; Stndt Opt) Benefits and challenges of working with linguistically and culturally diverse students; instructional practices and strategies; issues related to language learning, cultural considerations, and integration of culturally and linguistically diverse learners in the classroom.

CI 5646. Understanding and Teaching English Grammar. (3 cr; Stndt Opt. Prereq-Ling 5001 or #) English syntax from pedagogical perspective. Grammatical structures that challenge ESL learners. Analyzing learner errors. Issues/activities related to teaching and learning in ESL.


CI 5651. Foundations of Second Languages and Cultures Education. (3 cr; A-F or Aud) Historical overview of second language teaching and learning in the U.S. Exploration of second language instructional settings across multiple contexts: elementary and secondary options for foreign language, bilingual education, immersion language programs, and English as a second language programs. Theoretical frameworks for language instruction are tied to practical examples.

CI 5652. Integrating Culture in the Second Language Classroom. (3 cr; Stndt Opt) Exploration of culture in second language contexts. Rationale for and process of implementing cultural awareness, culture learning, and the integration of language and culture instruction as integral to effective second language development.

CI 5656. Reading and Writing in a Second Language. (3 cr; A-F or Aud) Reading comprehension and composing processes in a second language; relationship between first and second language comprehension and composing processes; relationship between reading and writing; relationship of culture to reading comprehension and writing; politics of literacy; assessment of second language reading comprehension and writing proficiency, using technology to enhance literacy instruction.

CI 5657. Speaking and Listening in a Second Language. (3 cr; A-F or Aud) Theories and methods in teaching language as communication in oral and aural modes; planning student interaction; classroom organization for oral language learning and acquisition; using technology to enhance interaction; assessment of listening comprehension and oral communication.

CI 5658. Second Language Testing and Assessment. (3 cr; A-F or Aud) Aligning second language classroom instruction and assessment; fundamental concepts in language assessment; traditional and alternative approaches to assessing proficiency in speaking, listening, reading, writing; creation of formative and summative assessments; critique of common assessment instruments.

CI 5660. Special Topics in the Teaching of Second Languages and Cultures. (1-4 cr (max 12 cr); Stndt Opt) Topics related specifically to the needs of the in-service teacher. Topics, location, credits, and duration are flexible.

CI 5662. Issues in Second Language Curriculum Design. (3 cr; A-F or Aud) 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 and state standards and implications for curriculum development; effects of technology on second language curriculum.


CI 5693. Directed Study in Second Languages and Cultures. (1-4 cr (max 4 cr); Stndt Opt. Prereq-#) Individual or group work on curricular, instructional, or assessment problems.

CI 5696. Practicum: Teaching World Languages and Cultures in Elementary Schools. (2-6 cr (max 12 cr); Stndt Opt. Prereq-5619, adviser approval; credits cannot be counted on a graduate degree program for endorsement candidates) 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. (2-6 cr (max 6 cr); Stndt Opt. Prereq-Adviser approval) 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. (2-6 cr (max 14 cr); Stndt Opt. Prereq-Adviser approval; credits cannot be counted on a graduate degree program) 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. (6-8 cr (max 16 cr); A-F or Aud. Prereq-SLC initial licensure program only) Teaching and learning experiences in elementary and secondary second language instructional settings. Includes a seminar held concurrently to support the student teaching experience.


CI 5705. Middle School Social Studies Methods. (2 cr; A-F only. Prereq-Elem ed licensure student) 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 cr; A-F or Aud) Content/organization of social studies programs. Improving teaching/learning situation through analysis of trends/issues. Integration with other subject areas.

CI 5741. Introductory to Social Studies Education. (3 cr; A-F only. Prereq-social studies initial licensure student) 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 cr; A-F only. Prereq-Secondary social studies initial licensure student) 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 cr; A-F only. Prereq-Secondary social studies initial licensure student) 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 cr; A-F only. Prereq-Secondary social studies initial licensure student) 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 cr; A-F only) Ways to engage students (grades 5-12) in social studies (textbooks, literature, speeches, editorials, political cartoons, tables, graphs, language instruction). Developing middle/high school students' disciplinary literacy.
Course Descriptions

CI 5746. Global and Multicultural Education in the Secondary Classroom. (3 cr; A-F only)
Issues, classroom practices, and controversies surrounding global/multicultural perspective-taking in social studies education. Strategies for helping secondary social studies students develop global/multicultural worldviews.

CI 5747. Global and Environmental Education: Content and Practice. (3 cr; A-F or Aud)
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 cr; Stdnt Opt)
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 cr; A-F or Aud)

CI 5783. Clinical Experiences in Teaching Social Studies. (1-8 cr [max 7 cr]; S-N or Aud. Prereq—MED/initial licensure student)
Principles of learning pertinent to modern program of mathematics in elementary grades. Objectives, content, philosophy, instructional materials, methods of instruction/evaluation.

CI 5900. Special Topics in Family, Youth, and Community. (1-2 cr [max 20 cr]; Stdnt Opt)
Topics not dealt with in regular courses. Topics vary by offering.

CI 5902. Family Education Perspectives. (3 cr; A-F or Aud)
Origins, evolution, and critique of alternative perspectives on family education. Implications for educators, programs, and participants.

CI 5904. Contemporary Family Education. (3 cr; A-F or Aud)
Contemporary conditions of and transitions in family life. Emphasizes implications for educators and educational programs.

CI 5906. Program Planning in Family Education. (3 cr; A-F or Aud)

CI 5908. Family and Work Relationships. (3 cr; A-F only)
Interactions of work/family roles, responsibilities, and aspirations. Resources, legal aspects, gender.

CI 5912. Sexuality Education. (3 cr; A-F only)
Development, delivery, and evaluation of sexuality education curriculum/programs.

CI 5914. Education for Family Communication. (3 cr; A-F only)
Development, delivery, and evaluation of curriculum/programs related to family communication.

CI 5922. Family and Consumer Sciences Curriculum in Grades 5-12. (3 cr; A-F only. Prereq—ILP student)
Examination, development, and implementation of family and consumer sciences curriculum in grades 5-12.

CI 5923. Educational Strategies in Family Education. (3 cr; A-F only)
Examination, development, and implementation of a variety of educational strategies.

CI 5924. Family and Consumer Sciences Student Teaching I. (1 cr; S-N only. = WHRE 5696. Prereq—ILP student)
Initial experiences in family/consumer sciences teaching profession. Observations of school organization/administration, seminars, relationship building with cooperating teachers, reflections on personal involvement as beginning student teachers.

CI 5925. Family and Consumer Sciences Student Teaching II. (2 cr; Stdnt Opt. Prereq—5924)
Part-time supervised teaching experience in family/consumer sciences programs. On-campus seminars emphasize reflective teaching practice and student learning in context of middle/high schools.

CI 5926. Family and Consumer Sciences Student Teaching III. (8 cr; Stdnt Opt. Prereq—5925)
Full-time supervised teaching experience in family/consumer sciences programs. On-campus seminars.

CI 5927. Family and Consumer Sciences Student Teaching IV. (1 cr; Stdnt Opt. = WHRE 5699. Prereq—5926)
Full-time supervised student teaching experience in family/consumer sciences programs.

CI 5928. Introduction to Parent Education. (1 cr; A-F only)
Philosophy, history, and models of parent education. Ethical, critically reflective professional practice.

CI 5936. Advanced Practice of Parent Education. (3 cr; Stdnt Opt. Prereq—5935 or FE 5702 or %)

CI 5937. Parent-Child Interaction. (3 cr; A-F only)

CI 5938. Reflective Dialogue in Parent Education. (3 cr; A-F or Aud)

CI 5942. Everyday Experiences of Families. (2 cr; A-F only)
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.

CI 5943. Parent Learning and Development: Implications for Parent Education. (2 cr; A-F only)
Research/theoretical perspectives critiqued. Challenging assumptions, examining competencies.

CI 5944. Parent Education Curriculum. (2 cr; A-F only. Prereq—5943 or #)
How parent learning/development, parent, child development, and family systems theories influence curriculum approaches/materials in parent education. Student develop construct, critique, and select curriculum.

CI 5945. Teaching and Learning in Parent Education. (2 cr; A-F only. Prereq—5942 or #)
Students select/use parent education teaching strategies/processes to meet needs of various populations of adult learners. Critical reflection, ethical practices, parent educator competencies.

CI 5946. Assessment and Evaluation in Parent Education. (2 cr; A-F only. Prereq—5943 or #)

CI 5947. Student Teaching in Parent Education. (2 cr; A-F only. Prereq—#)
Supervised parent education practice to meet individual student needs/interests. Online discussion, reflection, cooperative learning.

CI 5952. Everyday Lives of Youth. (3 cr; A-F or Aud)
Youth as idea/lived-reality in scholarship, public discourse, and professional practice. Building practice of work with or on behalf of youth.

CI 5954. Experiential Learning: Pedagogy for Community and Classroom. (3 cr; Stdnt Opt)
Relationship between experiential learning and teaching in community and school settings. Emphasizes intentional application of experiential learning theory/practice to educational program development.

CI 5956. Organizational Approaches to Youth Development. (3 cr; A-F or Aud)
Historical contexts, theoretical frameworks, organizational practices, and public policies that shape nonformal educational experiences of youth in community-based or school-linked settings.

CI 5958. Community: Context for Youth Development Leadership. (3 cr; A-F or Aud)
Issues/policies in family, school, and community that drive the professional practice of community-based youth work. Practical projects explore what it means to be local, to build social capital for youth, and to involve youth in community change.

CI 5960. Seminar in Youth Development Leadership. (1-4 cr [max 4 cr]; S-N or Aud. Prereq—YDL student or #)
Group study of topics/issues. Course proposal, educational program development. Students participate in co-created learning experience with a group of peers. Four-course sequence.

CI 5962. Leadership Field Experience; Youth Development. (4 cr; S-N only. Prereq—YDL student)
Demonstration of leadership in practice. Project on youth, experiential pedagogy, and community/program settings. Focuses on public policy, advocacy, evaluation, pedagogical issues, program design, curriculum development, or applied research.

CI 5972. Education in the Community. (3 cr; Stdnt Opt)
Models of community/education, their intersections. Twentieth century practice of education in the community in the U.S. Examples from other cultures/times.

CI 5974. The Democratic Learning Community. (3 cr; Stdnt Opt)
Historical/theoretical development of how leading thinkers have conceptualized education centered in the community. Colonial, Native American, transcendentalist, progressive, experiential, critical, and feminist perspectives.

CI 5993. Directed Study in Family, Youth, and Community. (1-3 cr [max 9 cr]; A-F only. Prereq—#)
Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member.
Course Descriptions

CI 8444. FTE: Doctoral. (1 cr; No grade.) Prereq: Doctoral student, adviser approval, DGS approval.


CI 8470. Special Topics on Literacy. (1-6 cr [max 6 cr]; Stndt Opt. Prereq-MA or PhD student) Current theories/research on literacy and literacy development. Alternative methods of conducting literacy research. Implicit to science for literacy instruction.

CI 8492. Readings in English Education and Reading. (1-3 cr [max 10 cr]; Stndt Opt. Prereq-#) Independent study course.

CI 8495. Problems: Teaching English and Reading. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-#) Individual research.

CI 8511. Seminar: Research in Science Education. (1 cr [max 6 cr]; Stndt Opt. Prereq-Cl grad student or #) Students and faculty present research projects for comment and critique. Special topics may also be considered.

CI 8570. Advanced Topics in Science Education. (1-4 cr [max 6 cr]; A-F or Aud. Prereq-Cl grad student or #) Examination of current research topics, methods, and issues.

CI 8571. Equity, Policy, and Social Justice in Science Education. (3 cr Prereq-Science ed grad student or #) Interactions of issues of diversity, equity, policy, and social justice related to science education. Diverse perspectives on purposes/scope of science education. Consequences for diversity, equity, access, social justice, empowerment, and educational policy.

CI 8594. Conducting Research in Science Education. (3 cr; Stndt Opt. Prereq-sci educ research course) Application of research methodology to a specific science education issue.

CI 8595. Problems: Science Education. (1-6 cr [max 12 cr]; Stndt Opt. Prereq-Cl grad student or #) Independent research.

CI 8650. Seminar: Special Topics in Second Languages and Cultures Research. (1-3 cr [max 6 cr]; Stndt Opt. Prereq-Cl grad student or #) Research topics vary.

CI 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

CI 8691. Readings in Second Languages and Cultures Education. (1-3 cr [max 3 cr]; Stndt Opt. Prereq-#) Independent reading.

CI 8695. Problems: Second Languages and Cultures Education. (1-6 cr [max 12 cr]; Stndt Opt. Prereq-#) Independent research.

CI 8742. Seminar: Research in Social Studies Education. (3 cr; A-F or Aud. Prereq-Cl grad student or #) Critical review and analysis of seminal research studies; criteria for appraising research findings; educational implications.

CI 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade)

CI 8795. Problems: Social Studies Education. (1-6 cr [max 12 cr]; Stndt Opt. Prereq-Cl grad student or #) Independent research.

CI 8796. Research Internship in Social Studies Education. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-Cl grad student) 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. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

CI 8900. Family, Youth, and Community Colloquium. (1 cr [max 4 cr]; S-N only. Prereq-MA or PhD student) 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 Contexts. (3 cr; A-F only) Meanings of and relationships among family, youth, and community in social, political, and economic contexts across cultures/time. Realities/philosophies influencing these meanings/relationships. Implications/consequences for professional practice.

CI 8904. Families, Youth, and Communities, and Education: Historical and Contemporary Perspectives. (3 cr; A-F only. Prereq-#) Teaching/learning in family/community settings and in formal education settings. Interrelationships, implications.

CI 8913. Interpretive Research. (3 cr; A-F only) Hermeneutic, ethnomet hodological, and phenomenological research methodologies. Ethics, evaluation, and usefulness of interpretive research. Practice in conducting interpretive research.

CI 8914. Critical Science Research. (3 cr; A-F only) Origins, influences, characteristics, and central concepts. Distinction between critical science and other action research. Requisite skills/knowledge for conducting critical science research, using that knowledge in a project.

CI 8994. Directed Research in Family, Youth, and Community. (1-6 cr [max 6 cr]; A-F only. Prereq-#) Prereq-Family, Youth, and Community student doing Plan B research)

Dance (DNCE) Department of Theatre Arts and Dance

College of Liberal Arts


DNCE 5333. Laban Movement Analysis. (2 cr; Stndt Opt. Prereq-#) Concepts of LMA, which is used to describe, understand, and perform all forms of movement/dance. Movement experiences, lectures, discussion, observation.


DNCE 5443. Theorizing Dancing Bodies. (3 cr; Stndt Opt. DNCE 4443, Prereq-#) Major developments in Western philosophic thought on dance and dance theory, from its beginnings to present.


DNCE 5500. Topics in Dance. (1-5 cr [max 10 cr]; Stndt Opt) Topics specified in Class Schedule.

DENT 5700. Performance. (1 cr; max 4 cr; Stdent Opt. Prereq–Bachelori course, %) Technical, improvisation, choreography, music, design, and technical production as they relate to dance performance.


# Dentistry (DENT)

## School of Dentistry

DENT 5050. Summer Student Selectives. (1-2 cr [max 2 cr]; S-N only) Clinical, laboratory, and practice issues. Faculty directed topics.

DENT 5101. Oral and Maxillofacial Radiology. (3.5 cr; A-F or Aud) General principles of radiology, radiation physics, dosimetry, biology, radiation protection, regulations and recent concepts of imaging.


DENT 5103. Oral Radiology Preclinical Lab I. (1 cr; S-N or Aud) This course consists of preclinical demonstration-participation phases in radiographic technique using mounted human skulls.

DENT 5104. Oral Radiology Preclinical Lab II. (1 cr [max 2 cr]; S-N or Aud) This course consists of preclinical demonstration-participation phases of radiographic technique using mounted human skulls.

DENT 5121. Physical Evaluation I. (2.9 cr; A-F or Aud) General concepts of diagnosis and patient evaluation for use during examination of patients in various adult clinical programs in the School of Dentistry.

DENT 5201. Pain and Anxiety Control. (1.2 cr; A-F or Aud) Didactic-clinical aspects of pain/anxiety control as pertains to dentistry. Emphasizes use of local anesthetics, conscious sedation (nitrous oxide inhalation). Acute/chronic pain mechanisms, neuropathic pain, issues pertaining to narcotic/other drug abuse.

DENT 5301. Introduction to Oral Biology. (1.1 cr [max 2.2 cr]; S-N or Aud) Introduce the scientific foundation of dentistry. Oral microbiology, biochemistry, tissues, diseases, and pain will be related to clinical practice through lectures and discussions of current literature.

DENT 5302. Topics in Dental Biochemistry. (1 cr; A-F or Aud) Biological, chemical, and biochemical phenomenon occurring in the oral cavity and the interrelationships between these phenomenon. Biological and chemical basis of dental caries and how saliva, dental plaque, and plaque fluid interact and impact on the caries process. Metabolic handling and antacaries mechanisms of fluoride.

DENT 5303. Microbiology for Dental Students. (6 cr; A-F or Aud. Prereq–Dental Biochemistry/Histology) General microbiology, bacterial pathogenesis, virology with specific emphasis on oral microbial ecology, dental caries and periodontal diseases. Evaluation of current literature will be done by student essays. Discussions are based on assigned literature and focus on methodology.

DENT 5315. Oral Histology and Embryology and Medical Genetics. (2.6 cr; A-F or Aud) Embryologic development and histologic structure of tissues in the head, face, and mouth with emphasis on clinical correlations, principles of medical genetics, complex traits of the orofacial region, and genetic contributions to oral diseases.

DENT 5322. Applied Dental Biomaterials. (1.6 cr; A-F or Aud. Prereq–5321) Lectures on applications of dental materials, including areas of restorative dentistry, prosthodontics, orthodontics, and endodontics. Instruction in the scientific basis for selection and utilization of materials. Areas of current controversy, including replacement of traditional materials with new materials. Literature review seminars cover the evaluation principles for information sources on dental materials.

DENT 5351. Introduction to Dental Biomaterials. (1.7 cr; A-F only) Principles of biomaterials science as applied to dentistry. Effect of synthetic materials on body (biocompatibility). Effect of body on materials (e.g., mechanical, chemical, corrosion effects). Polymers, metallic materials, ceramics, composites, cements. Theory of adhesive interfaces. Mechanisms of adhesion in contemporary dental practice.

DENT 5352. Applied Dental Biomaterials. (2 cr; A-F or Aud) Principles of biomaterials science applied to practical usage. Prosthodontics, operative dentistry. Students apply scientific principles to selection/utilization of biomaterials and evaluate a recent research publication.


DENT 5405. Interprofessional Ethics Education. (1 cr; S-N only) Concepts/methods in health care ethics. Interfacing with other students in health care professions. Online modules, facilitated small group discussions of case narratives.

DENT 5411. Professional Problem Solving. (0 cr; A-F or Aud) Critical thinking in ethical/professional problems in dentistry. How to organize, analyze, and reflect on issues, rights, responsibilities, codes of behavior/ethics, and consequences.

DENT 5412. Professional Problem Solving. (1 cr; A-F or Aud) Critical thinking in ethical/professional problems in dentistry. How to organize, analyze, and reflect on issues, rights, responsibilities, codes of behavior/ethics, and consequences.

DENT 5441. Patient Management II. (4.1 cr; S-N or Aud) Introduction to management of dental patients. Process/development of comprehensive treatment plans. Students are exposed to treatment planning in private-practice setting.

DENT 5501. Pediatric Dentistry Pre-Clinic. (2 cr; A-F or Aud) Physical, emotional, dental, and language development. Diagnosis, prevention, and management of oral diseases in children.

DENT 5601. Introduction to Clinical Preventive Dentistry. (2 cr; S-N or Aud) Application of principles of prevention through case-based small group learning format and clinical experiences. Clinical observation of preventive protocols/techniques. Students prepare/deliver presentation on preventive topic.

DENT 5611. Periodontology I Lecture. (1.6 cr; A-F or Aud) Periodontal anatomy, physiology/etiology of periodontal diseases. Clinical, histopathological, and pathogenesis of gingivitis and periodontitis. Role of genetics, tobacco use, and systemic disorders.

DENT 5612. Periodontology Technique. (2 cr; A-F or Aud) Pre-surgical procedures in periodontics. Development of clinical skills to examine, diagnose, prevent, and treat periodontal patients.

DENT 5613. Periodontology Technique II. (1 cr; S-N or Aud. Prereq–5612) Extension of Dent 5612. Closely supervised, students treat at least three periodontal patients during the summer semester. Students develop clinical skills to examine, diagnose, prevent, and treat periodontal patients before assuming responsibility for their comprehensive care.

DENT 5701. Introduction to Endodontics. (1 cr; A-F or Aud) Lecture and Laboratory. (4 cr; A-F or Aud) Study of morphology, physiology, and pathology of the human dental pulp and periradicular tissues. Introduction to management of dental patients. Study of morphology, physiology, and pathology of the human dental pulp and periradicular tissues. Students develop clinical skills to examine, diagnose, prevent, and treat periodontal patients before assuming responsibility for their comprehensive care.


DENT 5801. Operative Dentistry I. (1.7 cr; A-F only. Prereq–Dental Anatomy, Biomaterials) Restoration of small caries lesions, cervical abrasion lesions, and attrition defects. Practical aspects of caries risk assessment, lesion identification, and comprehensive caries management. Emphasizes indications for surgical intervention, principles of restoration design, and rationale for various design features.

DENT 5802. Operative Dentistry I Laboratory. (2.5 cr; A-F or Aud. Prereq–Dental Anatomy, Biomaterials) Restoration of small caries lesions, cervical abrasion lesions, and attrition defects in clinical simulation setting. Emphasizes designing/executing retentive/resistant restorations, conserving tooth structure, and operating in clinically relevant orientations. Self-evaluation techniques, discriminatory skills.

Course Descriptions

DENT 5805. Operative Dentistry III. (3.8 cr; A-F only. Prereq-Operative Dentistry [I, II], Operative Dentistry [I, II], Lab) Integration/application of skills/knowledge in diagnosis, treatment planning, and treatment. Clinical setting.

DENT 5806. Introduction to Psychomotor Motor Skills II. (1 cr; S-N only. Prereq-1st yr DDS Program) Maintaining r psychomotor skills for tooth preparation work.

DENT 5901. Oral Anatomy I. (2 cr; A-F or Aud) Tooth morphology, nomenclature, classification, charting, calcification, and eruption sequences; mouth growth and development.

DENT 5902. Oral Anatomy Laboratory I. (2.9 cr [max 5.8 cr]; A-F or Aud) Application of oral anatomy, fixed prosthodontic lab techniques, fundamentals of tooth preparation.

DENT 5903. Preclinical Prosthodontics Lecture II. (2 cr; A-F or Aud. Prereq-5901, 5902) Prosthodontic procedures.

DENT 5904. Preclinical Prosthodontic Techniques Laboratory II. (2 cr; A-F or Aud. Prereq-5901, 5902) Lab techniques, fundamentals of tooth preparation.

DENT 5905. Preclinical Prosthodontic Technique Lecture III. (1.5 cr; A-F or Aud. Prereq-5901, 5902, 5903, 5904) Fixed, removable, and occlusion topics.

DENT 5906. Preclinical Prosthodontics Technique Laboratory III. (2.1 cr; A-F or Aud. Prereq-5901, 5902, 5903, 5904) Fixed, removable, and occlusion topics.

DENT 5907. Preclinical Prosthodontics Technique Lecture IV. (3 cr; A-F or Aud. Prereq-5901, 5902, 5903, 5904, 5905, 5906) Fixed, removable, and occlusion topics.

DENT 5908. Preclinical Prosthodontic Technique Lecture IV. (3 cr; A-F or Aud. Prereq-5901, 5902, 5903, 5904, 5905, 5906) Fixed, removable, and occlusion topics.

DENT 5909. Preclinical Prosthodontics Technique Laboratory V. (3.3 cr; A-F or Aud. Prereq-5901, 5902, 5903, 5904, 5905, 5906, 5907, 5908) Fixed, removable, and occlusion topics.

DENT 5910. Preclinical Prosthodontics Technique Laboratory V. (3 cr; A-F or Aud. Prereq-5901, 5902, 5903, 5904, 5905, 5906, 5907, 5908) Fixed, removable, and occlusion topics.


DENT 5912. Preclinical Prosthodontics Techniques Laboratory VI. (2 cr; A-F or Aud. Prereq-5901 through 5910) Implanting fixed removable protocols. Principles of restoring damaged teeth.

DENT 5915. Clinical Occlusion. (1.3 cr [max 2.6 cr]; A-F only. Prereq-Enrolled in dentistry program) Clinical variation in occlusion encountered in a typical clinical setting. Guidelines to manage this variation.

DENT 8031. Topics and Problems in Dental Education. (1-3 cr [max 3 cr]; Stdnt Opt) Independent study in student learning, instructional development, curriculum planning, student testing and evaluation, and academic administration, where these areas and their interfaces are applied directly to professional dental education. Provides opportunity for applying and extending concepts learned in Dent 7033.

DENT 8090. Evidence-based Clinical Pediatric Dentistry. (2.5 cr; A-F or Aud) Selected pediatric dentistry topics. In depth literature review, seminar discussion.

DENT 8091. Interdisciplinary Care of the Cleft Palate Patient. (1 cr; S-N or Aud) Comprehensive surgical, dental, and speech and hearing evaluation and management of patients with cleft lip and palate.

DENT 8100. Topics in Advanced Periodontology: Literature Review. (2 cr; Stdnt Opt) 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. (2.5 cr; Stdnt Opt) Dental implant therapy from perspective of several dental disciplines.

DENT 8120. Advanced Principles and Techniques of TMJ and Orofacial Pain Disorders. (3 cr; A-F or Aud. Prereq—Participation in TMJ and Orofacial Pain advanced education program) Interdisciplinary study of theory, principles, epidemiology, and mechanisms associated with TMJ and craniofacial pain disorders and a basis for scientific understanding of diagnostic and management strategies for them.

DENT 8121. Current Literature in TMJ and Craniofacial Pain. (1 cr; A-F or Aud) Review of current literature and of how it relates to past literature, theories on pain, and philosophies of management.

DENT 8123. Advanced Topics in Orofacial Pain. (3 cr; A-F or Aud. Prereq—Grad student in dentistry or other health sciences graduate student or #) Review of cutting edge research and clinical findings regarding etiology/treatment of acute/chronic orofacial pain conditions and related disorders.

DES 5160. Topics in Design. (1-4 cr [max 24 cr]; A-F only) Topics in Design

DES 5193. Directed Study in Design. (1-6 cr [max 36 cr]; A-F only. Prereq-%)

Design (DES)

DES 5160. Topics in Design. (1-4 cr [max 24 cr]; A-F only) Topics in Design

DES 5193. Directed Study in Design. (1-6 cr [max 36 cr]; A-F only. Prereq-%)
Design, Housing, and Apparel (DHA)

DHA 5382. Digital Sound and Video. (3 cr; A-F or Aud. Prereq–[5384 or 5341]. DHA major or grad student or DHA grad student) Design solutions involving time-based media. Emphasizes sound/video. Electronic publishing via Internet.

DHA 5383. Digital Illustration and Animation. (4 cr; A-F or Aud. Prereq–[5346 or 5341]. DHA major or DHA grad student) Experience with computer illustration or #) Advanced computer design. Focuses on integration of design knowledge with Macintosh computer applications. Students use computer software to create digital illustration, 2D/3D digital animations. Technical/aesthetic investigation of processes inherent to 2D/3D motion graphics. Adobe Illustrator, After Effects, Macromedia Flash, 3D animation software.


DHA 5388. Design Planning, Analysis, and Evaluation. (3 cr; A-F or Aud. Prereq–[4354]. DHA major) Preliminary research, including theoretical, applied, and legal aspects. Planning/developmental models. Design prototyping, testing, and analysis.

DHA 5399W. Theory of Electronic Design. (3 cr; A-F or Aud. Prereq–[DHA major, sr] or grad student or #) Theories, methodologies, histories of electronic design, its impact on visual communications. Digital artifacts, processes, paradigms.

DHA 5463. Housing Policy. (3 cr; A-F or Aud. Prereq–PA 5261. Prereq–2401, 2465 or #) Examines competing ideas about solving the nation’s housing problems through public intervention in the market. Federal and local public sector responses to housing/housing-related data. Use of Geographical Information Systems (GIS) to display, analyze, and communicate spatial data related to housing issues. Students develop a project that makes an argument for a policy recommendation.

DHA 5464A. Rural Housing Issues. (3 cr; A-F or Aud. Prereq–[2401, 2465] or #) Housing issues for rural and small towns, and rural areas. Housing needs and policy implications for rural residents. Economic development strategies for housing availability, adequacy, and affordability.

DHA 5481. Promoting Independence in Housing and Community. (3 cr; A-F or Aud. Prereq–[2401, [sr or grad student]] or #) 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.


For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

DHA 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

DHA 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 per semester or summer; 10 cr total required [Plan A only])

DHA 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 per semester or summer; 24 cr required)

DHA 8990. MFA Creative Thesis. (.6 cr [max 12 cr]; A-F or Aud. Prereq—Completed coursework requirements for MFA in DHA w/web media emphasis, #) MFA project.

Development Studies and Social Change (DSSC)

College of Liberal Arts

DSSC 8111. Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change. (2 cr; S-N or Aud. Prereq—Grad DSSC minor or #)

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 cr; S-N only. Prereq—Grad DSSC minor or #)


DSC 8211. Doctoral Research Workshop in Development Studies and Social Change. (2 cr; S-N or Aud. Prereq—Grad DSSC minor or #)

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.

DSC 8212. Doctoral Research Workshop in Development Studies and Social Change. (1 cr; S-N or Aud. Prereq—Grad DSSC minor or #)

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.

DSC 8310. Topics in Development Studies and Social Change. (1 cr [max 3 cr]; S-N only. Prereq—Grad DSSC minor or #)

Seven-week seminar. Topical issues in development and social change.

Dutch (DTCCH)

Department of German, Scandinavian, and Dutch College of Liberal Arts

DTCCH 5993. Directed Studies. (1-4 cr [max 12 cr]; Stndt Opt. Prereq—F, %, @) Guided individual reading or study.

East Asian Studies (EAS)

Institute of International Studies

College of Liberal Arts

EAS 5940. Topics in Asian History. (1-4 cr [max 16 cr]; Stndt Opt. Prereq—Grad or intr consent) Selected topics such as cultural, economic, intellectual, political, and social history.

EAS 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

EAS 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 per semester or summer; 10 cr total required [Plan A only])

Ecology, Evolution, and Behavior (EEB)

Department of Ecology, Evolution and Behavior

College of Biological Sciences

EEB 5001. Spatiotemporal Dynamics of Plant Communities. (3 cr; Stndt Opt. Prereq—[Biol 5407, 4016] or #) Dynamic nature of plant communities in times of environmental changes. Emphasizes species invasion as key for structure/dynamics of plant assemblies. Observational, theoretical, and experimental studies on spatiotemporal dynamics of plant communities under various conditions in biological/environmental conditions, including human-induced Global Warming.

EEB 5008. Forest Response to Quaternary Climate Change. (2 cr; A-F or Aud. Prereq—Biol 4631 or 5407, EEB 4651 or Geo 4651) (concurrent registration EEB 5009) Forest responses to past climate change at the population, community, and ecosystem level. Response to natural and human disturbance, range shifts and invasions. Limitations to the speed of response to rapid climate change.


EEB 5011. Pollen Morphology. (2 cr; Stndt Opt. Prereq—Biol 3007, PBiol 4321 or #) Morphology and nomenclature of pollen grains and pteridophyte spores, survey of pollen and spores of major plant families, lab techniques.

EEB 5013. Quaternary Plant Macrofossils. (2 cr; Stndt Opt. Prereq—PBiol 4321 or 4511 or #) Morphology of seeds, fruits, and other macroscopic remains likely to occur in Quaternary deposits, survey of fossils of major plant families, lab techniques.

EEB 5033. Population and Quantitative Genetics. (4 cr; A-F or Aud. Prereq—[Biol 4003 or GCD 3022], intro statistics or #) 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 5042. Quantitative Genetics. (3 cr; A-F only. Prereq—Biol 4003 or GCD 3022 or #) A course in statistics is recommended. 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 5051. Analysis of Populations. (3 cr; Stndt Opt. Prereq—One semester college biology, intro statistics) Factors involved in the regulation, growth, and general dynamics of populations. Data needed to describe populations, population growth, population models, and regulatory mechanisms.


EEB 5068. Plant Physiological Ecology. (3 cr) Plant function, its plasticity/diversity in an ecological context. Impact of environmental stresses on major physiological processes of plants, including photosynthesis, respiration, water uptake/transport, and nutrient uptake/assimilation. Lab, field trip to Cedar Creek.

EEB 5122W. Plant Interactions with Animals and Microbes. (3 cr; A-F or Aud. Prereq—Biol 5122 or 5002, 3407 or 3409) Ecological and environmental implications of mutualistic and antagonistic interactions between plants, animals and microbes at organismal, population, and community levels.


EAS 5211. Molecular and Genomic Evolution. (3 cr; A-F or Aud. Prereq—[Biol 4003 or GCD 3022], grad student) or #) Molecular basis of evolutionary change. Current studies of selection and neutral evolutionary processes at molecular level. Evolution from gene to genome level: protein structure and function, multigene families, organelle genomes, genome organization. Lectures, discussions of current literature, and workshops where students practice analyses.

EAS 5231. Evolution of Social Behavior. (3 cr; A-F or Aud. Prereq—Biol 5407 or #) Introduction to theories and concepts relating to behavior evolution, mating systems, and cooperative behavior in animals.

EAS 5322. Evolution and Animal Cognition. (3 cr; Stndt Opt. Prereq—Biol 5407 or Psy 5061 or #) Animal cognitive abilities. Learning, perception, memory, navigation, and communication from evolutionary/comparsive 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.”
ECON 5091. Game Theory for Engineers. (4 cr; A-F or Aud. Prereq: [(EE 2285, EE 2373, Math 2374, Math 3283) or Math 4606], M.S. / Ph.D. student in [engineer or comp sci or info tech or operations mgmt]) or #; not for econ undergrads or Ph.D students)

ECON 5151. Elements of Economic Analysis: Firm and Households. (2 cr; Stdt Opt. Prereq: 3101, 3102, or equiv, Math 1271 or equiv, Math 2243 or equiv, grad or #)
Decision-making by households and firms under conditions of perfect competition, monopoly, and monopolistic competition.

ECON 5152. Elements of Economic Analysis: Income and Employment. (2 cr; Stdt Opt. Prereq: 3101, 3102 or equiv, Math 1271 or equiv, Math 2243 or equiv, grad or #)
Determinants of national income, employment, and price level; aggregate consumption, investment, and asset holding.

ECON 5312. Growth, Technology, and Development. (3 cr; Stdt Opt. Prereq: 3101, 3102 or equiv or #)
Economics of research and development; technical change and productivity growth; impact of technology on institutions; science and technology policy.

ECON 5890. Economics of the Health-Care System. (5 cr; A-F or Aud. Prereq: PUBH 6852, Prereq: [3101, 3102] or #)
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 cr; Stdt Opt. Prereq: 5151 or equiv, Math 2243, Math 2265 or equiv or #)
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 cr; Stdt Opt. Prereq: 8001)
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 cr; Stdt Opt. Prereq: 8002)
Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4163.

ECON 8004. Microeconomic Analysis. (2 cr; Stdt Opt. Prereq: 8003)
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 cr; Stdnt Opt. Prereq-5151 or equiv, Math 2243 or equiv, &Math 5615 or concurrent registration in Math 8601, grad econ major or #) 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 cr; Stdnt Opt. Prereq-5152 or equiv, Math 2243, Math 2263 or equiv or #) Dynamic general equilibrium models: solving for paths of interest rates, consumption, investment, prices. Models with uncertainty, search, matching, indivisibilities, private information. Implications for measurement and data reporting. Overlapping generations and dynasty models. Variational and recursive methods. This seven-week course meets with 4165.


ECON 8111. Introduction to Mathematical Economics. (2 cr; Stdnt Opt. Prereq-Math 2243 or equiv, &Econ 8101, &Math 5615 or comparable abstract math course) Use of mathematical models in economic theory. Standard techniques.

ECON 8112. Introduction to Mathematical Economics. (2 cr; Stdnt Opt. Prereq-8111, &Econ 8102, &Math 5615 or comparable abstract math course) Use of mathematical models in economic theory. May include special topics.

ECON 8118. Noncooperative Game Theory. (2 cr; Stdnt Opt. Prereq-5156 or Math 5615 or equiv or #) 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 cr; Stdnt Opt. Prereq-5156 or Math 5615 or equiv or #) 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, compenency, and noncooperative implementation of cooperative solution concepts. Seven-week course.

ECON 8121. History of Economic Thought. (2 cr; Stdnt Opt. Prereq-8104, 8105 or #) Selected topics, emphasizing development of theoretical topics. Seven-week course.

ECON 8122. History of Economic Thought. (2 cr; Stdnt Opt. Prereq-8124 or #) Selected topics, emphasizing development of theoretical topics. Seven-week course.

ECON 8181. Advanced Topics in Microeconomics. (2 cr [max 4 cr]; Stdnt Opt. Prereq-8104 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8182. Advanced Topics in Microeconomics. (2 cr [max 4 cr]; Stdnt Opt. Prereq-8104 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8185. Advanced Topics in Macroeconomics. (2 cr [max 4 cr]; Stdnt Opt. Prereq-8108 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8186. Advanced Topics in Macroeconomics. (2 cr [max 4 cr]; Stdnt Opt. Prereq-8108 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8191. Workshop in Mathematical Economics. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq-8110 or #) Students conduct research and present papers under faculty supervision.

ECON 8192. Workshop in Mathematical Economics. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq-8110 or #) Students work on research and present papers under faculty supervision.


ECON 8205. Applied Econometrics. (2 cr; Stdnt Opt. Prereq-Math 2242 or equiv, &Econ 8101, &Econ 8105, &Stat 5101 or #) 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 cr; Stdnt Opt. Prereq-8205, &8105, &8107, &Stat 5101 or #) 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 cr; Stdnt Opt. Prereq-8206, &8103, &8107, &Stat 5102 or #) 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 cr; Stdnt Opt. Prereq-8207, &8104, &8108, &Stat 5102 or #) 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 cr; Stdnt Opt. Prereq-5151, 5152, Math 2242 or equiv, Stat 5102 or #) Linear regression; general linear hypotheses; Gauss Markov Theorem, generalized least squares and their applications, hypothesis testing 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 8311. Economic Growth and Development. (2 cr; Stdnt Opt. Prereq–8103, 8105 or #) 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 cr; Stdnt Opt. Prereq–8311 or #) 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 cr; Stdnt Opt. Prereq–8312 or #) 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 8311. Economic Growth and Development. (2 cr; Stdnt Opt. Prereq–8103, 8105 or #) 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 cr; Stdnt Opt. Prereq–8311 or #) 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 cr; Stdnt Opt. Prereq–8312 or #) 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 8391. Workshop in Economic Growth and Development. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–#) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8392. Workshop in Economic Growth and Development. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–#) Faculty and student presentations based on recent literature. Seven-week course.


ECON 8402. International Trade and Payments Theory. (2 cr; Stdnt Opt. Prereq–8401 or #) Tariffs, quotas, and other barriers to trade; gains from trade; trading blocs; increasing returns; growth. This is a seven-week course.

ECON 8403. International Trade and Payments Theory. (2 cr; Stdnt Opt. Prereq–8402 or #) International business cycles; exchange rates; capital movements; international liquidity. This is a 7-week course.

ECON 8404. International Trade and Payments Theory. (2 cr; Stdnt Opt. Prereq–[8402, 8+403 or #] Theoretical models of international trade. Trade data, empirical work on trade. Seven week course.

ECON 8404. National Theory. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

ECON 8405. Advanced Topics in International Trade. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8403 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8406. Advanced Topics in International Trade. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8403 or #) Faculty and student presentations based on recent literature. Seven-week course.


ECON 8581. Advanced Topics in Labor Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8502 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8582. Advanced Topics in Labor Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8502 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8601. Industrial Organization and Government Regulation. (2 cr; Stdnt Opt. Prereq–8102 or #) 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 cr; Stdnt Opt. Prereq–8601 or #) 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 cr; Stdnt Opt. Prereq–8602 or #) 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. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 5% for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 must register up to four times, up to 60 combined cr)

ECON 8681. Advanced Topics in Industrial Organization. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8603 or #) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8682. Advanced Topics in Industrial Organization. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8603 or #) Faculty and student presentations based on recent literature. Seven-week course.


Course Descriptions

ECON 8703. Monetary Economics. (2 cr; Stdnt Opt. Prereq–7672 or #)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8704. Financial Economics. (2 cr; Stdnt Opt. Prereq–8103, 8106 or #)
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 cr; Stdnt Opt. Prereq–8704 or #)
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 8716. Advanced Topics in Monetary Economics. (1-3 cr [max 10 cr]; Stdnt Opt. Prereq–8705 or #)
Advanced topics in monetary economics. Seven-week course.

EDUC 8882. Advanced Topics in Public Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8603 or #)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8708. Financial Economics. (2 cr; Stdnt Opt. Prereq–8707 or #)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8709. Financial Economics. (2 cr; Stdnt Opt. Prereq–8707 or #)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8717. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

EDUC 8782. Advanced Topics in Monetary Economics. (2 cr [max 4 cr]; Stdnt Opt. Prereq–8702 or #)
Faculty and student presentations based on recent literature. Seven-week course.

EDUC 8783. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

EDUC 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

EDUC 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

EDUC 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

EDUC 8788. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Education (EDUC)

College of Education and Human Development

EDUC 8353. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

EDUC 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

Education and Human Development (EDHD)

College of Education and Human Development

EDHD 5001. Learning, Cognition, and Assessment. (3 cr; Stdnt Opt. =EPSY 3119, Prereq–MED/initial licensure student or CLA music ed or preteaching major or #; psychology course recommended)
Principles of learning, cognition, cognitive development, classroom management, motivation, instruction, assessment. Approaches include behaviorism, cognitive and social constructivism, human information processing theory. Topics include intelligence, knowledge acquisition, reasoning skills, scholastic achievement, standardized testing, reliability, validity, student evaluation, performance assessment, psychometrics, demonstrations. Applications to instruction and organization of curricular materials.

EDHD 5003. Developmental and Individual Differences in Educational Contexts. (3 cr; A-F or Aud. Prereq–Jr or sr or post-bac or MED/initial licensure or CLA music ed or preteaching major or FOE or agriculture or kinesiology or #; psychology course recommended)
Overview of developmental/individual differences of children/adolescents in educational contexts. Emphasizes behavioral biology, dynamic systems, and ecological perception.

EDHD 5004. Teaching Students With Special Needs in Inclusive Settings. (2 cr; A-F only. Prereq–Teacher preparation program in [CEHD or music education or agriculture education or DirecTrack] or #)
Exceptionalities in educational settings as defined in federal/state rules/regulations. Historical perspectives, definitions, etiology, needs, characteristics. Service delivery systems for each exceptionality.

EDHD 5005. School and Society. (2 cr; A-F or Aud. Prereq–Jr or sr or MED/initial licensure student or CLA music ed major or preteaching major or #)
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 5007. Technology for Teaching and Learning. (1.5 cr; A-F or Aud. Prereq–[MED/initial licensure or CLA music ed major or preteaching major or #; basic computer skills] Diverse educational technology in K-12 classrooms. Effective use of technology. Computer technologies used to stimulate productive/communicate and to enhance teaching/learning processes.

EDHD 5009. Human Relations: Applied Skills for School and Society. (1 cr; A-F or Aud. Prereq–MED/init lic or CLA music ed or preteaching or #)
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.

Educational Policy and Administration (EDPA)

Department of Educational Policy and Administration

College of Education and Human Development

EDPA 5001. Formal Organizations in Education. (3 cr; Stdnt Opt.)
Classical/current theories of organizations. Applications to education and related fields.

EDPA 5011. Leading Organizational Change: Theory and Practice. (3 cr; Stdnt Opt.)
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.

EDPA 5021. Historical Foundations of Modern Education. (3 cr; Stdnt Opt. =EDPA 3021, HUM 3021, HUM 4021)
Analysis and interpretation of important elements in modern education derived from pre-classical sources: Greeks, Romans, Middle Ages, Renaissance, Reformation, Enlightenment, and Industrial Revolution.

EDPA 5023. History of Western Educational Thought. (3 cr; Stdnt Opt. =EDPA 3023, HUM 3023, HUM 4023)
Great educational classics of Western civilization: Plato, Aristotle, Quintilian, Montaigne, Milton, Locke, Rousseau, and others.

EDPA 5024. History of Ideas in American Education. (3 cr; Stdnt Opt.)
EDPA 5026. Education Imagery in Europe and America. (3 cr; Stdnt Opt)
Imagery 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.

EDPA 5032. Comparative Philosophies of Education. (3 cr; Stdnt Opt)
Exploration of the principal philosophies in educational thought today, e.g., realism, idealism, pragmatism, and postmodernism. Practice in philosophical critique.

EDPA 5036. Ethics, Morality, and Values in Education. (3 cr; Stdnt Opt)
Application to key issues of professional practice. Moral education, virtues, principles.

EDPA 5041. Sociology of Education. (3 cr; Stdnt Opt. =SOC 5455)
Structures and processes within educational institutions; linkages between educational organizations and their social contexts, particularly related to educational change.

EDPA 5044. Introduction to the Economics of Education. (3 cr; Stdnt Opt)
Costs and economic benefits of education, with a focus on K-12; educational markets, prices, and production relationships; investment and cost-benefit analysis.

EDPA 5048. Cross-Cultural Perspectives on Leadership. (3 cr; Stdnt Opt)
Introduction to cultural variables of leadership that influence functioning of cross-cultural groups. Lectures, case studies, discussion, problem-solving, simulations. Intensive workshop.

EDPA 5052. Ethnic Groups and Communities: Families, Children, and Youth. (3 cr; Stdnt Opt)

EDPA 5056. Case Studies for Policy Research. (3 cr; A-F or Aud)
Qualitative case study research methods and their applications to educational policy and practice. Emphasis on choosing its studies that employ open-ended interviewing as primary data collection technique.

EDPA 5057. Research in International Education. (3 cr; Stdnt Opt)

EDPA 5061. Ethnographic Research Methods. (3 cr; Stdnt Opt)
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.

EDPA 5064. Divergent Perspectives in Educational Policy and Practice. (3 cr; Stdnt Opt)
Examines fundamental and current issues in the field of education. Participants learn how to approach an issue from multiple perspectives, develop skills to identify and analyze its component parts, and examine personal belief systems to place a given issue within a personal context.

EDPA 5070. Special Topics: School Leadership. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq-BA or BS or other baccalaureate degree)
Skills/knowledge necessary to respond to multiple challenges of reduced budgets, increased accountability requirements, and growing concerns about impact of technology investments in education.

EDPA 5080. Special Topics: Educational Policy and Administration. (1-3 cr [max 24 cr]; Stdnt Opt)
Topical issues in educational policy/administration.

EDPA 5087. Seminar: Educational Policy and Administration. (1-3 cr [max 24 cr]; Stdnt Opt)
Shared responsibility of students/instructor in presentation of topics.

EDPA 5095. Problems: Educational Policy and Administration. (1-3 cr [max 24 cr]; Stdnt Opt)
Course or independent study on specific topic within department program emphasis.

EDPA 5096. Internship: Educational Policy and Administration. (1-9 cr [max 24 cr]; Stdnt Opt)
Internship in elementary, secondary, general, or postsecondary administration, or other approved field related setting.

EDPA 5101. International Education and Development. (3 cr; Stdnt Opt)
Introduction to comparative and international development education, contemporary theories regarding the role of education in the economic, political, and sociocultural development of nations; examination of central topics and critical issues in the field.

EDPA 5102. Knowledge Constructions and Applications in International Development Contexts. (3 cr; Stdnt Opt)
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.

EDPA 5103. Comparative Education. (3 cr; Stdnt Opt)
Comparison 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.

EDPA 5104. Strategies for International Development of Education Systems. (3 cr; A-F or Aud, 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.

EDPA 5109. Critical Issues in International Education and Educational Exchange. (3 cr; Stdnt Opt)
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.

EDPA 5112. Anthropology of Education. (3 cr; Stdnt Opt. =ANTH 5120)
Insights from educational anthropology for educators to address issues of culture, ethnicity, and power in schools.

EDPA 5132. Intercultural Education and Training: Theory and Application. (3 cr; Stdnt Opt)
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.

EDPA 5134. Futures Research for Educational Leaders. (3 cr; A-F only. Prereq-Grad student)
Perspectives/methods of futures research. Historical/antecedent and contemporary influences on futures research. Futures research as social technology vs (inexact) science. Primary toolbox of futures research. Emerging potentials of futures research.

EDPA 5136. Scenario and Story Planning for Educational Innovators. (3 cr; A-F only. Prereq-Grad student)
How to create/use strategic scenarios/stories to anticipate/shape forces/events that could impact future educational design, policy, practice, and administration. Designing, analyzing, comparing multiple scenarios/stories; initial conditions, including assumptions, information content, and contexts.

EDPA 5141. Global Youth Policy and Leadership: Comparative Youth Policy and Leadership. (3 cr; A-F only. Prereq-CIDE student or #)
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 directed to provide programs/services to young persons.

EDPA 5142. Youth Futures in International and Global Contexts. (3 cr; A-F only. Prereq-CIDE student or #)
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.

EDPA 5144. Cultural Models, Simulations, and Games. (3 cr; Stdnt Opt. Prereq-Upper div or grad student)
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.

EDPA 5301. Contexts of Learning: Historical, Contemporary, and Projected. (3 cr; A-F or Aud)
Contextual understanding of education as a social institution. Education is studied as one institution among the several that constitute its dynamic context.

EDPA 5302. Educational Policy: Context, Inquiry, and Issues. (3 cr; Stdnt Opt)
Review of social science concepts/research in considering educational policies/issues, process of inquiry that affects policy development, implementation, evaluation. Focus on pre-K-12. Role of educational leaders, administrators.

EDPA 5303. Managing the Learning Organization. (3 cr; A-F or Aud)
Examines schools, colleges, and other human service organizations centered on learning. Focuses on perspectives and skills needed to manage organizations effectively.

EDPA 5304. Educational Leadership for Equity, Opportunity, and Outcome. (3 cr; Stdnt Opt)
Implications of multiple contexts in which leadership occurs. Role of followers. Complexities of collaborative structures and of shared governance.
Course Descriptions

EDPA 5305. Leadership and Vision in School Technology. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) How to create a shared vision for comprehensive integration of technology into educational environments. Ways to foster environment/culture conducive to realization of vision.

EDPA 5306. Staff Technology Development and Support. (1 cr; Stdnt Opt. =CI 5346. Prereq-Broadband Internet access, a newer computer) How to lead an organization in designing, implementing, evaluating, improving, and sharing approaches to staff development. Technology-related development. Facilitating staff development through use of technology.

EDPA 5307. School Management and Technology. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Various organizational/management issues impacted by information technology. Focuses on hardware, software, and database technologies designed to facilitate management/operations of school organizations.

EDPA 5308. Emerging Issues and School Technology. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Needs of schools/administrators to remain on forefront of information technologies. Focuses on anticipated technological trends years/decades ahead.

EDPA 5309. Electronic Communication Tools and Environments for Schools. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Various electronic communication channels, information environments to facilitate educational organizations’ operations/communication. Focuses on networked environments, integration with handheld computers, and outreach to internal/external stakeholders.

EDPA 5310. Data-Driven Decision Making I. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) 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.

EDPA 5311. Data-driven Decision Making II. (1 cr; Stdnt Opt. Prereq-5310, broadband Internet access, a newer computer) Continuation of data-driven decision making for schools/administrators. Hands-on training in students’ own organizations in using technology to analyze data to make educational decisions.

EDPA 5312. School Technology Policy Issues. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Various state/municipal issues related to educational technology. Focuses on “digital divide” in schools/communities, federal educational technology policy initiatives, and state/federal educational technology legislation.

EDPA 5313. Legal and Ethical Issues in School Technology. (1 cr; Stdnt Opt. Prereq-Broadband Internet access, a newer computer) Social, legal, and ethical issues related to school technology. How to model responsible decision-making related to these issues.


EDPA 5315. School Technology Leadership Multimedia Project. (1 cr; Stdnt Opt. Prereq- [Mac or PC]; 250 MB RAM, [Windows T 2000 or XP or Mac OS 9 or 10], Pentium [2 or faster], internet connection, [Netscape or Internet Explorer], virus protection software, School Technology Leadership) Students focus on individualized school technology leadership topic of choice, deliver a multimedia presentation of project results. Regular consultation with faculty, peer mentors, and outside mentors.

EDPA 5321. The Principal as Leader of High-Performing Schools. (3 cr; Stdnt Opt) Role of principal: qualifications, duties, problems.

EDPA 5322. Leaders in the Supervendity and Central Office. (3 cr; Stdnt Opt) 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.


EDPA 5326. Data Analysis for Educational Leadership. (2 cr; Stdnt Opt. Prereq-[5325 or equiv.], #) Advanced technological/analytical tools associated with data-driven decision-making processes in K-12 school environments.

EDPA 5328. Introduction to Educational Planning. (3 cr; Stdnt Opt) Principles, tools, comparative practices, and emerging issues in K-12 and higher education settings; decision making models, strategic and project planning; barriers to effectiveness; and change management processes.

EDPA 5332. Leadership Development Seminar. (3 cr; Stdnt Opt) Assessment and development of skills required of the educator in planning, decision making, and human relations. Introduction to contemporary issues in educational administration.

EDPA 5336. Laboratory in Decision Making. (3 cr; Stdnt Opt) Contributions of recent research and theory to effective administration. Analysis of administrative behavior in realistic settings; relations of administration to human behavior.

EDPA 5341. The American Middle School. (3 cr; Stdnt Opt) Focus on the uniqueness of the early adolescent and appropriate learning situations. For educators working with middle-level students.


EDPA 5346. Politics of Education. (3 cr; A-F or Aud. Prereq-postbac, MEd, or grad student) Political dimensions of policy making and implementation in education. Use of power/ influence in shaping educational policies and in resolving conflicts over educational issues. Analysis of consequences/cross-impacts.

EDPA 5348. Leaders of Human Resources Administration. (2 cr; Stdnt Opt. Prereq- Designed for students working on licensure for dir of community educ or superintendent or K-12 principal or dir of special educ) Skills required for effective administrator/leader. Human resources administration. Employee recruitment, selection, orientation/support, supervision, performance appraisal of school district personnel.

EDPA 5352. Projective Leadership for Strategic Learning Communities. (3 cr; Stdnt Opt) Explores many trends and changes facing society, culture, and education from a strategic learning community perspective; helps students “futureize the present.”

EDPA 5356. Disability Policy and Services. (3 cr; Stdnt Opt) 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.

EDPA 5361. Project in Teacher Leadership. (3 cr [max 6 cr]; S-N or Aud. =CI 5178. Prereq-MEd student in Teacher Leadership Program) 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.

EDPA 5364. Context and Practice of Educational Leadership. (3 cr; A-F or Aud) 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.

EDPA 5368. Leadership for Special Education Services. (3 cr; Stdnt Opt. Prereq-Administrator or supervisor or professional responsible for managing general or special or alternative education program) Legislative, procedural, executive, and judicial actions that affect services, families, and children with special needs at federal, state, and local levels.

EDPA 5372. Youth in Modern Society. (3 cr; Stdnt Opt) 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.


EDPA 5376. Organizational Approaches to Youth Development. (3 cr; Stdnt Opt) Defining youth development within framework of formal and informal organizations; organizational systems responsible for youth development in the community; policy issues surrounding these systems.
EDPA 5378. Experiential Learning: Theory and Practice. (3 cr; Stdnt Opt)
Theory/practices of learning by doing. Educator’s personal engagement in process. Technical, motivational, and evaluative aspects.

EDPA 5381. The Search for Children and Youth Policy in the U.S. (3 cr; Stdnt Opt)
Review of contemporary policy issues affecting children and youth, present status, development, functions, organization, and present the course.

EDPA 5384. Collaboration in Heterogeneous Classrooms and Schools. (3 cr; A-F or Aud)
Policy, research, practice base for addressing range of student abilities/backgrounds in diverse schools. Collaborative approaches to curricular, instructional, social support.

EDPA 5385. Licensure Seminar: Program Policies and Inclusionary Leadership. (1 cr; S-N or Aud)
Preparation for licensure program. Program overview, preassessment, reflective practice, APA writing, exit panel review, administrative employment interview.

EDPA 5386. Leadership Portfolio Seminar. (1 cr; S-N or Aud. Prereq—5385 or &5385)
Development of electronic administrative license portfolio to earn endorsement for license as school superintendent. K-12 principal, director of special education, or director of community education.

EDPA 5387. Leadership for Teaching and Learning. (2 cr; Stdnt Opt. Prereq—Undergrad degree)
Administration of inclusive/coherent systems of teaching/learning. Design principles, best practices, exemplary programs. School/domain administrator roles as leaders of learning systems.

EDPA 5388. Leadership for Master(Full) Scheduling. (2 cr; Stdnt Opt, Prereq—5387)
Scheduling models. Strategies for personalizing schools. Hands-on “infinite campus student system.” Master schedule is built online.

EDPA 5389. Community Education Leadership. (3 cr; Stdnt Opt)
Competencies of leadership, policy, and political influence. Legal/regulatory applications focusing on special education law.

EDPA 5392. Special Education Finance: Program Models, Policy, and Law. (2 cr; Stdnt Opt. Prereq—Knowledge of special education; [5324 or &5324] recommended)
How special education revenue is a resource used to accomplish student-related objectives. Special education revenue sources, compliance, budget monitoring, key special education policy, case law, program models from perspective of director of special education.

EDPA 5393. Leading School Finance Elections. (1 cr; S-N or Aud)
Comprehensive planning model for conducting school finance elections. Emphasizes systems, strategies, and campaign tactics.

EDPA 5394. Leadership in Community Education Finance and Law. (1 cr; S-N or Aud. Prereq—5324 recommended)
Interplay between finance and laws directly applicable to community education. MN Statute 124D, revenues/expenses, and UFARS approached from frame of resource development.

EDPA 5396. Field Experience in PK-12 Administration: Authentic Practice in Leadership. (3 cr [max 12 cr]; S-N or Aud. Prereq—#)
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.

EDPA 5501. Principles and Methods of Evaluation. (3 cr; Stdnt Opt. +EPSY 5243)
Introduction to program evaluation. Planning an evaluation study, collecting and analyzing information, reporting results; evaluation strategies; overview of the field of program evaluation.

EDPA 5521. Cost and Economic Analysis in Educational Evaluation. (3 cr; Stdnt Opt)
Use and application of cost-effectiveness, cost-benefit, cost-utility, and cost-effectiveness in evaluation of educational programs and programs.

EDPA 5524. Evaluation Colloquium. (1 cr [max 24 cr]; S-N or Aud. +EPSY 5246. Prereq—5501 or EPSY 5243)
Informal seminar of faculty and advanced students. Issues/problems of program evaluation.

EDPA 5528. Focus Group Interviewing Research Methods. (3 cr; Stdnt Opt)
Skills needed to conduct focus group interviews. Students conduct focus group study and report results at final class session.

EDPA 5701. U.S. Higher Education. (3 cr; Stdnt Opt)
U.S. higher/postsecondary education in historical/contemporary perspective. Emphasizes structure, history, and purposes of system as a whole.

EDPA 5704. College Students Today. (3 cr; Stdnt Opt. +EPSY 5451)

EDPA 5721. Racial and Ethnic Diversity in Higher Education. (2-3 cr [max 3 cr]; Stdnt Opt)
Review of research. Theoretical frameworks, methodological perspectives, and research strategies used to study students, staff, and faculty; historical perspectives.

EDPA 5724. Leadership and Administration of Student Affairs. (2-3 cr [max 3 cr]; Stdnt Opt. +EPSY 5421)
Scope, administration, coordination, and evaluation of programs in college and university student affairs.

EDPA 5727. Developmental Education Programs and Postsecondary Students. (2-3 cr [max 3 cr]; Stdnt Opt. Prereq—Bachelor’s degree)

EDPA 5728. Two-Year Postsecondary Institutions. (2-3 cr [max 3 cr]; Stdnt Opt)
Present status, development, functions, organization, curriculum, and trends in postsecondary, but nonbaccalaureate, institutions.

EDPA 5732. The Law and Postsecondary Institutions. (3 cr; Stdnt Opt)
Analysis of court opinions and federal regulations affecting postsecondary educational institutions.

EDPA 5734. Institutional Research in Postsecondary Education. (2-3 cr [max 3 cr]; A-F or Aud. Prereq—[5701, EPSY 5231 or EPSY 8261], grad student) or [#)
Scope, role, administration, research strategies, and evaluation of institutional research in postsecondary institutions. Overview of research methodologies, disciplinary foundations of institutional research. Use of institutional, state, and national databases in addressing full range of institutional missions/functions.

EDPA 5795. Plan B Research Design. (1 cr [max 6 cr]; A-F or Aud. 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.

EDPA 8002. Critical Issues in Contemporary Education. (5 cr; Stdnt Opt. Prereq—EdPA PhD student)
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.

EDPA 8011. Doctoral Research Seminar I. (1 cr; S-N or Aud. Prereq—EdPA doctoral student)
Introduction/planning for 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.

EDPA 8012. Doctoral Research Seminar II. (1 cr; S-N or Aud. Prereq—EdPA doctoral student)
Introduction to quantitative/qualitative research approaches/methods. Nature of research, role of researcher, philosophical perspectives on research, ethical issues in conducting research.

EDPA 8013. Doctoral Research Seminar III. (1 cr; S-N or Aud. Prereq—EdPA doctoral student)
Introduction to most important quantitative/qualitative approaches employed in educational policy research.

EDPA 8014. Doctoral Research Seminar IV. (1 cr; S-N or Aud. Prereq—EdPA doctoral student)
Preparation of thesis prospectus.

EDPA 8015. Research Design and Educational Policy. (3 cr; A-F only. Prereq—8001, EdPA PhD student)
Logic of research design, from research questions and audience considerations to selection of a suitable design for collecting/analyzing quantitative, qualitative, and mixed-method data.

EDPA 8020. Leadership: From Theory to Reflective Practice. (3 cr; A-F or Aud. Prereq—[5001 or equiv], doctoral student) or [#)
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.

EDPA 8022. Education and Globalization: Anthropological Perspectives. (3 cr; A-F or Aud)
Anthropological perspectives used to understand educational processes in a globalized world. What can be gained by adopting translocal view of educational phenomena.

EDPA 8087. Seminar: Educational Policy and Administration. (1-3 cr [max 24 cr]; Stdnt Opt)
Topical issues.
Course Descriptions

EDPA 8095. Problems: Educational Policy and Administration. (1-3 cr [max 24 cr]; Stdtnt Opt) Independent study on issues of educational policy/administration. Arranged with instructor.

EDPA 8096. Internship: Educational Policy and Administration. (1-9 cr [max 24 cr]; Stdtnt Opt) Internship on issues of educational policy/administration. Arranged with instructor.


EDPA 8121. Doctoral Seminar: Comparative and International Development Education. (1-6 cr [max 6 cr]; Stdtnt Opt. A-F or Aud. Prereq-EdPA PhD candidate) Focuses on needs of students while writing the dissertation; general guidance in how to construct the thesis.

EDPA 8124. Classic Readings in Anthropology and Education. (5 cr; A-F or Aud) Major contributions to theory or working paradigms.

EDPA 8143. Integrative Seminar in Global Youth Policy and Leadership. (1 cr [max 3 cr]; A-F only. Prereq-CIDE student or #) 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.


EDPA 8303. Modeling the Learning Organization. (3 cr [max 4 cr]; Stdtnt Opt) Computer software, perspectives on learning organization used to study global education, human service organizations.

EDPA 8304. Leadership and Ethics. (3 cr; Stdtnt Opt) 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.

EDPA 8321. Data Analysis for Educational Management. (3 cr; Stdtnt Opt) 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.

EDPA 8335. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

EDPA 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

EDPA 8502. Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives. (3 cr; Stdtnt Opt. Prereq-5501 or EPSY 5243) Concepts, approaches, models, and theoretical frameworks for program evaluation that have developed since the 1960s.


EDPA 8596. Evaluation Internship. (1-9 cr [max 24 cr]; Stdtnt Opt. EPSY 8296. Prereq-[5501 or EPSY 5243]. #) Hands-on experience in conducting a program evaluation in a real-world setting under supervision of an evaluation professional.

EDPA 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no registration after 1st/2nd registration, 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)

EDPA 8702. Administration and Leadership in Higher Education. (3 cr; Stdtnt Opt. Prereq-5001, 5701) Leadership, governance, and administration in higher education through theoretical perspectives and practical analysis. Planning, change, decision making, organizational culture, budgets, politics.

EDPA 8703. Public Policy in Higher Education. (3 cr; A-F or Aud. Prereq-5001, 5701) 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.

EDPA 8721. Instruction and Learning in Higher Education. (2-3 cr [max 3 cr]; Stdtnt Opt) Theory/practice of teaching strategies. Implications of student differences (learning style, ethnicity, gender, age) for teaching, evaluation and professional development of teaching. Context/nature of faculty work, ethical issues, teaching portfolio development.

EDPA 8724. Strategic Planning in Higher Education. (2-3 cr [max 3 cr]; Stdtnt Opt. Prereq-5701) Strategic planning principles, their application to higher education, pitfalls encountered by planners in higher education. Selected tools of strategic planning/management, strategic planning case studies.

EDPA 8728. Economics of Higher Education. (2-3 cr [max 3 cr]; Stdtnt Opt) 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.


EDPA 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

EDPA 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

EDPSY 5101. Intelligence and Creativity. (5 cr; A-F or Aud) Contemporary theories of intelligence and intellectual development and contemporary theories of creativity and their implications for educational practices and psychological research.

EDPSY 5112. Knowing, Learning, and Thinking. (4 cr; A-F or Aud) Principles of human information processing, memory, and thought; mental operations in comprehension and problem solving; developing expertise and automaticity; emphasis on applied settings.

EDPSY 5113. Psychology of Instruction and Technology. (3 cr; Stdtnt Opt) 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.

EDPSY 5114. Psychology of Student Learning. (3 cr; A-F or Aud) 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.

EDPSY 5115. Psychology of Adult Learning and Instruction. (3 cr; Stdtnt Opt) 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.

EDPSY 5118. Language: Psycholinguistic Research and Educational Application. (5 cr; A-F or Aud) Psycholinguistic study of language. Psychological processes involved in language use, mechanisms that guide these processes. Failures of these mechanisms. How language operates.

EDPSY 5135. Human Relations Workshop. (4 cr; Stdtnt Opt) 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.

EDPSY 5141. Aggression in Schools. (3 cr; A-F or Aud. Prereq-5xxx course in [developmental or educational] psychology) Development of aggression in schools. Aggression defined, compared to cooperative/prosocial behavior. Theories, methods, gender/individual differences.

EDPSY 5142. Play in Development and Education. (3 cr; A-F or Aud. Prereq-Course in child or developmental psychology) Development/functions of play in humans with comparisons made to other species, especially non-human primates. Play as it relates to developmentally appropriate practice.
EPSY 5151. Cooperative Learning. (3 cr; Stdnt Opt) Participants learn how to use cooperative learning in their setting. Topics include theory and research, teacher’s role, essential components that make cooperation work, teaching social skills, assessment procedures, and collegial teaching teams.

EPSY 5152. Psychology of Conflict Resolution. (3 cr; Stdnt Opt) Overview of the field of conflict resolution. Major theories, research, major figures in the field, factors influencing quality of conflict resolution are covered. The nature of conflict, the history of field, and intrapersonal, interpersonal, intergroup conflict, negotiation, mediation are discussed.

EPSY 5153. Social Development in PreK to Secondary Schools. (3 cr; A-F only. Prereq—Course in psychology) Social development in educational settings, from preschool through high school.

EPSY 5157. Social Psychology of Education. (3 cr; A-F or Aud) 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. (5 cr; A-F or Aud) 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. (0-4 cr [max 30 cr]; Stdnt Opt) Focus on special topics in psychological and methodological concepts relevant to advanced educational theory, research, and practice not covered in other courses.

EPSY 5216. Introduction to Research in Educational Psychology and Human Development. (3 cr; A-F or Aud. Prereq—5261 or intro statistics course) Designing/conducting a research study. Reviewing literature, formulating research problem, using different approaches to gather data, managing/analyzing data, reporting results.

EPSY 5231. Principles of Educational and Psychological Measurement. (4 cr; Stdnt Opt. Prereq—5261 or equiv) Concepts, principles, and methods in educational/psychological measurement. Reliability, validity, item analysis, scales, score reports (e.g., grades). Modern measurement theories, including item response theory and generalizability theory. Emphasizes construction, interpretation, use, and evaluation of assessments regarding achievement, aptitude, interests, attitudes, personality, and exceptionality.


EPSY 5231. Introductory Statistics and Measurement in Education. (4 cr; Stdnt Opt. +EPSY 5261 or [EPSY 5251, EPSY 5261]) Students develop an understanding of basic statistics and measurement concepts and tools and apply them to the collection, analysis, and interpretation of data.

EPSY 5243. Principles and Methods of Evaluation. (3 cr; Stdnt Opt. +EDPA 5501) Introductory course in program evaluation, planning an evaluation study, collecting and analyzing information, reporting results; overview of the field of program evaluation.

EPSY 5244. Survey Design, Sampling, and Implementation. (3 cr; Stdnt Opt. Prereq—[5221 or 5231 or 5261 or equiv]. [CEHD grad student or MEEd student]) Survey methods, including mail, phone, and Web-based/e-mail surveys. Principles of measurement, constructing surveys, preliminary testing, sampling, data analysis, reporting. Students develop a survey proposal and a draft survey, pilot the survey, and develop sampling/data analysis plans.

EPSY 5246. Evaluation Colloquium: Psychological Foundations. (1 cr [max 8 cr]; S-N or Aud. +EDPA 5524. Prereq—5243 or EDPA 5501) Informal seminar of faculty and advanced students interested in the issues and problems of program evaluation.

EPSY 5247. Qualitative Methods in Educational Psychology. (3 cr; Stdnt Opt. Prereq—Grad student) Introduction to qualitative methods of inquiry. Contrasting different research traditions (e.g., case study, phenomenology, ethnography, social interactionism, critical theory). Practice with field notes, observations, and interviewing. Use of NVIVO to track/code data.


EPSY 5272. Statistics Teaching Internship. (3 cr; S-N or Aud. Prereq—Grad student, #) Supervised teaching experience.

EPSY 5281. Introduction to Computer Operations and Data Analysis in Education and Related Fields. (3 cr; Stdnt Opt. Prereq—Statistics course) 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. (1-9 cr [max 9 cr]; Stdnt Opt) Current issues in educational psychology or related areas not normally available through regular curriculum offerings.

EPSY 5300. Social Topics in Counseling Psychology. (1-4 cr [max 8 cr]; Stdnt Opt) Theory, research, and practice in counseling and student personnel psychology. Topics vary.

EPSY 5401. Counseling Procedures. (3 cr; Stdnt Opt. Prereq—Upper div student) Emphasis on the counseling relationship and principles of interviewing. Case studies, role playing, and demonstration. For individuals whose professional work includes counseling and interviewing.

EPSY 5412. Introduction to Developmental Counseling and Guidance. (3 cr; Stdnt Opt. Prereq—#) Contemporary models of counselors as advocates for all students. Emphasizes prevention and systems intervention with counselors involved in the developmental guidance curriculum, school counseling, staff and community collaboration, individual student planning, and learning success with diverse populations.


EPSY 5421. Leadership and Administration of Student Affairs. (3 cr; Stdnt Opt. +EDPA 5724) Theoretical approaches, administrative structure, and evaluation methods used in college/university student affairs.

EPSY 5422. Principles of Group Work Theory and Procedures. (3 cr; Stdnt Opt. Prereq—Advanced undergrad or grad student in the helping professions) Principles and practices of group work for educators and the helping professions. Discussion of various types of groups (e.g., counseling support, task, psychosocial). Applications to various settings and populations (e.g., schools and community agencies).

EPSY 5432. Foundations of Individual/Organizational Career Development. (3 cr; Stdnt Opt) Introduction to individual and organizational career development theory and practice. Examines critical issues in work patterns, work values, and workplaces in a changing global society, with implications for career planning, development, and transitions, emphasizing personal and organizational change.

For definitions of course numbers, symbols, and abbreviations, see page 214.
EPSY 5601. Survey of Special Education. (2 cr; Stdnt Opt.) Introduction to programs and services provided to people with disabilities in school and community settings. Emphasis on the needs of families, to the roles and responsibilities of teachers, and to related service providers.

EPSY 5604. Transition From School to Work and Community Living for Persons With Special Needs. (3 cr; Stdnt Opt) 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 5612. Understanding of Academic Disabilities. (5 cr; A-F or Aud) 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 cr; A-F or Aud. Prereq—Child development course, 5601 or equiv) Emphasis on the organization of educational programs and services for people with disabilities and their families. First course for students seeking to become licensed teachers in special education.

EPSY 5614. Foundations of Special Education II. (3 cr; A-F or Aud. Prereq—5613) Emphasis on assessment, planning, and implementing educational programs for people with disabilities. Second course for students seeking to become licensed teachers in special education.

EPSY 5615. Advanced Academic Interventions. (3 cr; A-F or Aud. Prereq—5612) Designing, implementing, and evaluating individual educational plans (IEPs) for special education service in learning disabilities and behavioral disorders, and mild mental/intellectual disabilities.

EPSY 5616. Behavior Analysis and Classroom Management. (3 cr; Stdnt Opt) Introduction to assumptions, principles, and procedures of behavioral approach to analyzing behavior and programs for classroom management. Emphasis on specifying problems, conducting observations, intervening, and evaluating behavioral change.

EPSY 5618. Specialized Interventions for Students With Disabilities in Reading and Written Language. (3 cr; A-F or Aud. Prereq—Enrollment in [EBD or LD or DD or D/HH] or #) 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 5621. Functional/Basic Academic Interventions in Mental Retardation. (3 cr; A-F or Aud. Prereq—5613, 5614) Methods and materials course emphasizing functional approaches to promoting academic learning in students with mild to moderate mental retardation and moderate to severe mental retardation.

EPSY 5622. Programs and Curricula for Learners with Severe Disabilities. (3 cr; Stdnt Opt. Prereq—5616) Emphasis on developing programs and curricula for students with moderate, severe, and profound developmental delays, as well as severe multiple disabilities. Special consideration given to preparing children and youth for integrated community environments.


EPSY 5626. Seminar: Developmental Disabilities and Instructional Management. (3 cr; Stdnt Opt. Prereq—5622 or #) Data-based strategies for school and nonschool instruction of learners with developmental disabilities including assessment, design, implementation, and evaluation of instructional plans. Curriculum content, concept and task analysis, classroom arrangements, natural and instructional cues, corrections, and consequences.

EPSY 5635. Education of Students with Physical and Health Disabilities. (3 cr; A-F or Aud. Prereq—5650 or #) Introduction to students with physical and health disabilities and their characteristics; the educational implications of physical disabilities; assessment procedures and appropriate educational interventions for learners with physical and health disabilities.

EPSY 5636. Education of Multihandicapped Learners with Sensory Impairments. (2 cr [max 3 cr]; Stdnt Opt. Prereq—5613, 5614) Characteristics of learners with visual and auditory impairments; design of instructional programs to remediate or circumvent disabilities, including use of prosthetic devices; related areas of performance affected by sensory impairments.

EPSY 5641. Foundations of Education for Individuals Who Are Deaf/Hard of Hearing. (3 cr; Stdnt Opt. Prereq—5644 or #) Historical and current issues related to education of individuals who are deaf or hard of hearing. Implications of causes of hearing loss, social and cultural relationships, philosophies of education, characteristics and legislative guidelines and their applicability to education of individuals who are deaf or hard of hearing.


EPSY 5646. Reading and Writing Practices with Deaf/Hard of Hearing Children. (3 cr; Stdnt Opt. Prereq—5644 or general educ methods in tchg reading and writing skills, or #) Gain knowledge and skills to assess, plan, and implement instruction for children and youth with hearing loss. Emphasis is placed on research, theoretical, and programmatic issues in developing reading and writing skills, curricular adaptations, and effective instructional approaches.

EPSY 5647. Aural and Speech Programming for Persons Who Are Deaf/Hard of Hearing. (3 cr; Stdnt Opt) 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 5649. Models of Instructional Programming With Deaf and Hard of Hearing Students. (3 cr; Stdnt Opt. Prereq—5641, 5644 or #) 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 5656. Social and Interpersonal Characteristics of Students with Disabilities. (3 cr; A-F or Aud) Emphasis on children and youth of school age and on the ways in which their emotional, social, and behavioral disorders affect their functioning in school and on ways in which their behaviors disturb others.

EPSY 5657. Interventions for Social and Emotional Disabilities. (3 cr; A-F or Aud. Prereq—5616, 5656) Developing comprehensive behavioral programs for students with social and emotional disabilities. Instructing students with social and emotional disabilities.


EPSY 5671. Literary Braille. (3 cr; A-F or Aud) Mastery of literary braille code including all contractions and short-form words used in Grade 2 English Braille: American Usage. Use of specialized braille writing equipment including, braille writer, slate and stylus, and computer programs with six-key input.

EPSY 5672. Advanced Braille Codes. (2 cr; A-F or Aud. Prereq—5671 or #) Mastery of the Nemeth code for braille mathematics transcription including elementary math computation, algebra, geometry, trigonometry, and symbolic logic notation. Introduction to foreign languages, computer notation, music, and raised line drawing techniques.
EPSY 5674. Techniques of Orientation, Mobility, and Independence for Students with Visual Disabilities. (3 cr; A-F or Aud. Prereq—5675 or #) Introduction to basic techniques to gain skills in pre-cane techniques, orientation to learning environments, and adaptations for activities of daily living and independence. Introduction to mobility maps, consideration of cane, guide dog, and telepnic aids to mobility.

EPSY 5676. Case Management for Children with Visual Disabilities. (3 cr; A-F or Aud. Prereq—5671, 5673, 5675) Advanced course evaluating and managing cognitive, psychosocial, physical, and academic needs of students. Consideration of parent, teacher, and student in counseling and educational program management.

EPSY 5681. Education of Infants, Toddlers, and Preschool Children with Disabilities: Methods and Materials. (3 cr; A-F or Aud. Prereq—5625) Overview of the methods and materials available to maximize the developmental and educational outcomes for young children, birth to age 5, who have disabilities and their families in home and school based-settings.

EPSY 5701. Practicum: Field Experience in Special Education. (1-6 cr [max 12 cr]; A-F or Aud. Prereq—5614, [FOE or SpEd grad or licensure student]) or #) 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 cr; A-F only. Prereq—5616, 5661, 5609, one of [5622 or 5644 or SLHS 5606], enrolled in Autism Spectrum Disorder certificate program) 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 cr; A-F only. Prereq—5616, 5657, Psy 4011, Applied Behavior Analysis Certificate student) or #) 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 5720. Special Topics: Special Education. (1-4 cr [max 12 cr]; Stdt Opt. Prereq—#) Lab and fieldwork approach, often assuming a product orientation, e.g., generation of action plan, creating set of observation field notes, collecting data in some form. Provides opportunities for educational personnel to study specific problems and possibilities related to special education.

EPSY 5740. Special Topics: Interventions and Practices in Educational and Human Service Programs. (1-4 cr [max 8 cr]; Stdt Opt. Prereq—#) Concepts, issues, and practices related to the community inclusion of children, youth, and adults with developmental disabilities through weekly seminar and extensive supervised experience working with individuals within the community.

EPSY 5751. Student Teaching: Deaf and Hard of Hearing. (1-6 cr [max 10 cr]; Stdt Opt. Prereq—#) Students participate in educational programming for infants, children, and youth who are deaf or hard of hearing. On-site, directed experiences under supervision of master teachers of deaf/hard of hearing students.

EPSY 5752. Student Teaching: Learning Disabilities. (1-6 cr [max 10 cr]; S-N or Aud. Prereq—#) Supervised experience in teaching related work in schools or other agencies serving children and adolescents with learning disabilities.

EPSY 5753. Student Teaching: Early Childhood Special Education. (1-6 cr [max 8 cr]; S-N or Aud. Prereq—#) Completion of all course requirements for license in ECSE) Supervised experience in teaching 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. (1-6 cr [max 8 cr]; A-F or Aud. Prereq—Completion of licensure courses for social and emotional disorders, #) 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. (1-6 cr [max 6 cr]; A-F or Aud. Prereq—Completion of all licensure coursework, #) 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. (1-6 cr [max 6 cr]; A-F or Aud. Prereq—Completion of all licensure coursework, #) 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 5757. Student Teaching: Physical and Health Related Disabilities. (1-6 cr [max 8 cr]; A-F or Aud. Prereq—#) Supervised student teaching and related work (direct instruction and consultation) in schools or other agencies serving children and adolescents who have physical disabilities.

EPSY 5758. Student Teaching: Visual Impairments. (1-6 cr [max 6 cr]; A-F or Aud. Prereq—#) Supervised student teaching, or special practicum project, in schools or other agencies serving children and adolescents who have visual impairments.

EPSY 5800. Special Topics in School Psychology. (1-9 cr [max 9 cr]; Stdt Opt) Current issues in school psychology or areas not normally available through regular curriculum offerings.

EPSY 5801. Assessment and Decision Making in School and Community Settings. (3 cr; A-F or Aud) 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, perspective taking, mathematics, adaptive behavior, and language.

EPSY 5849. Observation and Assessment of the Preschool Child. (3 cr or max 4 cr; Stdt Opt) Introduction to assessment principles and practices, including observational assessment methods, for classroom teachers. (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. Collaborative Family-School Relationships. (2-3 cr [max 5 cr]; Stdt Opt. Prereq—Honors senior or grad student) Theoretical and empirical bases for creating collaborative family-school relationships for students’ development and educational success in school. Emphasis on model programs of daily in K-12 and practical strategies for educational personnel to address National Educational goal 8.

EPSY 5852. Prevention and Early Intervention. (3 cr; Stdt Op) Theory/research base for school-based primary/secondary programs to promote academic/social competence of children/youth (birth to grade 12).

EPSY 5871. Interdisciplinary Practice and Interagency Coordination in Education and Human Services. (3 cr; Stdt Op) Principles and procedures of interdisciplinary practice and interagency coordination. Examine the relative strengths of interdisciplinary approaches, develop skills for collaborating with others, and examine different approaches to interagency coordination.

EPSY 5891. Independent Study in Educational Psychology. (1-8 cr [max 20 cr]; A-F or Aud. Prereq—#) Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member.

EPSY 8114. Seminar: Cognition and Learning. (3 cr; max 9 cr; Stdt Opt) 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 cr; Stdt Op) Seminar including, but not limited to, learning and instructional theories, advanced and emerging educational technologies, and measurement and evaluation.

EPSY 8177. Writing Empirical Paper and Research/Grant Proposals in Education and Psychology. (3 cr; Stdt Op) Prereq—#) 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 other's.

EPSY 8132. Personality Development and Socialization. (3 cr; Stdt Opt. Prereq—Personality or child psyche course) Major research and theoretical work. Developmental and educational influences on personality.

EPSY 8215. Advanced Research Methodologies in Education. (3 cr; Stdt Opt. Prereq—5221, 5247, 8261, 8262, #) Quantitative research methods, including models of scientific inquiry, role of theories/research design, role of measurement error in quantitative data-based inference, and qualitative methods of inquiry. Focuses on advanced quantitative/qualitative methodologies used in methodologically-oriented studies in educational measurement, evaluation, and statistics.

EPSY 8216. Seminar: Research Processes in Psychological Foundations of Education. (3 cr; A-F or Aud. Prereq—Completion to doctoral program in psych foundations or #) 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 8231. Psychological Scaling. (3 cr; Stdt Opt. Prereq—5221 or equiv, 8261-8262 or equiv) Elementary and advanced topics in unidimensional and multidimensional scaling: measurement theory and statistics, rating scales and other category scaling methods, magnitude estimation, paired comparisons, multi-attribute scaling, and multidimensional scaling.

For definitions of course numbers, symbols, and abbreviations, see page 214. 281
EPSY 8222. Advanced Measurement: Theory and Application. (4 cr; Stdnt Opt. +PSY 8565. Prereq-[8261 or Psy 8626 or equiv], [8261 or 8262 or equiv]) Generalizability theory, item response theory, factor models for test items, binomial model. Application to problems of designing, linking assessments. Includes a computer lab.

EPSY 8247. Advanced Interviewing and NVIVO. (3 cr; Stdnt Opt. Prereq-5247 or qualitative course or #) 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 8261. Statistical Methods I: Probability and Inference. (3 cr; Stdnt Opt. Prereq-5264 or 5265 or equiv) Advanced theory, derivations of quantitative statistics. Descriptive statistics, probability, normal distribution. One-/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. (5 cr; Stdnt Opt. Prereq-[8260, 8261] or equiv) Analysis of variance designs (two-/three-way), repeated measures, correlation, simple/multiple regression models, non-parametric procedures, multivariate analyses.


EPSY 8265. Factor Analysis. (3 cr; Stdnt Opt. Prereq-8262 or #) Factor analytic techniques/applications. Component, common factor, confirmatory analysis. Factor extraction, estimating number of dimensions. Rotation, factor scores, hierarchal factor analysis.

EPSY 8266. Statistical Analysis Using Structural Equation Methods. (3 cr; Stdnt Opt. Prereq-8263 or 8264) Quantitative techniques using manifest and latent variable approaches for analysis of educational and social science data. Introduction to structural equation modeling approaches to multiple regression, factor analysis, and path modeling. Developing, estimating, and interpreting structural equation models.


EPSY 8271. Statistics Education Research Seminar: Studies on Teaching and Learning Statistics. (3 cr [max 9 cr], Stdnt Opt) 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 8281. Advanced Statistical Computing and Data Analysis. (3 cr; Stdnt Opt. Prereq-5261 or equiv, 8215 or equiv) Cross-disciplinary course. Students learn to use SAS statistical package to perform data management, data analysis, and report writing.


EPSY 8290. Special Topics: Seminar in Psychological Foundations. (1-6 cr [max 15 cr]; Stdnt Opt, Prereq-#) Students formulate research designs. Learning and cognition, social psychology, measurement, and statistics.

EPSY 8295. Evaluation Problems. (1-6 cr [max 24 cr]) Stdnt Opt. -EDPA 8595. Prereq-5243 or EdPA 5501, #) Individually directed study of an issue in the theory or practice of program evaluation.

EPSY 8296. Evaluation Internship. (1-9 cr [max 24 cr]) Stdnt Opt. -EDPA 8596. Prereq-5243 or EdPA 5501, #) Hands-on experience in conducting a program evaluation in a real-world setting under supervision of an evaluation professional.

EPSY 8300. Special Topics in Educational Psychology. (1-4 cr [max 9 cr]; Stdnt Opt) Issues or related coursework in areas not normally available through regular curriculum offerings.


EPSY 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

EPSY 8400. Topics: Counseling and Student Personnel Psychology. (1-3 cr [max 9 cr]; Stdnt Opt) 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. (5 cr; A-F or Aud. Prereq-Grad ed psy major with CSPS subprog or #) Traditional and contemporary theories of counseling and psychotherapy. Applications to various settings and populations.

EPSY 8403. Social/Cultural Contexts: Counseling and Skills. (3 cr; A-F or Aud. Prereq-Grad ed psy major with CSPS subprog or #) 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 cr; A-F or Aud. Prereq-Ed psy MA or PhD student with CSPS subprog or #) 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 8407. Assessing and Counseling Clients With Psychological Disorders. (4 cr; A-F only. Prereq-CSPP PhD or MA student or #) 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 cr; A-F or Aud. Prereq-Ed psy PhD student with CSPS subprog or #) Focus on critically reviewing counseling research, qualitatively and quantitatively integrating research, and designing valid research.

EPSY 8412. Seminar: Advanced Counseling Theory and Ethics. (4 cr; A-F or Aud. Prereq-Ed psy PhD student with CSPS subprog or #) 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 cr; A-F or Aud. Prereq-[Psy 5604H or Psy 8171 or Psy 8112], doctoral student, #) Assessment interviews, MMPI-2, MMPI-A, DSM4, written assessment reports.
Prereq–EdPsy MA student with CSPP subprog or #)

EPSY 8541. University Counseling Practicum II. (4-6 cr [max 6 cr]; S-N or Aud. Prereq- EPSY 8514. Prereq- 8513, #)
Integrates science of counseling psychology with supervised practice in University Counseling and Consulting Services with career, academic, and personal clients.

EPSY 8543. University Counseling Practicum II. (4-6 cr [max 6 cr]; S-N or Aud. Prereq- EPSY 8514. Prereq-8513, #)
Integrates science of counseling psychology with supervised practice in University Counseling and Consulting Services with career, academic, and personal clients.

EPSY 8545. Organization of School Counseling Comprehensive Programs. (3-6 cr [max 6 cr]; A-F or Aud. Prereq- CSPP grad student in school counselor prog or #)
Integrates learning from all courses in MA program with research in comprehensive guidance programs. Critiques of research, analyses of current trends/issues. Theories of management/organization in educational and other service settings. Literature review of comprehensive guidance programs. Students develop/demonstrate knowledge of comprehensive school counseling programming in K-12 school settings.

EPSY 8546. Crisis Management and Consulting in School Counseling. (3 cr; A-F or Aud. Prereq- CSPP grad student in school counselor program or #)

EPSY 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

EPSY 8452. Psychological Aspects of Counseling Supervision. (3 cr; Stdnt Opt. Prereq–Ed psy PhD student with CSPP subprog or #)
Theories, review of relevant research, demonstration, and in-class practice of supervision skills.

EPSY 8501. Counseling Pre-Practicum. (3 cr; A-F or Aud. Prereq–[CSPP or genetic counseling] grad student)
Overview of basic helping skills through demonstration, in-class practice.

EPSY 8502. Field Placement in Counseling and Student Personnel Psychology. (2 cr; S-N or Aud. Prereq–8501 or #)
Students participate under supervision in practitioner activities within a counseling work environment.

EPSY 8503. Counseling Practicum I. (1-4 cr [max 4 cr]; A-F or Aud. Prereq–8502 or #)
Beginning-level supervised practice in counseling with individuals and groups, emphasizes ethical issues with systematic evaluation of student’s counseling practice through direct observations, video, and audio tapes.

EPSY 8504. Counseling Practicum II. (1-4 cr [max 4 cr]; A-F or Aud. Prereq–8503 or #)
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. (2 cr; Stdnt Opt. Prereq–[Ed psy PhD student with CSPP subprog] or #)
Supervised internship in counseling psychology.

EPSY 8512. Internship: CSPP. (1-12 cr [max 12 cr]; S-N only. Prereq–EdPsy PhD student with CSPP subprog or #)
Supervised internship in counseling psychology.

EPSY 8513. University Counseling Practicum I. (4-6 cr [max 6 cr]; S-N or Aud. Prereq– EPSY 8514. Prereq-EdPsy grad student with CSPP subprog or #)
Science of counseling psychology. Supervised practice in University Counseling and Consulting Services with career, academic, and personal clients.

EPSY 8514. University Counseling Practicum II. (4-6 cr [max 6 cr]; S-N or Aud. Prereq– EPSY 8515. Prereq– 8513, #)
Integrates science of counseling psychology with supervised practice in University Counseling and Consulting Services with career, academic, and personal clients.

EPSY 8521. Practicum in Student Affairs and Student Development. (1-4 cr [max 6 cr]; A-F or Aud. Prereq–EdPsy MA or PhD student with CSPP subprog or #)
Supervised practice in university and college student development offices.

EPSY 8522. Counseling Practicum: Advanced. (3 cr [max 12 cr; A-F only, Prereq–[Grad EPSY PhD student with CSPP subprog] or #; instructor consent required after 2 repeats]
Advanced skills practicum in counseling, counseling psychology, or student development.

EPSY 8600. Special Topics: Special Education Issues. (1-3 cr [max 9 cr]; Stdnt Opt)
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 cr; A-F or Aud)
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 8621. Seminar on Intellectual Impairments. (3 cr; Stdnt Opt. Prereq–Grad students interested in mental retardation and related intellectual impairments)
Review of research and theories in context of relevant developmental and cognitive theories; important contributions in primary sources concerning principles of cognition and behavior and applied problems. Procedures for deriving appropriate field applications; generalizing and implementing researchable questions.

EPSY 8651. Seminar on Social and Emotional Disabilities. (3 cr; A-F or Aud)
Review and critical analysis of current trends and future directions of education of students with social and emotional disabilities.

EPSY 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

EPSY 8677. Seminar in Early Intervention. (3 cr; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

EPSY 8800. Special Topics in School Psychology. (1-4 cr [max 9 cr]; Stdnt Opt)
Issues or related coursework in areas not normally available through regular curriculum offerings.

EPSY 8811. Assessment in School Psychology I: Foundations of Academic Assessment. (3 cr; A-F or Aud. Prereq–Grad ed psy major with school psy subprog or #)
Theories and models of psychoeducational assessment of children and adolescents within home, school, and community. Conceptual and empirical foundations of psycho-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 cr; A-F or Aud. Prereq–Grad ed psy major with school psy subprog or #)
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 cr; Max 4 cr; A-F or Aud. Prereq–8821, grad ed psy major with school psy subprog or #. &8811 or &8812)
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. Systematic Intervention and Consultation. (3 cr; A-F or Aud)
Principles/models of consultation/interventions for social-emotional problems exhibited by school-aged children. Emphasizes universal intervention, competence enhancement approaches. All interventions presented from a system-level perspective.

EPSY 8816. Individual Intervention and Consultation. (3 cr; A-F or Aud)
In-depth study/analysis of instructional interventions/procedures necessary to work with school personnel in developing schoolwide, classroom, individual instructional interventions. Practice in developing/applying interventions with individual students.
Course Descriptions

EPSY 8818. Intervention Practicum in School Psychology. (1 cr [max 2 cr]; A-F or Aud. Prereq-Grad ed psy major with school psy subprog, &8815 & &8816) Students design, implement, and evaluate interventions for individuals or groups of children and for system-level conditions under supervision of practicing school psychologists. Students observe school psychologists collaborate with educators and parents in intervention-related activities.


EPSY 8822. Research in School Psychology. (3 cr [max 6 cr]; A-F only. Prereq-[[8860, 8861, 5616] or equiv], grad ed psy major with school psy subprog] or #) Integrative, developmental discussions/activities about research in school psychology. Consuming, synthesizing, distributing, and conducting research. Students formulate their own research agenda.

EPSY 8823. Ethics and Professional Standards in School Psychology. (3 cr; A-F or Aud. Prereq-8821) 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 learn as researchers and practicing school psychologists in schools.

EPSY 8831. Practicum: School Psychological Services. (1-3 cr [max 6 cr]; Stdt Opt. Prereq-Grad ed psy major with school psy subprog] 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 8841. Practicum: Instruction and Supervision in School Psychology. (2 cr [max 4 cr]; A-F or Aud. Prereq-Grad ed psy major with school psy subprog] or #) Review of best practice literature and strategies for evaluating supervision skills. Students give lectures and supervise school psychology students in order to learn firsthand the issues related to providing supervision and to understand responsibilities related to academic careers.

EPSY 8842. Internship: School Psychological Services. (1-10 cr [max 10 cr]; S-N or Aud. Prereq-Grad ed psy major with school psy subprog) Advanced field placement. Full-time supervised experience for one year or part-time for no more than two years.

EPSY 8850. Doctoral Seminar in School Psychology: Research, Training, Practice, Policy Issues, and Action Plans. (3 cr; A-F only. Prereq-Grad student in school psychology coursework in school psychology) or advanced PhD student from related department, #) 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 8868. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; Prereq-Grad ed psy major with School Psych. subprog] Max 18 cr per semester or summer, 24 cr required)

EPSY 8905. History and Systems of Psychology: Landmark Issues in Educational Psychology. (3 cr; Stdt Opt. Prereq-Ed psy PhD student) 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. (1-10 cr [max 20 cr]; A-F or Aud. Prereq-#) Arranged independently with individual faculty members.

EPSY 8994. Research Problems: Educational Psychology. (1-6 cr [max 18 cr]; A-F or Aud. Prereq-#) Research methodology, techniques, and literature. Students participate in formulating/executing research proposal.

Electrical and Computer Engineering (EE)

Department of Electrical and Computer Engineering

Institute of Technology

EE 5121. Transistor Device Modeling for Circuit Simulation. (3 cr; Stdt Opt. Prereq-[[3115, 3161], IT grad student] or %) 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 cr; Stdt Opt. Prereq-[[3161, 3160], IT grad student] or %) Microelectromechanical systems composed of microsensors, microactuators, and electronics integrated onto common substrate. Design, fabrication, and operation principles. Labs on micromachining, photolithography, etching, thin film deposition, metallization, packaging, and device characterization.


EE 5171. Microelectronic Fabrication. (4 cr; Stdt Opt. Prereq-IT grad student or %) Fabrication of microelectronic devices. Silicon integrated circuits, GaAs devices. Lithography, oxidation, diffusion, metallization, packaging, and device characterization. Process integration of various technologies, including CMOS, double poly bipolar, and GaAs MESFET.

EE 5173. Basic Microelectronics Laboratory. (1 cr; Stdt Opt. Prereq-[[5171 or 5171], IT grad student] or %) Students fabricate a polysilicon gate, single-layer metal, NMOS chip, performing 80 percent of processing, including photolithography, diffusion, oxidation, and etching. In-process measurement results are compared with final electrical test results. Simple circuits are used to estimate technology performance.


EE 5235. Robust Control System Design. (3 cr; Stdt Opt. Prereq-IT grad, 3015, 5231 or %) 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 5324. VLSI Design II. (3 cr; Stdt Opt. Prereq-[[3010, 3015], IT grad student] or %) 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 cr; Stdnt Opt. Prereq-[4501, [5234 or &5235], IT grad student or %) Complete design of an integrated circuit. Designs evaluated by computer simulation.


EE 5333. Analog Integrated Circuit Design. (3 cr; Stdnt Opt. Prereq-[3115, IT grad student or %) 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 circuits).

EE 5364. Advanced Computer Architecture. (3 cr; Stdnt Opt. Prereq-[4535 or CSci 4203], IT grad student or %) Instruction set architecture, processor microarchitecture. Memory and I/O systems. Interconnections between computer software and hardware. Methodologies of computer design.

EE 5371. Computer Systems Performance Measurement and Evaluation. (3 cr; Stdnt Opt. Prereq-[5248, [5263 or 5261 or CSci 4203 or 5201], IT grad student or %) Tools and techniques for measuring computer performance. Benchmark programs, measurement tools, performance metrics. Deterministic/probabilistic simulation techniques, random number generation/testing. Bottleneck analysis.

EE 5381. Telecommunications Networks. (3 cr; Stdnt Opt. Prereq-[4501, 5531, IT grad student or %) Fundamental concepts of modern telecommunications networks, mathematical tools required for their performance analysis. Layered network architecture, point-to-point protocols/links, delay models, multiaccess communication/routing.


EE 5561. Image Processing and Applications. (3 cr; Stdnt Opt. Prereq-[4541, 5581, IT grad student or %) Two-dimensional digital filtering/transforms. Application to image enhancement, restoration, compression, and segmentation.

EE 5581. Information Theory and Coding. (3 cr; Stdnt Opt. Prereq-[5531, IT grad student or %) Source/channel models, codes for sources/channels. Entropy, discrete-time information theory, capacity, rate-distortion functions. Coding theorems.

EE 5583. Error Control Coding. (3 cr; Stdnt Opt. Prereq-[5025, Math 2373 or equiv], IT grad student or %) Error-correcting codes. Concepts, properties, polynomial representation. BCH, Golay, Reed-Muller/Reed-Solomon codes. Convolutional codes, iterative codes.


EE 5601. Introduction to RF/Microwave Engineering. (3 cr; Stdnt Opt. Prereq-[3561, IT grad student or %) Fundamentals of EM theory and transmission lines concepts. Transmission lines and network analysis. CAD tool. Lumped circuit component designs. Passive circuit components. Connectivity to central communication theme.

EE 5602. RF/Microwave Circuit Design. (3 cr; Stdnt Opt. Prereq-[5601 or equiv], IT grad student or %) Transmission lines, network analysis concepts. CAD tools for passive/active designs. Device based circuit designs (detectors, frequency multipliers, mixers). Transistor based circuit design (amplifiers, oscillators, mixer/doubler).

EE 5611. Plasma-Aided Manufacturing. (4 cr; A-F or Aud: *ME 5361, Prereq-[EE 5321, ME 5322 or equiv], [upper div IT or grad student]) Manufacturing using plasma processes. Plasma properties as a processing medium. Plasma spraying and microelectronics processing. Process control and system design; industrial speakers, Cross-disciplinary experience between heat transfer design issues and manufacturing technology.

EE 5613. RF/Microwave Circuit Design Laboratory. (2 cr; Stdnt Opt. Prereq-[5601 or &5601], IT grad student or %) 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 cr; Stdnt Opt. Prereq-[5601 or &5601], IT grad student or %) Antenna performance parameters, vector potential/radiation integral, wire antenna structures, broadband antenna structures, microstrip/ aperture theory, antenna measurements.

EE 5621. Physical Optics. (3 cr; Stdnt Opt. Prereq-[5015, IT grad student or %) Physical optics principles, including Fourier analysis of optical systems/images, scalar diffraction theory, interferometry, and coherence theory. Distraction of optical elements, holography, astronomical imaging, optical information processing, microoptics.


EE 5624. Optical Electronics. (4 cr; Stdnt Opt. Prereq-[3561 or Phys 3002], IT grad student or %) 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 5628. Fiber Optics Laboratory. (1 cr; Stdnt Opt. Prereq-[5567 or &5572], IT grad student or %) Experiments in fiber optics. Dielectric waveguides, modes in optical fibers, fiber dispersion/attenuation, properties of light sources/detectors, optical communication systems.

For definitions of course numbers, symbols, and abbreviations, see page 214. 285
Course Descriptions


EE 5655. Magnetic Recording. (3 cr; Stdnt Opt. Prereq–IT grad student or %) Magnetic fundamentals, recording materials, idealized 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 cr; Stdnt Opt. Prereq–IT grad student or %) Fabrication, characterization, and application of thin film and nanostructured materials/devices. Focuses on vacuum deposition. Material sciences. Hands-on, team-based labs.


EE 5721. Power Generation Operation and Control. (3 cr; Stdnt Opt. Prereq–[4721], IT grad student) or %) 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 5863. Computer Systems Performance Analysis. (2 cr; Stdnt Opt. = EE 5371. Prereq–[4563] or 5351], IT grad student) or %) Basic performance measurement/simulation techniques necessary for experimental computer science/engineering. Hands-on performance evaluation techniques using simulations/measurements of existing systems. Using measured data to compare computer system workloads and evaluate such features that improve systems performance.

EE 5940. Special Topics in Electrical Engineering I. (1-4 cr [max 12 cr]; Stdnt Opt) Special topics in electrical and computer engineering. Topics vary.

EE 5950. Special Topics in Electrical Engineering II. (1-4 cr [max 12 cr]; Stdnt Opt) Special topics in electrical and computer engineering. Topics vary.

EE 5960. Special Topics in Electrical Engineering III. (1-4 cr [max 12 cr]; Stdnt Opt) Special topics in electrical and computer engineering. Topics vary.

EE 5970. Special Topics in Electrical Engineering IV. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq–EE or CompE grad student) or %) Special topics in electrical engineering. Topics vary.

EE 5990. Curricular Practical Training. (1-2 cr [max 6 cr]; S-N or Aud) Prereq–Grad student, %) Industrial work assignment involving advanced electrical engineering technology. Review by faculty member. Final report covering work assignment.

EE 8100. Advanced Topics in Electronics. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq–#) Topics vary according to needs and staff availability.

EE 8141. Advanced Heterojunction Transistors. (3 cr; Stdnt Opt. Prereq–5564A or #) Recent developments in device modeling with emphasis on bipolar junction transistors. High-level effects in base and collector regions and their interrelationship.


EE 8190. Electronics Seminar. (1 cr [max 3 cr]; S-N or Aud. Prereq–#) Current literature, individual assignments.

EE 8210. System Theory Seminar. (1 cr [max 3 cr]; S-N or Aud) Current literature, individual assignments.

EE 8213. Advanced System Theory. (3 cr; Stdnt Opt. Prereq–IT grad student) or %) Generalized linear systems; applications, structural properties, computational approaches, classification, functional behavior, and synthesis.

EE 8215. Nonlinear Systems. (3 cr; Stdnt Opt. Prereq–#) 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 cr [max 3 cr]; S-N or Aud) Current literature, individual assignments.


EE 8300. Advanced Topics in Computers. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq–#) Topics vary according to needs and staff availability.

EE 8310. Advanced Topics in VLSI. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq–#) Topics vary according to needs and staff availability.

EE 8320. Advanced Topics in Design Automation. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–Grad student) or %) State-of-the-art automated design tools for electronic system design. Topics vary.

EE 8331. CMOS Data Converters: A/D and D/A. (3 cr; Stdnt Opt. Prereq–5535A or #) 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 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

EE 8337. Analog Circuits for Wire/ Wireless Communications. (3 cr; A-F or Aud. Prereq–5535) 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 cr [max 3 cr]; S-N or Aud) Current literature, individual assignments.


EE 8370. Computer Aided Design Seminar. (1 cr [max 5 cr]; S-N or Aud. Prereq–[EE or CompE or CSCI] grad major) or %) Current literature, individual assignments.

EE 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

EE 8500. Seminar: Communications. (1 cr [max 3 cr]; S-N or Aud) Current literature, individual assignments.
EE 8520. Advanced Topics in Signal Processing. (1-3 cr [max 12 cr]; Stdtnt Opt. Prereq-#) Topics vary according to needs and staff availability.

EE 8521. Detection and Estimation Theory. (3 cr; Stdtnt Opt. Prereq-5531 or #) Risk theory approach to detection and estimation, random process representation, signal parameter estimators, waveform estimation, detection of phase, frequency, and delay in signals. Applications to communications and radar-sonar signal design and processing.

EE 8591. Predictive Learning from Data. (3 cr; Stdtnt Opt. Prereq-IT grad student or #) 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 cr [max 3 cr]; S-N or Aud. Prereq-EE grad major or #) 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 Magnetisms. (1-3 cr [max 12 cr]; Stdtnt Opt. Prereq-5653 or #) Topics vary according to needs and staff availability.

EE 8630. Advanced Topics in Electromagnetics. (1-3 cr [max 12 cr]; Stdtnt Opt) Topics vary according to needs and staff availability.

EE 8660. Seminar: Magnetisms. (1 cr [max 3 cr]; S-N or Aud) Current literature, individual assignments.

EE 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

EE 8725. Advanced Power System Analysis and Economics. (3 cr; Stdtnt Opt. Prereq-4721, IT grad student or #) 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. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

EE 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

EE 8940. Special Investigations. (1-3 cr [max 3 cr]; Stdtnt Opt. Prereq-1-3 cr [may be repeated for cr]; #) Studies of approved theoretical or experimental topics.

EE 8950. Advanced Topics in Electrical and Computer Engineering. (1-3 cr [max 12 cr]; Stdtnt Opt. Prereq-Cr or (may be repeated for cr); #) Topics vary according to needs and staff availability.

EE 8965. Plan C Project I. (3 cr; Stdtnt Opt. Prereq-Grad EE major or #) Project topics arranged between student and adviser. Written reports.

EE 8967. Plan C Project II. (1-3 cr [max 3 cr]; Stdtnt Opt. Prereq-EE grad student) Project topics arranged between student and adviser. Written reports.

EE 8970. Graduate Seminar I. (1 cr [max 3 cr]; S-N or Aud; Prereq-Grad student) Recent developments in electrical engineering, related disciplines.

EE 8980. Graduate Seminar II. (1 cr [max 3 cr]; S-N or Aud) Recent developments in electrical engineering, related disciplines.

English: Creative Writing (ENGW)

Department of English Language and Literature College of Liberal Arts

ENGW 5101. Reading Across Genres. (4 cr [max 8 cr]; Stdtnt Opt. Prereq-#) Special topics in essay writing (e.g., arts reviewing, writing about public affairs, writing in personal voice). Topics specified in Class Schedule.

ENGW 5102. Reading and Writing. (4 cr [max 8 cr]; Stdtnt Opt. Prereq-grad student, %) Special topics in reading fiction, literary nonfiction, poetry. Topics specified in Class Schedule.

ENGW 5606. Literary Aspects of Journalism. (3 cr; A-F or Aud. Prereq-ENG or ENGL or WS 3xxx course or Jr or Sr, %) Story structure, dialogue, description. Students turn story created in 5205 into a fully realized screenplay.

ENGW 5201. Advanced Topics in Creative Writing. (4 cr [max 16 cr]; Stdtnt Opt. Prereq-#) Special topics in essay writing (e.g., arts reviewing, writing about public affairs, writing in personal voice). Topics specified in Class Schedule.

ENGW 5205. Screenwriting. (4 cr, A-F or Aud. Prereq-Jr or Sr, %) Special topics in essay writing (e.g., arts reviewing, writing about public affairs, writing in personal voice). Topics specified in Class Schedule.

ENGW 5207. Screenwriting II. (4 cr; Stdtnt Opt. Prereq-5205, one [Eng W or EngL or WS] 3xxx course, Jr or Sr, %) Projects in writing poetry, fiction, drama, and nonfiction, or study of ways to improve writing.

ENGW 5994. Directed Study in Writing. (1-4 cr [max 16 cr]; Stdtnt Opt. Prereq-#) Projects in writing poetry, fiction, drama, and nonfiction, or study of ways to improve writing.

ENGW 8910. Reading Across Genres. (4 cr, S-N or Aud, Prereq-Creative writing MFA student, %) Contemporary writing in fiction, poetry, and creative nonfiction. Primarily a reading course rather than a writing course.


ENGW 8912. Seminar: Writing of Poetry. (4 cr [max 8 cr]; Stdtnt Opt. Prereq-#) Special topics in creative writing (e.g., novel, short story collection). Assignments in common. Individual project.

ENGW 8913. Seminar: Writing of Literary Nonfiction. (4 cr [max 8 cr]; Stdtnt Opt. Prereq-#) Special topics in creative writing (e.g., novel, short story collection). Assignments in common. Individual project.

ENGW 8914. Thesis Seminar: Poetry. (4 cr [max 8 cr]; Stdtnt Opt. Prereq-Creative writing MFA student, %) For students working on their creative project.
ENGL 5090. Readings in Special Subjects. (3-4 cr [max 9 cr]; Stdnt Opt. Prereq—Creative writing MFA student or #) 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. (5 cr [max 9 cr]; Stdnt Opt. Prereq—Grad student or #) Wide reading in literature of period. Relevant scholarship/criticism. Topics vary. See Class Schedule.

ENGL 5121. Readings in Early Modern Literature and Culture. (5 cr [max 9 cr]; Stdnt Opt. Prereq—Grad student or #) Topical readings in early modern poetry, prose, fiction, and drama. Attention to relevant scholarship or criticism. Preparation for work in other courses or seminars.

ENGL 5140. Readings in 18th Century Literature and Culture. (5 cr; Stdnt Opt. Prereq—Grad student or #) 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. (5 cr [max 9 cr]; Stdnt Opt. Prereq—Grad student or #) 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 5200. Readings in American Literature. (3 cr [max 9 cr]; Stdnt Opt. Prereq—Grad student or #) General background/preparation for advanced graduate study. Readings cover either a wide historical range (e.g., 19th century), a genre (e.g., the novel), or a major literary movement (e.g., modernism).

ENGL 5210. Readings in African American Literature. (3 cr; Stdnt Opt. Prereq—Grad student or #) Selected readings in post-colonial literature. Topics specified in Class Schedule.


ENGL 5400. Readings in Post-Colonial Literature. (3 cr [max 9 cr]; Stdnt Opt. Prereq—ENGL 5400, ENGL 5400H. Prereq—Grad student or #) Selected readings in post-colonial literature. Topics specified in Class Schedule.


ENGL 5597. Harlem Renaissance. (3 cr; Stdnt Opt. Prereq—AFRO 4597. Prereq—Grad student or #) Multidisciplinary review of Jazz Age’s Harlem Renaissance: literature, popular culture, visual arts, political journalism, major black/white figures.

ENGL 5630. Theories of Writing and Writing Instruction. (3 cr; Stdnt Opt. Prereq—Grad student or #) Introduction to major theories that inform teaching of writing in college and upper-level high school curriculums. Topics specified in Class Schedule.

ENGL 5711. Introduction to Editing. (4 cr; Stdnt Opt) 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 5743. History of Rhetoric and Writing. (3 cr; Stdnt Opt. Prereq—Grad student or #) Assumptions of classical/contemporary rhetorical theory, especially as they influence interdisciplinary field of composition studies.

ENGL 5790. Topics in Rhetoric, Composition, and Language. (3 cr [max 9 cr]; Stdnt Opt. Prereq—Grad student or #) Topics specified in Class Schedule.

ENGL 5800. Practicum in the Teaching of English. (1-2 cr [max 2 cr]; Stdnt Opt. Prereq—Grad student or #) 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 5992. Directed Readings, Study, or Research. (1-3 cr [max 45 cr]; Stdnt Opt. Prereq—Grad student or #) Sample topics: literature of World War II, writings of the Holocaust, literature of English Civil War, advanced versification.
Course Descriptions


ENT 5321. Ecology of Agricultural Systems. (3 cr; A-F or Aud. +AGRO 5321. Prereq-[(1-3 cr) above] course in [Agro or AnSc or Hort], [1-3 cr] above] course in [Ent or PlPa or Soil]) Ecology of agricultural problems. Formal methods of systems inquiry are developed/analyzed.

ENT 5341. Biological Control of Insects and Weeds. (3-4 cr [max 4 cr]; A-F or Aud. Prereq-3001, Biol 1009, EEB 3001 or grad) 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 5361. Aquatic Insects. (4 cr; A-F or Aud. Prereq-#) Taxonomy, natural history of aquatic insects including their importance in aquatic ecology, water resource management, recreation, and conservation. Emphasizes family-level identification of immature/adults. Field trips scheduled to local aquatic habitats. A collection is required.


ENT 5900. Basic Entomology. (1-6 cr [max 12 cr]; Stdtnt Opt. Prereq-#) For graduate students who need to make up certain deficiencies in their biological science background.

ENT 5910. Special Problems in Entomology. (1-6 cr [max 10 cr]; Stdtnt Opt. Prereq-#) Individual field, lab, or library studies in various aspects of entomology.

ENT 5920. Special Lectures in Entomology. (1-3 cr [max 3 cr]; Stdtnt Opt) Lectures or labs in special fields of entomological research. Given by visiting scholar or regular staff member.

ENT 8006. Supervised Laboratory or Extension Teaching Experience. (1-3 cr [max 3 cr]; A-F or Aud. Prereq-3005 or equiv or #) 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 cr; Stdtnt Opt. Prereq-[5011, basic genetics course or #; offered alt yrs]) Molecular genetic techniques and their applications. Emphasizes insect species other than Drosophila. Application of genetic techniques to physiological processes.


ENT 8061. Scientific Communication and Ethics. (1 cr; S-N or Aud) Students develop/use critical elements of scientific communication, within an ethical framework. Elements in writing scientific manuscripts and research proposals. Oral communication for scientific, outreach, and classroom presentations.

ENT 8200. Colloquium in Social Insects. (1-3 cr [max 3 cr]; Stdtnt Opt. Prereq-3020 or 3200) Current research on bees, wasps, ants, and termites. Student critiques and research reports.

ENT 8210. Colloquium in Insect Evolution. (1-3 cr [max 3 cr]; Stdtnt Opt. 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. (1-3 cr [max 2 cr]; Stdtnt Opt. Prereq-5041 or 5045 or #) Advanced topics.

ENT 8300. Graduate Seminar. (1 cr; S-N or Aud. Prereq-#) Oral and written reports on and discussion by students of selected topics from current literature.

ENT 8333. Pre-Doctoral. (1 cr; No grade. Prereq-[Master's student, adviser and DGS consent]) FTE: Master's. (1 cr; No grade. PreDoc-Doctoral student, adviser and DGS consent)

ENT 8444. FTE: Doctoral. (1 cr; No grade. PreDoc-Doctoral student, adviser and DGS consent)

ENT 8594. Research in Entomology. (1-16 cr [max 16 cr]; S-N or Aud) Directed research.

ENT 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

ENT 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; No grade. PreDoc-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

ENT 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. PreDoc-Max 18 cr per semester or summer; 24 cr required)

Environmental Sciences, Policy, and Management (ESPM)

Division of Environmental Sciences, Policy, and Management

College of Food, Agriculture and Natural Resource Sciences

ESPM 5001. Treaty Rights and Natural Resources. (3 cr; A-F or Aud. =ESPM 3001. Prereq-Grad student or #) Readings, class discussion about treaty rights reserved by indigenous Americans with respect to use of natural resources. Emphasizes Midwest issues. Web-assisted course.


ESPM 5021. Ecological Vegetation Management: a Consulting Approach. (3 cr; Stdtnt Opt. +ESPM 5021. Prereq-Grad student or #) Application of ecological concepts such as succession/competition to ecosystems under management. Wetlands, riparian zones, urban interfaces, agriculture, agroforestry, Northern/boreal conifer, hardwood forests, grasslands (prairie). Management objectives, methods, impacts. Evaluating practices for sustainability. Social issues. Regional (Great Lakes area), national, global case studies.

ESPM 5031. Applied Global Positioning Systems for Geographic Information Systems. (3 cr; A-F or Aud. =ESPM 3031. Prereq-Grad student or #) 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 cr; Stdtnt Opt. Prereq-Grad student or #) 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 5101. Conservation of Plant Biodiversity. (3 cr; A-F or Aud. =ESPM 5101. Prereq-Grad student or #) 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 5108. Ecology of Managed Systems. (4 cr; A-F or Aud. =ESPM 5108. Prereq-Grad student or #) Analysis of functioning of ecosystems primarily structured by managed plant communities. Managed forests, field-crop agroecosystems, rangelands, aquatic systems. Structure-function relations. Roles of biodiversity in productivity, resource-use efficiency, nutrient cycling, resilience. Emerging principles for design of sustainable managed ecosystems, provision of ecological services.

ESPM 5131. Environmental Biophysics and Ecology. (3 cr; A-F or Aud. Prereq-[[Biol 1009 or equiv], Math 1271, Phys 1101, [upper div or grad student] or #) Basic concepts of environmental variables such as temperature, humidity, wind, and radiation. Mechanics of heat/mass transfer between a living organism and its surrounding environment. Set of practical examples to integrate concepts and transport processes.

ESPM 5202. Environmental Conflict Management, Leadership, and Planning. (3 cr; A-F or Aud. =ESPM 3202W. Prereq-Grad or #) 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 5211. Survey, Measurement, and Modeling for Environmental Analysis. (3 cr; Stdnt Opt. =ESPM 3211. Prereq-Grad student or #) 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: History, Creation, and Implementation. (3 cr; Stdnt Opt. =ESPM 3241W. Prereq-Grad student or #) Basic concepts of political/administrative processes important to natural resource policy and program development. Case study approach to policy/legislative process, participants in policy development, and public programs. Federal/state laws/regulations, international issues.

ESPM 5245. Methods for Natural Resource and Environmental Policy. (3 cr; A-F or Aud. =ESPM 4242. Prereq-3241 or equiv), 3261 or equiv], [or grad student]) 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 cr; A-F or Aud. =ESPM 3245. Prereq-Grad student or #) Overview of policies that affect recreation at local, state, and federal levels. Landscape-level planning. Collaborative relationships as means to implement sustainable/social/policy. Class project involving all aspects of implementing recreation policy, from public meetings to hands-on evaluation of options.

ESPM 5251. Natural Resources in Sustainable International Development. (3 cr; A-F or Aud. =ESPM 3251, LAS 3251. Prereq-Grad student or #) 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 5295. GIS in Environmental Science and Management. (4 cr; A-F or Aud. Prereq-Grad student or #) Application of spatial data inventory/analysis in complex environmental planning problems. Spatial data collection, visualization, and management, including GPS, DLG, TIGER, NWI data, and spatial analysis. Topics identified by non-University partners.


ESPM 5480. Topics in Natural Resources. (1-4 cr [max 6 cr]; Stdnt Opt. Prereq-Sr or grad student) Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.

ESPM 5482. Biosafety Science and Policy. (3 cr; Stdnt Opt) Science/policy for governing environmental/health safety of genetic engineering through Minnesota, national, and international cases.


ESPM 5555. Wetland Soils. (3 cr; A-F or Aud. =SOIL 5555. Prereq-1125 or 2125 or equiv or #; 4531 recommended) Morphology, chemistry, hydrology, formation of mineral/organic soils in wetland environments. Soil morphologic indicators of wet conditions, field techniques of identifying hydric soils for wetland delineations. Projects. Wetland benefits, preservation, regulation, mitigation. Field trips, lab, field hydric soil delineation project.

ESPM 5575. Wetlands Conservation. (3 cr; Stdnt Opt. =ESPM 5575. Prereq-#; 3575; Sr or grad student or #) 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 5602. Regulations and Corporate Environmental Management. (3 cr; A-F only. =ESPM 3602, MGMT 3602. Prereq-APEC 1101 or ECON 1101) 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 cr; A-F only. Prereq-[Math 1142 or [Math 1271, Math 1282]], [Econ 1101 or ApEc 1101]) 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 cr; A-F only. =ESPM 3604) Environmental problems such as climate change, ozone depletion, and loss of biodiversity.


ESPM 5606. Pollution Prevention: Principles, Technologies, and Practices. (3 cr; A-F only. =ESPM 3606, Prereq-CHM 1011 or CHEM 1011) Implementing a pollution prevention project, e.g., cleaner production, design for the environment, life-cycle management. Ways industries can reduce their industrial emissions/costs by preventing pollution.

ESPM 5607. Industrial Biotechnology and the Environment. (3 cr; A-F only. =ESPM 4607. Prereq-BIOL 1009, CHEM 121, grad student) Biotechnology pertaining to biobased products and their environmental impact.

ESPM 5608. Bioremediation. (2 cr; A-F only. =ESPM 4608. Prereq-[BIOL 1001 or BIOL 1009, CHEM 1011]) Use of organisms in remediation of waste/pollution problems related to bio-based product industries. Types, characteristics, and identification of useful microorganisms. Applications of microbes to benefit industrial processes of wood/fiber.

ESPM 5703. Agroforestry in Watershed Management. (3 cr; Stdnt Opt. =ESPM 3703. Prereq-Grad student or #) 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.

For definitions of course numbers, symbols, and abbreviations, see page 214.

Experimental and Clinical Pharmacology (ECP)
College of Pharmacy

ECP 5610. Pharmacoeconomics. (2 cr; Stdnt Opt. Prereq-PubH 5320, PubH 5330 or #) Application of epidemiologic principles to study, use, and beneficial/adverse outcomes of drugs in human populations.

ECP 5620. Drug Metabolism and Disposition. (3 cr; A-F or Aud. Prereq-Grad student or #) 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 8100. Seminar. (1 cr; max 8 cr; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Selected topics in experimental and clinical pharmacology.

ECP 8200. Research Problems. (1-8 cr; max 16 cr; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Individually designed research experience directed at contemporary problems related to drug use.

ECP 8210. Clinical Therapeutics. (3 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Theory/application of contemporary methods of analysis for concentration-time data and exposure-response relationships.

ECP 8400. Pharmacometrics. (3 cr; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Theory/application of contemporary methods of using simulations to design more efficient/informative clinical trials.

ECP 8430. Advances in Pharmacometrics Modeling and Simulation. (1 cr; max 6 cr; S-N only. Prereq-Grad student in ECP or PHM or #) Modeling/simulation at interface between physiological/pharmacological processes. Current literature, discussion groups. Computer applications using relevant software programs.

ECP 8900. Advanced Topics in Experimental and Clinical Pharmacology. (1-4 cr; max 8 cr; Stdnt Opt. Prereq-SACP grad major in ECP track or #) Topic varies depending on faculty teaching course.

ECP 8992. Directed Readings in Experimental and Clinical Pharmacology. (1-2 cr; max 4 cr; Stdnt Opt)

ECP 8993. Directed Study in Experimental and Clinical Pharmacology. (1-4 cr; max 4 cr; Stdnt Opt)

Family Medicine and Community Health (FMCH) Medical School

FMCH 5201. Clinical Family Medicine. (12 cr; max 108 cr; No grade. Prereq-family practice resident or #) Supervised care for patients of all ages on a continuous, primary, preventive, and general diagnostic basis. Diagnosis, methods of treatment, and problem-solving devices for benefit of patient and family, emphasizing health hazard appraisal. New and refined methods of recording, documentation, and retrieval of clinical data.

FMCH 5345. Curriculum Design and Teaching Strategies for Medical Education I. (3 cr; A-F or Aud. Prereq-concurrent enrollment in 5346, #) 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 cr; A-F or Aud. Prereq-5345, #) Taken with 5345. Practice 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 cr; max 9 cr; O-N or Aud. Prereq-MD or DO degree) 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 5565. Principles of Geriatrics I. (1 cr; max 5 cr; P-N or Aud. Prereq-Medical School or dental school or GNP School graduate) First in two-course sequence. Survey of major topics in geriatric medicine. Epidemiology, etiology, diagnosis, and treatment of major geriatric syndromes and illnesses.

FMCH 5566. Principles of Geriatrics II. (1 cr; max 5 cr; P-N or Aud. 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 cr; O-N or Aud. Prereq-Enrollment in health sci grad programs in CSPP, Psy, PubH, SW or FSOS or #) Assessment and treatment techniques pertaining to common sexual problems.

FMCH 5953. Directed Study. (1-t0 cr; max 10 cr; O-N or Aud. Prereq-#; qualified students may arrange for work on a tutorial basis) Studies on special topics as arranged between student and faculty.

FMCH 5960. Basic Research Methods in Family Practice. (3 cr; A-F or Aud. Prereq-Post-MD fellow, #) History and current status of research in family medicine, research resources available in the department. How to ask/define a research question, conduct a literature search, select a research methodology, meet federal requirements for protection of human subjects in research, critically read the medical literature and facilitate its discussion, and prepare a grant proposal.

FMCH 5961. Family Medicine Fellows and Junior Faculty Integration Seminar. (1-9 cr; max 9 cr; A-F or Aud. Prereq-# family medicine faculty or fellow, #) Preparation for roles in academia. Achieving success as a clinical investigator. Funding opportunities, authorship, collaboration, publishing, grant preparation.

Family Policy Minor (FPOL)
Department of Family Social Science

College of Education and Human Development

FPOL 8000. Family Policy Perspectives. (3 cr; A-F or Aud) Policies that effect families, from persepctive 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)
Department of Family Social Science

College of Education and Human Development

FSOS 5014. Quantitative Family Research Methods I. (3 cr; Stdnt Opt. Prereq-Grad student or #) 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 cr; S-N or Aud. Prereq-Grad student or #) Application of basic family research methods into experiential learning using statistical software. Analyses that correspond with problem situations in 5014 and 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 cr; Stdnt Opt. Prereq-Grad student or #) Systemic/cybernetic frameworks as they apply to diverse families. Thinking systemically about families across multiple ecological systems. How to identify and discuss 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 cr; Stdnt Opt. +FSOS 5102. 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 5193. Directed Study in Family Social Science. (1-6 cr max 6 cr; Stdnt Opt. Prereq-FSOS or grad student in related field)


FSOS 5429. Counseling Skills Practicum I. (3 cr; Stdnt Opt. +FSOS 5429) 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 8001. Conceptual Frameworks in the Family. (3 cr; Stdnt Opt. Prereq-Family course or #) Major theoretical models about families, emphasizing sociohistorical context.

FSOS 8003. Current Issues in Family Science. (3 cr; Stdnt Opt) 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 cr; Stdnt Opt) 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 8015. Qualitative Family Research Methods. (3 cr; Stdnt Opt) 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 cr; Stdnt Opt. Prereq-[5014 or equiv or 200 level two stat courses] or #) Quantitative research process, from developing a research question to putting findings to use. Major course project (development of a federally fundable research grant application) is basis for class discussion. Focuses on family research. Applying research knowledge to study of families.

FSOS 8031. Family of Origin. (3 cr; S-N or Aud. Prereq-Prefference given to marriage and family therapy students) 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 cr; Stdnt Opt. Prereq-[5032 or equiv, #) 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 cr; Stdnt Opt. Prereq-5032 or 5032 or #) 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 cr; A-F or Aud. 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 and Family Therapy Research. (3 cr; A-F or Aud. Prereq-8013, 8014) Strengths and limitations of current couple and family outcome research; methodological issues, including qualitative and quantitative.

FSOS 8037. Ethical, Legal, and Professional Issues in Mental Health Practice: Issues with Couples and Families. (2-10 cr max 10 cr; A-F or Aud. Prereq-[5032, practicum or internship exper] or [grad student in cooperating mental health practice prog who has completed course on therapy with children]) 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 cr; A-F or Aud. Prereq-5032 or equiv or #) 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 cr; Stdnt Opt. Prereq-8001 or equiv or #, FSOS PhD student beyond 1st yr) 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 cr; Stdnt Opt. Prereq-8001 or equiv, 8013 or equiv, 8014 or equiv) For advanced doctoral students primarily in family social science who are working on independent research projects. Focus on receiving 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 8010. Family Stress, Coping, and Adaptation. (3 cr; Stdnt Opt. Prereq-8001 or equiv, research methods course) Helping families become more resilient to stress by decreasing vulnerability to crises and traumatic stress disorders. Students develop research or internship proposal on family stress, coping, adaptation, crisis, trauma, or resilience.

FSOS 8014. Family Policy Seminar. (3 cr; Stdnt Opt) Distinguishing family policy research from other family research. Conceptual frameworks, methods, and roles family policy research can play in policy-making and knowledge-building processes.

FSOS 8015. Family Gerontology. (3 cr; Stdnt Opt. Prereq-4154 or equiv or #) 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 8017. Family Values Research: Theories and Critical Methods. (3 cr; Stdnt Opt. Prereq-8013 or equiv, 8014 or equiv or #; WCFE 8920 recommended) Interdisciplinary seminars 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. (1-6 cr max 6 cr; A-F only or FSOS grad student or #) Special seminars on timely topics.

FSOS 8160. Topics in Marriage and Family Therapy. (1-6 cr max 6 cr; Stdnt Opt. Prereq-MFT grad student or #) Special seminars on timely topics.


FSOS 8200. Orientation for Family Social Science. (1 cr; S-N or Aud. Prereq-#) 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 cr; S-N or Aud. Prereq-#; required for grad FSOS majors in family and marriage therapy prog) Students cooperatively 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. Family Therapy Practicum. (1-12 cr max 12 cr; S-N or Aud. Prereq-MFT grad student) Clinical placement doing marriage and family therapy in a community setting.

FSOS 8296. Family Therapy Internship. (1-21 cr max 21 cr; S-N or Aud. Prereq-8295, marriage and family therapy student) Full-time clinical placement doing marriage and family therapy in a community setting.

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

Finance (FINA)
Department of Finance
Curtis L. Carlson School of Management


FINA 8890. Seminar: Finance Topics. (2-4 cr [max 16 cr]; A-F only. Prereq-[8802, 8812, 8822, 8835] or equiv); business admin student or #) Current topics/problems of interest considered in depth. Topics vary.

FINA 8892. Independent Study in Finance. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq-Business admin PhD student or #) Problems or developments of special interest to the student.

FINA 8894. Directed Research in Finance. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq-Business admin PhD student specializing in finance or #) Individualized directed research on a project of interest to the student, approved and advised by faculty.

Financial Mathematics (FM)
School of Mathematics
Institute of Technology


FM 5011. Mathematical Background for Finance I. (4 cr; Stdnt Opt. Prereq-[5001, 5002] with grade of at least B or [MFM program director approval, grad MFM major]) Mathematics needed for MFM program. Focuses on finance.


FM 5021. Mathematical Theory Applied to Finance I. (4 cr; Stdnt Opt. Prereq-[5011 or 5011], grad MFM major, program director approval) Bridge between theory and application.

FM 5022. Mathematical Theory Applied to Finance II. (4 cr; Stdnt Opt. Prereq-[5021 or 5012], grad MFM major, program director approval) Bridge between theory and application.

FM 5031. A Practitioner’s Course in Finance I. (4 cr; Stdnt Opt. Prereq-[5021 or 5022], grad MFM major, program director approval) Practical course taught by industry professionals. Focuses on hands-on real-world problem solving.

FM 5032. A Practitioner’s Course in Finance II. (4 cr; Stdnt Opt. Prereq-[5021, 5022], grad MFM major, program director approval) Practical course taught by industry professionals. Focuses on hands-on real-world problem solving.


Finnish (FIN)
College of Liberal Arts

FIN 5670. Topics in Finnish Studies. (3 cr [max 9 cr]; Stdnt Opt) Interdisciplinary social science topics on Finnish people, culture, and society. Taught in English.

Fishes and Wildlife (FW)
Department of Fisheries, Wildlife, and Conservation Biology

College of Food, Agricultural and Natural Resource Sciences


FW 5051. Analysis of Populations. (4 cr; Stdnt Opt. Prereq-[Biol 3407 or Biol 3400W], [4001 or STAT 3011 or ENSP 3002], sr #) Factors involved in population growth, general dynamics of populations. Data needed to describe populations, population growth, population models, regulatory mechanisms.


FW 5292. Special Lectures: Fisheries. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq-5292. Prereq-Grad student or #) Lectures in special fields of fisheries given by visiting scholar or regular staff member.

FW 5392. Special Lectures: Wildlife. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq-5392. Prereq-Grad student or #) Lectures given by visiting scholar or staff member.
FW 8401. Fish Physiology and Behavior. (3 cr; Stdnt Opt. Prereq—[[5156 or 5156], grad student] or #) Introduction to major themes of modern comparative physiology. Focuses on how they interface with study of fish behavior.

FW 8411. Aquatic Toxicology. (3 cr; Stdnt Opt. Prereq—Intro chem, intro ecol, #) Pollution assessment approaches, biological effects, fate/flow of contaminants in aquatic systems, major types of pollutants.

FW 8455. Sustainable Aquaculture. (3 cr; Stdnt Opt. Prereq—[Intro biology, intro chemistry] or #) How aquaculture affects the environment and human well-being in Minnesota and world-wide. Role of aquaculture as world’s fastest growing food sector and in hatcheries to support fishing and rebuild endangered species. Organic aquaculture, other innovations.


FW 5601. Fisheries Population Analysis. (3 cr; A-F or Aud. Prereq—[4001 or Stat 5021], Biol 3407, [Math 1142 or Math 1271]) Introduction to theory/methods for estimating vital statistics of fish populations. Using microcomputer/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 cr; A-F or Aud. Prereq—Biol 3407) Environmental interactions of wildlife at population/community levels. Environmental threats from human activities. Habitat management practices. Objectives, policies, regulations in population management.


FW 5625. Wildlife Handling and Immobilization for Research and Management. (2 cr; S-N or Aud. Prereq—General biology, [grad student or vet med student or FW 87]) Practical techniques to maximize human/animal safety and animal handling operation efficiencies. Preparation procedures, legal responsibilities, capture drugs/delivery systems, safety measures, ethical issues, basic veterinary procedures for handling wildlife. Field course. Uses live animals.

FW 8200. Seminar. (1-4 cr [max 8 cr]; S-N or Aud) Oral and written student reports on selected topics from current literature in fisheries biology and management and wildlife. Lectures by and discussions with faculty and visiting specialists.

FW 8333. FTE: Master’s. (1 cr; No grad. Prereq—Master’s student, adviser and DGS consent)

FW 8394. Research in Fisheries. (1-4 cr [max 4 cr]; Stdnt Opt) Directed research.

FW 8444. FTE: Doctoral. (1 cr; No grad. Prereq—Doctoral student, adviser and DGS consent)

FW 8448. Fishery Science. (3 cr; Stdnt Opt. Prereq—Grad student [in fisheries or wildlife conserv or conserv biol or ecology] or #) Applying ecological theory to study/manipulation of fish populations. Dynamics of growth, mortality, and yield of fish stocks. Field assessment methodology. Simulation applied to management problems. Web-assisted students produce a publishable (print or electronic) project.

FW 8450. Data Analysis. (4 cr; A-F or Aud. Prereq—Stats 5331 or 5332; 5335 or 5336 or 5337) 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 cr; A-F or Aud) Seminar examining population- level biological issues (genesetics; demographic processes; community, ecosystem, and landscape scale interaction; restoration ecology; ex situ strategies for restoration and recovery) and societal issues (social, economic, cultural perspectives; sustainable development strategies; roles of institutions; international and U.S. policies).

FW 8459. Stream and River Ecology. (3 cr; Stdnt Opt. Prereq—Limnology course or #) Structure/dynamics of running waters from ecosystem perspective. Historical perspective, basic hydrology/fluvial geomorphology, terrestrial-aqueous interactions, detrital dynamics, metabolism, drift, trophic relations, biotic/abiotic interactions, ecosystem experiments and natural alternations, stability/succession, ecosystem dynamics in a watershed.

FW 8461. Advanced Topics in Fish Physiology. (1 cr; Stdnt Opt. Prereq—Vertebrate physiology course or #) Lectures, discussion, current literature. Complements 5459.

FW 8462. Advanced Topics in Fish Behavior. (1 cr; Stdnt Opt. Prereq—5459 or behavior course or #) Current literature. Complements 5459.

FW 8465. Fish Habitats and Restoration. (3 cr; Stdnt Opt. Prereq—Intro ecology course or #) Mechanisms underlying physiology/behavior that shape fish community structure in specific north temperate habitats. Techniques and planning procedures for restoring lakes/streams.


FW 8666. Doctoral Pre-Thesis Credits. (1-6 cr; max 12 cr) No grade. 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

FW 8773. Thesis Credits: Master’s. (1-18 cr; max 50 cr) No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required (Plan A only)

FW 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)
Course Descriptions

FSCN 8318. Current Issues in Food Science. (2 cr [max 4 cr]; A-F or Aud. Prereq–4111, 4121, %) Current issues, how they impact food industry.

FSCN 8330. Advanced Topics in Food Science. (1-3 cr [max 6 cr]; Stdnt Opt) Recent research or special topics.

FSCN 8330. Research Topics. (1 cr [max 6 cr]; Stdnt Opt) Seminar in which faculty member or group of faculty/graduate students discuss research progress or review class current research literature.


FSCN 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

FSCN 8334. Reaction Kinetics of Food Deterioration. (2 cr; Stdnt Opt. Prereq–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 biologies.


FSCN 8391. Independent Study: Food Science. (1-4 cr [max 6 cr]; Stdnt Opt. Prereq–#) Includes written reports.

FSCN 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

FSCN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

FSCN 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

FSCN 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Foreign Study—SPAN (FSSP)

College of Liberal Arts

FSSP 5960. Preparatory Seminar for SPAN Overseas Research. (4 cr; A-F or Aud. =FSSP 5960, Prereq-%) Preparatory seminar for SPAN overseas research.

FSSP 5970. Seminar for SPAN Overseas Research. (4 cr; A-F or Aud. =FSSP 5970, FSSP 5960) Seminar for SPAN overseas research.

FSSP 5980. Seminar for SPAN Overseas Research. (1-4 cr [max 4 cr]; A-F or Aud. =FSSP 5970, FSSP 5970, Prereq-%)

Forest Resources (FR)

Department of Forest Resources

College of Food, Agricultural and Natural Resource Sciences

FR 5104. Forest Ecology. (4 cr; A-F or Aud. =FR 3104. Prereq–[ Biol 1001 or 1009], grad student or #; 1 semester college chemistry recommended) Form/function of forests as ecological systems. Characteristics/dynamics of species, populations, communities, landscapes, and ecosystem processes. Examples applying ecology to forest management. Weekly discussions on research topics, exercises, current issues in forest resource management. Required weekend field trip.

FR 5105. Forest Ecosystem Health and Management. (3 cr; A-F only. =FR 3105, Prereq–3104 or BIOL 3407 or EEB 3001 or equiv) Principles of forest ecosystem health and its management applied to areas ranging from wilderness to urban forest, and from local to global scales.


FR 5118. Trees: Structure and Function. (3 cr; A-F or Aud. =FR 4118, Prereq–Grad student or #) Plant-water relations. Relations of biology to ecology and management. How physiological factors affect ecological processes and management decisions.

FR 5131. Geographical Information Systems (GIS) for Natural Resources. (4 cr; A-F only. =FR 3131, Prereq–Grad student or #) Introduction to GIS. Focuses on natural resources. Data structures, sources, collection, and quality. Lab exercises introduce geodesy, map projections, spatial analyses, and cartographic modeling.


FR 5153. Forest and Wetland Hydrology. (3 cr; Stdnt Opt. Prereq–[Basic hydrology course, upper div or grad student] or #) Current topics, methods/models in forest/wetland hydrology. Hydrologic role of forests, wetlands, riparian systems in snowfall/rainfall regimes. How activities such as deforestation, wetland drainage, and stream channel alterations, affect hydrologic response of watersheds. Runoff/streamflow response from undisturbed/ altered forest/wetland watersheds. Problem-solving exercises.

FR 5161. Northern Forest Field Course. (2 cr; A-F or Aud. Prereq–#) Field identification of common trees, shrubs, and nonwoody vascular plants. Plant communities, soil site relationships, wildlife values. Natural history of northern/boreal forests in terms of soils, ecological characteristics of trees, community-environmental relationships, stand development, succession, and regeneration ecology. Land survey, tree/forest stand measurement, forest sampling techniques. Taught at Cloquet Forestry Center.

FR 5203. Forest Fire and Disturbance Ecology. (3 cr; A-F or Aud. =FR 3203. Prereq–[Grad student or #], course fee) Ecology, history, management, and control of fire, wind, insect infestation, browsing, and other disturbances in forests. Disturbance regimes of boreal northern hardwood, and other major forest types of North America. Influence of disturbance on wildlife habitat, urban/wildland interfaces, forest management, and stand/landscape dynamics. Guest speakers on fire organization, training, and operations. Two-day field trip.

FR 5204. Landscape Ecology and Management. (3 cr; A-F or Aud. =FR 3204. Prereq–Grad student or #) Introduction to landscape ecology at different scales in time/space. Development/implications of broad-scale patterns of ecological phenomena, role of disturbance in ecosystems. Characteristic/typical scales of ecological events. Principles of landscape ecology as framework for landscape research, analysis, conservation, and management.


FR 5228. Advanced Assessment and Modeling. (3 cr; A-F or Aud. Prereq-3218, Math 1272, Stat 5021) Application of recently developed mathematics, computer science, and statistics methodologies to natural resource functioning, management, and use problems. Specific topics, software, and methodologies vary.


FR 5411. Managing Forest Ecosystems: Silviculture. (3 cr; Stdt. Opt. = FR 5411. Prereq-Grad student or #) Management of forest ecosystems for sustaining ecological integrity, soil productivity, water quality, wildlife habitat, biological diversity, commodity production in landscape context. Silvics, forest dynamics, disturbances, regeneration, restoration, silvicultural systems. Ramifications of management choices. Weekend field trip


FR 5431. Timber Harvesting and Road Planning. (2 cr; Stdt. Opt. = FR 5431. Prereq-Grad student or #) 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

FR 5471. Forest Planning and Management. (3 cr; A-F or Aud. = FR 5471. Prereq-Grad student or #) 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.

FR 5480. Topics in Natural Resources. (1-3 cr [max 5 cr]; Stdt. Opt. = FR 5480. Prereq-#) Lectures in several fields of natural resources given by visiting scholar or faculty member. Topics specified in Class Schedule.


FR 5615. Field Remote Sensing and Resource Survey. (2 cr; A-F or Aud. Prereq-3218, 3262) Field applications of remote sensing, sampling/measurement methods to inventory/mapping of forest and other natural resources. Offered at Croquet Forestry Center.


FR 5700. Colloquium in Natural Resources. (1-3 cr [max 3 cr]; Stdt. Opt. Prereq-#) Colloquium in specialized topics in natural resources.


French (FREN)

Department of French and Italian

College of Liberal Arts

FREN 5250. Promenades Poétiques: The Subject in Motion. (3 cr [max 9 cr]; Stdt. Opt. 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 cr [max 9 cr]; Stdt. Opt. Prereq-3111 or above) Tragedy as dramatic form in relation to social order, myth and history, and theatre.

FREN 5270. “To Change or not to Change?” Speculations on (Post) Modern French Texts. (3 cr [max 9 cr]; Stdt. Opt. Prereq-3111) The meaning and purpose of the notion of “change” in French novels. Explore how a multiplicity of causes produces major changes in an individual’s personal and public life. The notion of change as it relates to financial and intellectual speculation.

FREN 5301. Critical Issues in French Studies. (3 cr; Stdt. Opt. Prereq-Grad or #) 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 cr [max 12 cr]; Stdt. Opt. Prereq-3101 or equiv) Problem, period, author, or topic of interest. See Class Schedule.

FREN 5470. Post/Colonial Francophone Literatures. (5 cr [max 9 cr]; Stdt. Opt. Prereq-[LING 3001 or Ling 5001], grad student) Advanced study of sound system of contemporary French. French (FREN) ...
Course Descriptions

**FREN 5502. Structure of French: Morphology and Syntax.** (3 cr; Stdnt Opt. = FREN 3502. Prereq-5501 or #)
Linguistic study of contemporary French word forms (inflectional and derivational morphology); introduction to French syntax (linguistic study of grammar) and characteristic syntactic constructions.

**FREN 5531. Sociolinguistics of French.** (3 cr; Stdnt Opt. = FREN 3531. Prereq-5501; 3501, 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 cr; Stdnt Opt. Prereq-3015, 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. ‘Macro’ level analyses such as discourse analysis and conversation analysis.

**FREN 5995. Directed Teaching.** (1-6 cr [max 24 cr]; S-N or Aud. Prereq-#)
Directed teaching.

**FREN 8110. Topics in Early Medieval French Literature.** (3 cr [max 9 cr]; Stdnt Opt)
Introduction to epic, romance, allégorie, and theater in Old French readings (12th-13th centuries). Specific topics/texts studied vary. Taught in French.

**FREN 8111. Introduction to Old French.** (3 cr; Stdnt Opt)
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 cr; Stdnt Opt)
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 “courtey love.” Knowledge of French, Spanish, or Italian desirable. Taught in English.

**FREN 8120. Topics in Later Medieval French Literature.** (3 cr [max 9 cr]; Stdnt Opt. Prereq-8110 or #)
Topics presented by texts written in French ca. 1300-1500. Evolution of Middle French language. Specific topics/texts vary. Taught in French.

**FREN 8210. Narrative, History, and Memory: Topics.** (3 cr [max 9 cr]; Stdnt Opt)
Significance of narrative paradigm in literature, history, and cultural memory. Specific topics/texts treated vary. Taught in French.

**FREN 8220. Staging Modernity: Seminar in Problems of 20th-Century Theatre.** (3 cr [max 9 cr]; Stdnt Opt)

**FREN 8250. Critical Issues: Poetry.** (3 cr [max 12 cr]; Stdnt Opt)
Significant critical issues relating to poetic writing of selected authors or periods.

**FREN 8260. Critical Issues: Theatre.** (3 cr [max 12 cr]; Stdnt Opt)
Significant critical issues relating to dramatic writing of selected authors or periods.

**FREN 8270. Critical Issues: Prose.** (3 cr [max 12 cr]; Stdnt Opt)
Significant critical issues relating to prose writing of selected authors or periods.

**FREN 8271. The Novel of the Ancien Régime.** (3 cr; Stdnt Opt)
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 cr [max 12 cr]; Stdnt Opt)
In-depth study of major author’s writing, critical tradition this writing has occasioned, and theoretical issues upon which this writing may be brought to bear.

**FREN 8291. Jean Genet’s Writings and French Institutions.** (3 cr; Stdnt Opt)
Jean Genet’s writings at the crossroads of several disciplines (politics, psychoanalysis, religion, and law). Genet’s novels, dramas, and political essays explore the power of institutional settings and strategies imagined by individuals to short-circuit their impact.

**FREN 8333. FTE: Master’s.** (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

**FREN 8371. The Rule of Reason, The Reign of Madness: Readings in Early Modern France.** (3 cr; Stdnt Opt)
Relationship between construction of reason and madness in philosophy, legitimation of political rule, and the institution of literature in early modern France.

**FREN 8410. Topics in Quebecois Literature.** (3 cr [max 9 cr]; Stdnt Opt)
Quebecois in relation to other North American literatures and to Francophone literature produced elsewhere in the world. Specific topics/texts vary. Taught in French.

**FREN 8420. Critical Issues: Francophone Literature.** (3 cr [max 9 cr]; Stdnt Opt)
Critical issues relating to literature of Francophone world. Specific topics/texts vary. Taught in French.

**FREN 8444. FTE: Doctoral.** (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

**FREN 8521. History of the French Language.** (3 cr; Stdnt Opt)
History of French from its origins in Latin to the present day. Aspects of diachronic phonology (sound change), morphology, syntax. Taught in French.

**FREN 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 2 cr]; No grade. 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)

**FREN 8777. Thesis Credits: Master’s.** (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required) (Plan A only)

**FREN 8812. Seminar: Dissertation Preparation and Writing.** (3 cr; S-N only. Prereq-Completion of doctoral prelims)

**FREN 8888. Thesis Credit: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

**FREN 8960. Directed Teaching.** (1-5 cr [max 25 cr]; Stdnt Opt)

**FREN 8992. Directed Readings for Graduate Students.** (1-5 cr [max 25 cr]; Stdnt Opt. Prereq-#)

**FREN 8994. Directed Research.** (1-5 cr [max 25 cr]; Stdnt Opt. Prereq-#; may be taken as tutorial with #)

**French and Italian (FRIT)**

**Department of French and Italian**

**College of Liberal Arts**

**FRIT 5257. Passionate Beings: Literary and Medical Problematics in Italy and France from 1800 to the Present.** (4 cr; Stdnt Opt)
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 cr; Stdnt Opt. Prereq-Knowledge of [French or Italian] helpful but not required)
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 cr; Stdnt Opt)
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)**

**Department of Gender, Women, and Sexuality Studies**

**College of Liberal Arts**

**GLBT 5993. Directed Study.** (1-12 cr [max 12 cr]; Stdnt Opt)

**Gender, Women, and Sexuality Studies (GWSS)**

**Department of Gender, Women, and Sexuality Studies**

**College of Liberal Arts**

**GWSS 5101. Feminist Approaches to Ethnicity.** (5 cr; Stdnt Opt)
Preparation for feminist ethnographic research in the social sciences. Using recent works by feminist ethnographers, focus is 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.** (5 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq-grad or #)
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 cr; Stdnt Opt)
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 5105W. Gendered Rhetoric of Science and Technology. (3 cr; Stdnt Opt. Prereq--Rhet 5108, Rhet 5530: 8 cr WOSt or grad or #)
How gender roles affect the production and technology as well as influence scientific and technological thinking and communication strategies.

GWSS 5107. Gender, Culture, and Science. (3 cr; Stdnt Opt)
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 cr; Stdnt Opt. =GWSS 4122, PHIL 4622; PHIL 5622. Prereq--8 cr 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.


GWSS 5201. Global Processes and the Politics of Sexuality. (3 cr; Stdnt Opt. 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 cr; Stdnt Opt) Topics specified in Class Schedule.

GWSS 5300. Communication and Gender. (3 cr; A-F or Aud. =COMM 5406; Prereq--one women’s courses study or #)
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 5393. Chicana/ Latina Feminisms. (3 cr; Stdnt Opt. Prereq--8 cr WOSt and/or Chic or grad or #)
The historical and social development of Chicana and Latina feminisms in general and their various specific types.

GWSS 5404. Working Class Women’s Cultures. (3 cr; Stdnt Opt. 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.

Chicanas, their various relationships to family/community. Local, national, and global work forces. Questions/issues related to growing integration of women into the system of production.

GWSS 5570. Topics: Political Economy and Global Studies. (3 cr [max 12 cr]; Stdnt Opt) Topics specified in Class Schedule.

GWSS 5580. Women and the Law. (3 cr; Stdnt Opt. Prereq--9 cr WOSt or pre-law grad or #)
Legal system as it relates to women: historical/legal approach to issues related to constitutional rights of women.

GWSS 5590. Queering Theory. (3 cr; Stdnt Opt. =GWSS 4403)
Lesbianism and lesbian identities as products of cultural practices, relations, and meanings that are historically specific/changing.

GWSS 5590. Topics: Social Change, Activism, Law, and Policy Studies. (3 cr [max 12 cr]; Stdnt Opt)
Topics specified in Class Schedule.


GWSS 5790. Topics: Sexuality Studies. (3 cr [max 6 cr]; Stdnt Opt) Topics specified in Class Schedule.

GWSS 5990. Directed Study. (1-12 cr [max 12 cr]; Stdnt Opt)
GWSS 5994. Directed Instruction. (1-12 cr [max 36 cr]; Stdnt Opt)
GWSS 5995. Directed Research. (1-8 cr [max 36 cr]; Stdnt Opt)
GWSS 8101. Intellectual History of Feminism. (3 cr; Stdnt Opt)
Major trends in feminist intellectual history from 14th century to the present, especially in the United States and Europe.


GWSS 8103. Feminist Theories of Knowledge. (3 cr; Stdnt Opt. =PHIL 8133)
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 8108. Feminist Theories and Methods I. (3 cr; Stdnt Opt. Prereq--Feminist studies PhD or grad minor student or #)

GWSS 8109. Feminist Theories and Methods II. (3 cr; Stdnt Opt. Prereq--Feminist studies PhD or grad minor student or #)

GWSS 8190. Topics: Feminist Theory. (1-3 cr [max 12 cr]; A-F or Aud)
Topics in feminist theory.

GWSS 8201. Feminist Theory and Methods in the Social Sciences. (3 cr; Stdnt Opt)
Seminar on recent theories, including feminist versions of positivist, interpretivist, critical theoretical, and postmodernist models of social science knowledge. Methodologies congial to feminist practices of inquiry, including use of narrative in theory, feminist ethnography, discourse analysis, and comparative methods in history.

GWSS 8290. Topics: Social Sciences and Public Policy. (1-3 cr [max 3 cr]; Stdnt Opt)
GWSS 8301. Feminist Literary Criticism. (3 cr; Stdnt Opt)
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 theoretical analysis taking place in various University departments.

GWSS 8333. FTE: Master’s. (1 cr; No grade. Prereq--Master’s student, adviser and DGS consent)

GWSS 8390. Topics: Literary Studies. (1-3 cr [max 3 cr]; Stdnt Opt)
GWSS 8401. Gender, Space, and Resistance. (3 cr; Stdnt Opt)
Identity politics, social movements, and development politics; complex interrelationships among gender, space, and resistance. Social nature of place and space; sociopolitical and economic processes by which gendered, raced, and classed differences are constituted, reinforced, and resisted in and through space, place, and social networks.

GWSS 8444. FTE: Doctoral. (1 cr; No grade. Prereq--Doctoral student, adviser and DGS consent)

GWSS 8490. Topics: Comparative and Global Studies. (1-3 cr [max 3 cr]; Stdnt Opt)
GWSS 8590. Topics: Historical Studies. (1-3 cr [max 3 cr]; Stdnt Opt)

GWSS 8666. Doctoral Pre-Thesis Credits. (1-8 cr [max 12 cr]; No grade. 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)

GWSS 8888. Thesis Credit: Doctoral. (1-24 cr [max 24 cr]; No grade. Prereq--Max 18 cr per semester or summer; 24 cr required)

GWSS 8993. Directed Study. (1-6 cr [max 9 cr]; Stdnt Opt)

GWSS 8994. Directed Instruction. (1-8 cr [max 36 cr]; Stdnt Opt)

GWSS 8995. Directed Research. (1-8 cr [max 36 cr]; Stdnt Opt)

GWSS 8996. Feminist Studies Colloquium. (1 cr [max 4 cr]; S-N or Aud. Prereq--Grad major or minor in feminist studies)

GWSS 8997. Feminist Research and Writing. (3 cr; Stdnt Opt. Prereq--To 8100, passed written prelims in degree granting program)
Develops interdisciplinary feminist components of Ph.D. thesis or other major piece of writing. Facilitates research/writing.
Course Descriptions

Genetics, Cell Biology and Development (GCD)

Department of Genetics, Cell Biology, and Development

College of Biological Sciences

GCD 5036. Molecular Cell Biology. (3 cr; Stdnt Opt. Prereq-Biol 4004 or #; [sr or grad student recommended])
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 6008. Mammalian Gene Transfer and Expression. (2 cr; A-F or Aud. Prereq—#)
Current gene transfer technology. Applications of genetic modifications in animals, particularly transgenic animals and human gene therapy.

GCD 8007. Advanced Human Genetics. (3 cr; Stdnt Opt. Prereq—8121 or #)
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 cr; Stdnt Opt. +GCD 6103. Prereq—Undergraduate biology, chemistry, math, and physics course; #) 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. (3 cr; Stdnt Opt. Prereq—3022 or Biol 4003, BioC 5201 or BioC 4331 or #)
Literature-based course covering modern genetic analysis, including mutant screens, characterization of multiple alleles, gene mapping and cloning, genome sequencing, intergenic interactions, transposable elements, genetic mosaics, and molecular mechanisms of recombination.


GCD 8151. Cell Structure and Function. (3 cr; Stdnt Opt. Prereq—[[4034 or 8121 or BioC 8002], Biol 4004] or MBMB or MCDB&G grad student), #) 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. (5 cr; Stdnt Opt. Prereq—[[4034 or 8121 or BioC 8002], [8131 or Biol 4003], Biol 4004] or #) Current concepts of and experimental approaches taken to understand basic mechanisms of development. Model organisms. Embryology, cell fate determination, differentiation, pattern formation, polarity, cell migration, and cell interactions. Analysis of original research articles.

GCD 8171. Literature Analysis. (2 cr; A-F or Aud. Prereq—Grad MCDG major) 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 8181. Stem Cell Biology. (3 cr; Stdnt Opt. Prereq—[[4034 or 8121 or BioC 8002], [4161 or B161]] or #) Students read/evaluate primary literature on stem cell research and applications. Critical analysis, written summaries/critiques, oral presentations.

GCD 8212. Selected Topics in Cell and Developmental Biology. (5 cr; Stdnt Opt. Prereq—[8121 or BioC 8002], [8131, [4161 or 8161 or #]) 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 8900. Seminar. (1 cr [max 4 cr]; S-N or Aud. Prereq—Grad MCDG major or #) Critical current scientific research.

GCD 8910. Journal Club. (1 cr [max 4 cr]; S-N or Aud. Prereq—Grad MCDG major or #) Critical examination of current selected literature.

GCD 8912. Genetic Counseling in Practice. (4 cr; A-F or Aud. Prereq—MCDG MS student with genetic counseling specialization or #) Practical genetic counseling, communicating genetic and medical information to the family, helping families with decision making.

GCD 8913. Psychosocial Issues in Genetic Counseling. (3 cr; A-F or Aud. Prereq—MCDG MS student with genetic counseling specialization or #) Interviewing skills, supportive counseling, and case-study analysis specific to genetic counseling.

GCD 8914. Ethical and Legal Issues in Genetic Counseling. (3 cr; A-F or Aud. Prereq—MCDG MS student with genetic counseling specialization or #) Professional ethical; ethical and legal concerns with new genetic technologies.

GCD 8920. Special Topics. (1-4 cr [max 8 cr]; S-N or Aud. Prereq—Grad MCDG major or #) Special topics.

GCD 8993. Directed Studies. (1-5 cr [max 15 cr]; S-N or Aud. Prereq—MCDG MS student with genetic counseling specialization or #) Independent research determined by student's interests, in consultation with faculty mentor.

Geographic Information Science (GIS)

Department of Geography

College of Liberal Arts

GIS 5530. GIS Internship. (1-5 cr [max 6 cr]; S-N only. Prereq—#, strong GIS/mapping skills) Intensive hands-on experience using GIS to solve practical problems.


GIS 5572. ArcGIS II. (3 cr; Stdnt Opt. Prereq—[GEOG 5561 or equiv, in MGIS program] or #) In-depth exploration of topics from 5571, as well as dynamic segmentation, address matching, and macro language programming.

GIS 5573. Desktop Mapping. (1.5 cr; Stdnt Opt. Prereq—Geog 3511 or equiv, Geog 3511 or equiv, status in MGIS program or #) Introduction to desktop mapping systems such as ArcView, MapInfo and MapMate. Emphasizes the application of these systems to the display and analysis of geophysical data.

GIS 5574. GIS and the Internet. (1.5 cr; Stdnt Opt. Prereq—Geog 5561 or equiv, status in MGIS program or #) The role of the Internet in GIS applications. Topics include GIS data sources on the Internet, the role of the Internet in dissemination of information, Internet capabilities for interactive mapping and issues surrounding the development of GIS-related Web sites.

GIS 5575. Surveying and the Global Positioning System (GPS). (2 cr; Stdnt Opt. Prereq—Geog 5561 or equiv, status in MGIS program or #) Introduction to GPS (Global Positioning System) and other surveying techniques of use to GIS professionals. Topics include geodesy, data adjustment, datums, ellipsoids, coordinate systems, and transformations.

GIS 5577. Spatial Data Administration. (2 cr; Stdnt Opt. Prereq—#) Theory/Methodology for administration of geographic databases. Quality assurance, development planning/management, maintenance, access/distribution, documentation.

GIS 5578. GIS Programming. (3 cr; Stdnt Opt. Prereq—MGIS student or #) Opportunities/feasibility that computer programming offers to application of GIS technologies. Programming techniques using Visual Basic, Python, and ArcObjects. Students apply GIS principles/concepts to programs using ESRI software.

GIS 5590. Special Topics in GIS. (1-3 cr [max 6 cr]; A-F or Aud. Prereq—#) Special topics in geographic information science (GIS). Topics vary according to student needs, technological developments in field.

GIS 8333. FTE: Master's. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

GIS 8501. Survey of Geographic Information Science: Past, Present, and Future Trends and Activities. (3 cr; Stdnt Opt. Prereq—MGIS student or #) Major trends and activities in geographic information science; university, local, state, and federal-level initiatives. History of GIS and its various disciplinary roots as well as major GIS-related resources (e.g., data sources, Web resources).
GEOG 5411. Geography of Health and Health Care. (4 cr; Stdnt Opt. = GEOG 5411W) Application of environmental, 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 cr; Stdnt Opt. = EES 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 cr; Stdnt Opt. Prereq.- 5401 or 5401) 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 cr; Stdnt Opt. Prereq.-1425 or 3401 or 5401) Theories of climate 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 cr; Stdnt Opt. = GEOG 5431) Introduction to an in-depth study of plant and animal distributions at different scales over time and 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 5441. Quaternary Landscape Evolution. (3 cr; Stdnt Opt. Prereq.-5401 or grad student or 5401) Roles of climate change, geomorphic history, vegetation change, and soil development in the evolution of landscape patterns during the Quaternary Period, with emphasis on North America.


GEOG 5512. Cartography: Topics. (3 cr; Stdnt Opt. Prereq.-5511 or 3511 or 5511) Selected topics include the system of cartographic communication, urban mapping, spatial analysis, history of cartography.

GEOG 5530. Cartography Internship. (2-7 cr [max 10 cr]; S-N or Aud. Prereq.-) Provides intensive hands-on experience in contemporary map production and design, ranging from GIS application to digital press. Strong computer skills essential.


GEOG 5561. Principles of Geographic Information Science. (4 cr; Stdnt Opt. Prereq-grad student or) Introduction to the study of geographic information systems (GIS) for geography and non-geography students. Topics include GIS application domains, data models and sources, current methods and output techniques. Lectures, reading, and hands-on experience with GIS software.


GEOG 5563. Advanced Geographic Information Science. (3 cr; Stdnt Opt. Prereq-B or better in 5561 or 5561 or) 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 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq-GIS 5561 or 5561 or FR 4131 or LA 5573 or one intro GIS course or grad student or 5561) 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, hydrosheric, geomorphic, pedologic, biologic, and human landuse systems.


GEOG 5605W. Geographical Perspectives on Planning. (2 cr; Stdnt Opt. = GEOG 5605W, GEOG 5605W, GEOG 5605W, PA 5203W) Open to graduate students and undergraduates wishing Honors credits. Includes one additional weekly seminar-style meeting and a bibliography project on a topic selected in consultation with the instructor. Meets with 3605.

GEOG 5701. Field Research. (3 cr; Stdnt Opt. Prereq-9 cr in geog, #) Field investigation in physical, cultural, and economic geography; techniques of analysis and presentation; reconstruction of environments.
Course Descriptions

GEOG 5775. Geographic Education. (3 cr; Stdnt Opt. Prereq–Three courses in geography or history or social sciences or education or #) Teaching geography from middle school up; pedagogical use of geographical themes; methods for effective teaching of multiple cognitive domains -- facts, theories, analytical skills, and evaluations; designing audio-visual aids, independent projects, simulations, etc. to meet National Standards in geography.

GEOG 5900. Topics in Geography. (3 cr [max 9 cr]; Stdnt Opt. Prereq–sr or grad, #) Special topics and regions. Course offered by visiting professors in their research fields.

GEOG 8001. Problems in Geographic Thought. (3 cr; A-F or Aud) 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 cr; Stdnt Opt. Prereq–#) Conceptual literature and empirical studies on fertility, mortality, and migrations in different parts of the world.

GEOG 8006. Proseminar: Research Methods in Geography. (3 cr; Stdnt Opt. Prereq–#) 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 cr; Stdnt Opt. Prereq–#) 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 8020. Research Seminar: Economic Geography. (1 cr; Stdnt Opt. Prereq–#) Contemporary research. Advanced topics, which vary with interests of faculty offering course.


GEOG 8012. Proseminar: The State, the Economy, and Spatial Development. (3 cr; Stdnt Opt. Prereq–#) Introduction to research in economic, political, and urban geography: conceptual research addressing interrelationship between political and economic processes and spatial dynamics of urban and regional development; empirical research documenting nature and extent of this interrelationship at different spatial scales.

GEOG 8013. Proseminar: Physical Geography. (3 cr; Stdnt Opt. Prereq–#) Historical development of research in physical geography, current research trends, and transfer of current research to undergraduate education.

GEOG 8015. Proseminar: Historical Geography. (3 cr; Stdnt Opt. Prereq–#) Introduction to concepts, research and empirical studies.

GEOG 8101. Proseminar: Urban Geography. (2-3 cr [max 3 cr]; A-F or Aud) Contemporary research. Topics vary with the interests of faculty.

GEOG 8101A. Explorations in the Geography of Minnesota. (3 cr; S-N or Aud. Prereq–#) Physical environment, agriculture, forestry, mining, land survey, population, recreation, cities/towns, transportation. Sources of information about the state. Students make short oral/written reports. Might provide springboard for a Plan B paper, thesis, or dissertation. Two or three Saturday field trips.

GEOG 8101B. Environmental Policy. (3 cr; Stdnt Opt. Prereq–#) U.S. environmental policies at federal/state level. Policy formulation, implementation, and evaluation.

GEOG 8101C. Africa. (3 cr; Stdnt Opt. Prereq–#) Advanced topics. Topics vary with interests of faculty offering course.

GEOG 8101D. East Asia and China. (3 cr; Stdnt Opt. Prereq–#) Contemporary research, advanced topics. Topics vary with interests of faculty offering course.

GEOG 8101E. South Asia. (3 cr; Stdnt Opt) Advanced topics. Topics vary with interests of faculty offering course.


GEOG 8130. Theoretical Geography. (3 cr; Stdnt Opt. Prereq–#) Advanced topics. Topics vary with interests of faculty offering course. Contemporary theoretical/philosophical themes transcending subdisciplines of human/physical geography.

GEOG 8140. Medical Geography. (3 cr; Stdnt Opt. Prereq–5411 or #) Geographic inquiry concerning selected problems of health and health care.

GEOG 8160. Seminar: Physical Geography. (3 cr; Stdnt Opt. Prereq–#) Topics of contemporary research. Topics vary with interests of faculty offering course.

GEOG 8170. Seminar: Climatology. (3 cr Prereq–#) Sample topics: climate modeling; climatic variability; climate change and predictability; severe local storms; drought; energy balance; urban climate; statistical climatology.

GEOG 8180. Biogeography. (3 cr [max 9 cr]; Stdnt Opt. Prereq–#) Forest dynamics, dendrochronology, tree rings and climate, environmental disturbance, paleobiogeography, field/lab methods in biogeography.

GEOG 8200. Seminar: Urban Geography. (3 cr; Stdnt Opt. Prereq–#) 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 8302. Research Development. (3 cr; S-N or Aud. Prereq–#) Students in geography and related social sciences are guided in key steps to effective research proposal writing.

GEOG 8333. FTE: Masters. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

GEOG 8336. Development Theory and the State. (3 cr; A-F or Aud) Why certain interventionist states in third world countries have been able to guide their economies to overcome legacy of underdevelopment while most have failed to induce development. Internal/external conditions that facilitated such departure from underdevelopment. Comparative national/provincial case studies: Taiwan, South Korea, Botswana, Brazil, India. Applying theoretical approaches to policy issues.

GEOG 8350. Seminar: World Population. (3 cr; Stdnt Opt. Prereq–#) Contemporary research in world population development and problems. Topics vary with interests of faculty offering course.

GEOG 8405. Seminar: Graduate Student Professional Development. (1 cr [max 2 cr]; S-N or Aud. Prereq–Geography grad student or #) 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 cr [max 3 cr]; S-N or Aud. Prereq–[Geog or MGIS] grad student or #) Teaching methodologies, learning objectives, course content, classroom techniques, student/course evaluation. Specific application to instruction in Geography.

GEOG 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)
GEOG 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

GEOG 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Master’s 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)

GEOE 8331. Geomechanics Modeling. (3 cr; A-F or Aud. =CE 5331. Prereq–IT upper division or grad student, CE 4301, GE 4301 or #) 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 8331. Geomechanics Modeling. (3 cr; A-F or Aud. =CE 5331. Prereq–IT upper division or grad student, CE 4301 or #) 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 8330. Seminar: Geomechanics. (1-3 cr [max 4 cr]; S-N or Aud. = CE 8300) Presentations on various topics.

GEOE 8351. Advanced Groundwater Mechanics II. (3 cr; A-F or Aud. =CE 8351. Prereq–CE 4351, IT grad student or #) Solute transport; shallow flow in leaky aquifers; complex variable methods in groundwater flow; analytic element method: potentials for line sinks, line dipoles, line dipoles, area sinks, and special analytic elements; singular Cauchy integrals; analytic elements in domains with closed boundaries.

GEOE 8352. Advanced Groundwater Mechanics III. (3 cr; A-F or Aud. =CE 8352. Prereq–CE 4351 or GE 4351, IT grad student or #) 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.
Course Descriptions

GEO 5108. Principles of Environmental Geology. (3 cr; Stdnt Opt. Prereq–Geology majors: core curriculum through 4501 or #; nonmajors: 1001 or #) Human impact on geological environment and effect of geological processes on human life from an ecosystem and biogeochemical cycles perspective. Geologic limits to resources and carrying capacity of Earth. Land use planning, environmental impact assessment, eugeologic world models. Field project and trip.


GEO 5302. Isotope Geology. (3 cr; A-F or Aud. Prereq–2503 or #) Theory and uses of radioactive, radiogenic, and stable isotopes in geology. Radioactive dating, geothermometry, and tracer techniques in geologic processes.


GEO 5353. Electron Microprobe Theory and Practice. (3 cr; Stdnt Opt. Prereq–[One yr chem, one yr physics] or #) Characterization of solid materials with electron beam instrumentation, including reduction of X-ray data to chemical compositions.


GEO 5503. Advanced Petrology. (3 cr; Stdnt Opt. Prereq–3502, CHEM 1021, [MATH 1522 or MATH 1572 or MATH 1572H]) Quantitative approach to modern igneous/metamorphic petrology. Emphasizes thermodynamics of minerals/melts and with applications to phase diagrams, thermobalance, melting relationships, and energetics of petrologic mass transfer.

GEO 5601. Advanced Sedimentology. (4 cr; Stdnt Opt. Prereq–4602 or #) Modern techniques of sedimentary basin analysis focusing on interactions among the lithosphere, atmosphere, and hydrosphere. Sedimentary facies of modern and ancient systems, petrology of clastic and carbonate deposits, tectonic and paleoclimatic interpretations, paleocurrent analysis, diagenetic effects on subsurface fluid flow, and volcanic sedimentation.


GEO 5705. Limnogeology and Paleoenvironments. (3 cr; Stdnt Opt. Prereq–#) Within-lake, hydrogeologic, and landscape (geological/biological) processes that lead to formation of various proxy records of paleoenvironment. Systems approach to physical, geochemical, biogeochemical, and biotic proxies. Basic principles, case studies. Emphasizes how proxy records relate to paleoclimate.

GEO 5713. Tracers and Karst Hydrogeology. (3 cr; Stdnt Opt. 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 hydrogeology; use of natural and synthetic chemical and isotopic labels or tracers to follow movement and mixing of water through hydrologic cycle.

GEO 5802. Scientific Visualization. (3 cr; Stdnt Opt. Prereq–CSci 1107 or CSci 1113 or #) Visualization hardware and software, three-dimensional graphics, representation of scientific data, modeling, user interface techniques, output, common used algorithms, animation, case studies and examples.


GEO 8345. Principles of Rock Magnetism. (1-3 cr [max 3 cr]) Core curriculum through 4501 or #) Permanent 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.


GEO 8345. Igneous Petrology. (3 cr; Stdnt Opt. Prereq–4301 or #) Igneous rocks and processes, emphasizing geochemistry of melts and minerals. Content varies with instructor and student interest.


GEO 8601. Introduction to Stream Restoration. (3 cr; A-F or Aud. = EEB 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 #) 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.

GEO 8602. Stream Restoration Practice. (2 cr; S-N only. =CE 8602.) Prereq–Grad student admitted before summer 2007 may register up to four times, up to 60 combined cr)

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GEO 8712. Transport Phenomena and Analytical Geohydrology. (3 cr; A-F or Aud.) Groundwater sampling for chemical analysis. Weather data collection, hydrogeologic mapping, water balance calculation.

GEO 8866. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]) No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; ¾ 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)

GEO 8977. Thesis Credits: Master’s. (1-16 cr [max 50 cr]) No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only]

University of Minnesota 2009-10 Graduate School Catalog

304
 GER 5734. Old Saxon. (3 cr; Stdnt Opt) Study of the poetry of Old Saxon. Detailed investigation of Old Saxon in comparison with the other Old Germanic languages.

 GER 5740. Readings in Philology. (3 cr [max 9 cr]; Stdnt Opt) Philological analysis of a chosen text in any medieval Germanic language.

 GER 5993. Directed Studies. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq—%, @) Guided individual reading or study.

 GER 8010. Current Debates in Literary and Cultural Theory. (3 cr [max 12 cr]; Stdnt Opt) Seminar. Close readings of theoretical constellations in texts. Topic such as text/image, history/memory/time, oral culture/literacy, public/private, authority/crisis. Draws on literary, philosophical, and theoretical work.

 GER 8020. Problems in Literary and Cultural History. (3 cr [max 12 cr]; Stdnt Opt) Historiographic texts as literary and literary or filmic texts as historical documents. Homogenizing/constructive elements in historiography. Strategies of writing historical syntheses.

 GER 8200. Seminar in Medieval German Literature and Culture. (3 cr [max 9 cr]; Stdnt Opt. Prereq—5721) 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 cr [max 9 cr]; Stdnt Opt) Topics on specific author, group of authors, genre, or subject matter in German literature, 1450-1750.

 GER 8220. Seminar in 18th-Century German Literature and Culture. (3 cr [max 9 cr]; Stdnt Opt) Literary, philosophical, and aesthetic texts emerging from major 18th-century literary trends, 1720-1810. Cultural and historical contexts of Enlightenment and Weimar Classicism.

 GER 8230. Seminar in 19th-Century German Literature and Culture. (3 cr [max 9 cr]; Stdnt Opt) Literature and culture of the period of the first German Empire, 1850-1900.

 GER 8240. Seminar in 20th-Century German Literature and Culture. (3 cr [max 9 cr]; A-F or Aud) Topics on literature, film, or other forms of “high” and popular culture.

 GER 8250. Topics in Literature and Cultural Theory. (3 cr [max 9 cr]; Stdnt Opt) Further readings of texts critical of modernity with an emphasis on topics of the period of the first German Empire, 1850-1900.

 GER 8260. Seminar in 21st-Century German Literature and Culture. (3 cr [max 9 cr]; A-F or Aud) Topics on literature, film, or other forms of “high” and popular culture.

 GER 8270. Seminar in the Philosophy of Language. (3 cr [max 9 cr]; Stdnt Opt) Philosophical investigation of the monuments of Old High German. Detailed investigation of Old High German in comparison with the other Old Germanic languages.

 GER 8280. Seminar in the Prehistory of German. (3 cr [max 9 cr]; Stdnt Opt) Philosophical investigation of the monuments of Old High German. Detailed investigation of Old High German in comparison with the other Old Germanic languages.

 GER 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr) For doctoral students in German and Scandinavian studies who are beginning to establish topics and do research for their dissertations. Discussion of a variety of topics related to this process as well as presentation of some written work.


 GER 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required) Introduction to techniques of historical text-critical editing of medieval Germanic and Latin manuscripts.

 German, Scandinavian, and Dutch (GSD)

 College of Liberal Arts

 GSD 5103. Teaching of Germanic Languages. (3 cr; Stdnt Opt) Second language acquisition theory, methods, testing, and technology applicable to teaching of modern Germanic languages.

 GSD 8001. Approaches to Textual Analysis. (3 cr; Stdnt Opt) Theoretical approaches to textual analysis that shape disciplinary discussions in Germanic studies.

 GSD 8002. Interdisciplinary Approaches to Textual Analysis. (3 cr; Stdnt Opt) Theoretical approaches in textual studies that challenge conventional notions of boundaries between disciplines and between national literatures/cultures.

 GSD 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent) FTE: Master’s.

 GSD 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent) FTE: Doctoral.

 GSD 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr) For doctoral students in German and Scandinavian studies who are beginning to establish topics and do research for their dissertations. Discussion of a variety of topics related to this process as well as presentation of some written work.


 GSD 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required) Introduction to techniques of historical text-critical editing of medieval Germanic and Latin manuscripts.
Gerontology (GERO)

School of Public Health

GERO 5100. Topics in Gerontology. (2-4 cr; [max 10 cr]; Stdnt Opt)
Trendy topics related to the biology, sociology, and psychology of aging and applied aging services.

GERO 5105. Multidisciplinary Perspectives on Aging. (3 cr; Stdnt Opt)

GERO 5110. Biology of Aging. (3 cr; Stdnt Opt)
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 cr; Stdnt Opt. Prereq—Introductory course in epidemiology or #)
Methodological issues unique to studies of older populations. Focuses on measurement of epidemiological characteristics. Health conditions/disorders of older Americans.

GERO 5112. Aging: Policy and Demography. (3 cr; A-F or Aud. Prereq—[Grad-level research methods, basic statistics course] or #)

GERO 5115. Introduction to Geriatrics. (2 cr; S-N only)
Online course. Major topics in geriatrics. How to diagnose/treat conditions common in caring for older people.

GERO 5191. Independent Study: Gerontology. (1-4 cr; [max 6 cr] Prereq—Approval of [advisor, DGS for gerontology minor])
Qualified students work on a tutorial basis. "Description varies with topic title." Requirements specified in Class Schedule.

GERO 5202. Seminar in Gerontology. (2 cr; Stdnt Opt. Prereq—#)
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 gerontological journals; become familiar with large database in aging and describe how that database has been used in research for secondary analyses.

Global Studies (GLOS)

Institute of International Studies

College of Liberal Arts

GLOS 5103. Empire and Modernity. (3 cr; A-F or Aud. Prereq—[3101, 3144] or #)
How modern world has been constituted by colonial encounter. Role of colonialism in construction of west. Images of non-western societies. Modernity in colonial/postcolonial societies. Problems/potential of universal categories such as democracy, gender, history, human rights. Globalization at the margins.

The relations of Mexico and the United States from an international perspective with a central focus on the cultural interchange in the border lands between the two countries. Uses both literary and historical materials.

GLOS 5301. Environment & Empire. (3 cr; A-F or Aud. Prereq—[3101, 3144] or #)
Key issues in environmental history. Emphasizes global/colonial processes that have made modern environment. Global spread of diseases, modern remaking of world’s flora/fauna, idea of nature. New technologies and the environment. Conservatism/ideology.

GLOS 5403. Human Rights Advocacy. (3 cr; Stdnt Opt. Prereq—Grad student or #)

GLOS 5410. Interactive Global and Local Studies. (3 cr; A-F or Aud. Prereq—#)
Global studies topics, locally in the Twin Cities and Minnesota, and internationally through linked communication with classes at cooperating universities in other countries. Students communicate with counterparts abroad through e-mail to develop comparative/interactive elements. Possible topics: role of river in local history, grain storage/processing, manufacturing/trade, growth of metropolitan area.

GLOS 5602. Other Worlds: Globality and Culture. (3 cr; A-F or Aud. Prereq—[3101, 3144; grad student] or #)
Interconnectedness of world. Considering not one world, but many. Colonialism, consumption, diasporic conditions, global media, nationalism, supra-national governance. How globality is experienced/challenged locally/specifically.

GLOS 5603. Socialist/Post-socialist Transformations. (3 cr; A-F or Aud. +HIST 5251)
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.

GLOS 5643. Colonialism and Culture. (3 cr; A-F or Aud. +ANTH 5043)
Making of culture as colonial/anthropological object of knowledge. Relationship between colonial knowledge/formation of academic disciplines (especially anthropology). Colonial/postcolonial transformations of colony, nation, and metropole.

GLOS 5801. International Development: Critical Perspectives on Theory and Practice. (3 cr; A-F or Aud. Prereq—Admission to MSID prog, grad student)
Interdisciplinary approaches to development. Assumptions, competing paradigms, analysis of policies, projects, problems. Globalization, societal crisis, indigenous alternatives to dominant paradigm. Partially taught in separate sections to deepen understanding of particular topic (e.g., environment, health, education).

GLOS 5802. Cross-Cultural Perspectives on Work. (3 cr; A-F or Aud. Prereq—Admission to MSID prog, grad student)

GLOS 5803. MSID Country Analysis. (3 cr; A-F or Aud. Prereq—Admission to MSID prog, grad student)
Multidisciplinary study of host country. Emphasizes social sciences and history, especially concepts/information regarding development issues.
Greek (GRK)
Department of Classical and Near Eastern Studies

GRK 5001. Intensive Classical Greek. (3 cr; Stdnt Opt. Prereq—Previous experience in another foreign language recommended) Introduction to classical Greek. Covers two semesters of material in one semester.

GRK 5003. Intermediate Greek Prose: Graduate Student Enrollment. (3 cr; Stdnt Opt. Prereq—[GRK 3003 or [1002 or 5001] or [1002 or 5001]]) Readings in Classical Greek prose texts by one or more authors (e.g., Plato, Lydias, Xenophon, Herodotus). Review of grammar/morphology. Meets with 3003.


GRK 5100. Advanced Reading. (3 cr [max 18 cr]; Stdnt Opt. Prereq—[3004 or equiv] and 5004) Reading in Greek texts/authors. Texts/authors vary each term.


GRK 5701. Prose Composition. (3 cr; Stdnt Opt. Prereq—Grad student or #) 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 Greek prose into Greek.


GRK 5704. Greek Paleography. (3 cr; Stdnt Opt. Prereq—Grad student or #) 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 cr; Stdnt Opt. =LAT 5705) Prereq—Grad student or #) Historical/comparative grammar of Greek/Latin, from their Proto-Indo-European origins to classical norms.

GRK 5706. History of Greek. (3 cr; Stdnt Opt. Prereq—Grad student or #) Reading and formal analysis of documents illustrating evolution of Greek language from Mycenaean to modern times.

GRK 5800. Sight Reading for Graduate Students. (1 cr [max 6 cr]; S-N only, Prereq—[SPEAK score of 50 or ELP rating of 1 from [5102 or 5105]]) Colloquis support for teaching, faculty mentorship at regional college or university, investigation of faculty role at variety of institutions, classroom observation/feedback, preparation for academic job search. Non-native English speakers must pass University requirements for intracultural teaching assistants.

GRK 8100. Readings in Greek Prose. (3 cr [max 18 cr]; Stdnt Opt. Prereq—Advanced grad student) Reading and discussion of ancient Greek prose texts.

GRK 8120. Greek Text Course. (3 cr [max 15 cr]; Stdnt Opt. Prereq—[5111 or #; not for students in dept of Classical and Near Eastern Studies] Students attend 3xxx Greek courses. Supplementary dept of Classical and Near Eastern Studies)

GRK 8262. Survey of Greek Literature I. (3 cr; Stdnt Opt.) Extensive selections from all genres of Greek literature of archaic and early classical periods.

GRK 8263. Survey of Greek Literature II. (3 cr; Stdnt Opt.) Extensive selections from Greek authors of the classical and Hellenistic eras.
Course Descriptions

HINF 8434. Medical Decision Support Techniques. (3 cr; A-F or Aud. Prereq-5432 or #) 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 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

HINF 8446. Professional Studies in Health Informatics. (1-2 cr [max 2 cr]; A-F or Aud. Prereq-5451, PubH 5452 or #, grad hist inf major) 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 in Health Informatics. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-#) Directed readings in topics of current or theoretical interest in medical informatics.

HINF 8494. Research in Health Informatics. (1-6 cr [max 6 cr]; A-F or Aud. Prereq-#) Directed research under faculty guidance.

HINF 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 1% for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 50 combined cr)

HINF 8770. Plan B Project. (4 cr; A-F or Aud. Prereq-Plan B MS student, #, no credit toward PhD) Research project. Topic arranged between student and instructor. Written report required.

HINF 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

HINF 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

Hebrew (HEBR)

Department of Classical and Near Eastern Studies
College of Liberal Arts

HEBR 5090. Advanced Modern Hebrew. (5 cr [max 18 cr]; Stdnt Opt. Prereq-3012 or #, grad student!) Preparation to read various kinds of authentic Hebrew texts and to develop higher levels of comprehension/speaking. Conducted entirely in Hebrew. Emphasizes discipline, responsibilities, resources, and job opportunities. Directed experiences in consulting, teaching, writing, conducting research, and managing facilities.

HEBR 5200. Advanced Classical Hebrew. (3 cr [max 18 cr]; Stdnt Opt. Prereq-3000 or #, grad student) 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 5990. Topics in Hebrew Studies. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq-Grad student or #) Historical, linguistic, literary, religious, or humanistic study of Hebrew society/culture. Approach/method of study varies with topic.


Hindi (HNDI)

Department of Asian Languages and Literatures
College of Liberal Arts

HNDI 5040. Readings in Hindi/Urdu Texts. (3 cr [max 9 cr]; Stdnt Opt. Prereq-4622 or equiv or #) Students read authentic materials of various types to improve reading/speaking ability.


HNDI 5993. Directed Readings. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq-#) Guided individual reading or study of modern Hindi texts.

HNDI 8790. Research. (1-5 cr [max 5 cr]; Stdnt Opt. Prereq-#)

History (HIST)

Department of History
College of Liberal Arts

HIST 5011. Proseminar in the History of Medieval Europe. (3 cr; A-F or Aud. Prereq-Advanced undergrads of exceptional ability or grads, #) Examination of basic scholarly bibliography for medieval Western European history. Aim is to help students prepare for M.A. and Ph.D. examinations.

HIST 5115. Medieval Latin Historians. (3 cr; Stdnt Opt. Prereq-Reading knowledge of Latin) 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 5211. Socialist/Post-socialist Transformations. (3 cr; A-F or Aud. =GLOS 5603) Transformations underway in post-socialist societies of Eastern Europe, former Soviet Union. Rambifications of abandonment of state socialism, introduction of market relations. Effect of former system, new market system on cultural institutions/identities.

HIST 5244. Imperial Russia: Formation and Expansion of the Russian Empire in the 18th and 19th Centuries. (3 cr [max 4 cr]; Stdnt Opt) Interaction with Europe and Asia; attempts at modernization and reform; emancipation of the serfs and rise of revolutionary movements.

HIST 5265. 17th-Century Russia: The Collapse of Imperial Russia, the Revolutions, and the Soviet Regime. (3 cr; Stdnt Opt) Analysis of the factors that led to the collapse of the tsarist regime; discussion of the 1917 revolution, the evolution of the Soviet regime and the collapse of Soviet communism. Emphasis on the role of nationalities and the rise of the Commonwealth of independent states.

HIST 5271. The Viking World: Story, History, and Archaeology. (3 cr; A-F or Aud. =HIST 3271) 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 5285. Problems in Historiography and Representation of the Holocaust. (3 cr; Stdnt Opt. =JWST 5111. Prereq-JWST 3521 or RELS 3521 or #) 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 cr; Stdnt Opt) 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 cr; Stdnt Opt) Social movements (revolutionary, nationalist, women’s; communist and post-communist societies.
HIST 5379. Problems in Early American History. (3 cr; Stdnt Opt) 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. (3-4 cr [max 6 cr]; Stdnt Opt. Preq—1501, 1502) 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 5436. Social History of African Women: 1850 to the Present. (3 cr; Stdnt Opt. Preq—Grad or #) 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 5437. History of East Africa. (3 cr; Stdnt Opt. AFRO 3437, AFRO 5437, HIST 5437) Major themes in history of East Africa, from era of early human cultural development to present. Methods that historians use to reconstruct history. Varying interpretations/constructions of history over time.


HIST 5441. Transformations in Pre-Colonial African History. (3 cr; A-F or Aud. Preq—#) 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 cr; Stdnt Opt. Preq—Grad or #) 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 5464. China in the Song, Yuan, and Ming Dynasties. (3 cr; Stdnt Opt. EAS 3464, HIST 3464) China during the Song (976-1279), Yuan (1279-1368) and Ming (1368-1644) dynasties, political institutions, and social structures. Attention to primary sources and how historians ask and answer questions about the past.

HIST 5465. China in the Ming and Qing Dynasties. (3 cr; Stdnt Opt. EAS 3465W, HIST 3465W) Political/social history of China from 1600 until end of Qing dynasty in 1911. Ethnicity, daily life, legal structures, city life, peasantry.

HIST 5467. State and Revolution in Modern China. (3 cr; Stdnt Opt. EAS 3467W, HIST 3467W) Modern China's political evolution including the Taiping Rebellion, Republican Revolution, rise of Nationalist and Communist parties, Maoist era, reform under Deng Xiaoping, and the emergence of democracy in Taiwan.

HIST 5468. Social Change in Modern China. (3 cr; Stdnt Opt. EAS 3468, HIST 3468) Optimum War and opening of Treaty Ports in 19th century; missionary activity and cultural influence; changes in education system; women's movement; early industrialization; socialism and collectivization after 1949; industrialization of Taiwan; PRC's entry into the world trading system.

HIST 5469. Historiographies of China, 1000-1700. (3 cr; A-F or Aud. Preq—Grad student or #) 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 5479. History of Chinese Cities and Urban Life. (3 cr; A-F or Aud. HIST 5479) Introduction to traditional Chinese cities, their modern transformation. Ideal city plan in Confucian classics compared with physical layout of some major cities. Models about Chinese cities, influence of the models on our understanding of Chinese history/society.

HIST 5501. Medieval Europe and the World. (3 cr; A-F or Aud. Preq—#) 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/explorers. Assessment of other cultures’ knowledge of Europe in the period.

HIST 5505. Survey of the Middle East. (3 cr; Stdnt Opt. Preq—Grad or #) Peoples, lands, cultures of the Middle East, from earliest civilizations to present.

HIST 5520. Topics in Chinese History. (3 cr [max 12 cr]; Stdnt Opt) Selected topics not covered in regular courses. Taught as staffing permits.

Course Descriptions

HIST 5649. Ideas in Context: Making Early Modern Knowledge, 1500-1800. (3 cr; A-F or Aud. Prereq-Grad student or #) Role of institutions/loci in development of early-modern European thought/culture. University, academy, learned society, princely court, museum, geographical society, university, learned society, princely court, museum, editing, publishing, armies, navies, state bureaucracies, salons, other independent associations of nascent civil society.

HIST 5650. Proseminar: Early Modern Europe. (3 cr; A-F or Aud. Prereq-Hist grad or #) 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: Modern Britain. (3 cr; A-F or Aud. Prereq-Grad student or #) 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 cr; A-F or Aud) Introduction to current historical research on European women’s history, 1450-1750. Topics include gender roles and forms of family structure, women’s participation in religious movements, legal status of women.

HIST 5720. Society/Politics:Modern Europe. (3 cr [max 6 cr]; A-F or Aud. Prereq-Grad or #) Introduction to literature in English on problems of modern European social, cultural, political history. Thematic/geographic focus varies from 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 cr; Stdnt Opt. + Hist 5721. Prereq-previous coursework in 19th- and/or 20th-century Europe, #) 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. (3-4 cr [max 12 cr]; A-F or Aud. Prereq-#) Readings and discussions on some central questions concerning the history of Germany during the modern period with a particular emphasis on the relationship between social change and political development. Offerings vary in thematic and chronological focus.

HIST 5761. Proseminar - Imperial Russia. (3 cr; A-F or Aud. Prereq-Knowledge of Russian or German or French) 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 Russian. (3 cr; A-F or Aud. Prereq-5761, knowledge of Russian or German or French) 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 cr; A-F or Aud. Prereq-#) 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 cr; A-F or Aud. Prereq-#) 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 cr; A-F or Aud) Standard methods of population analysis. Focuses on methods widely used for historical population research.

HIST 5801. Seminar in Early American History. (3 cr; A-F or Aud) Introduction to the literature of early American history. Readings selected from some of the best scholarship in the field, the questions that now hold the attention of colonial historians, and the theories, methods, and sources they use in pursuit of those questions.

HIST 5802. Readings in American History, 1848-Present. (3 cr; A-F or Aud) Readings-intensive course: U.S. history from Mexican-American War to present.


HIST 5812. American History in the Twentieth Century. (3 cr [max 4 cr]; A-F or Aud. Prereq-Grad student, #) Intensive readings seminar.


HIST 5841. Proseminar in American Economic History. (3 cr; A-F or Aud. Prereq-#) Historical literature on American economic and business history from American Revolution to the modern economy.

HIST 5844. U.S. Labor History. (3 cr; A-F or Aud) 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 work, labor protest, and trade union organization.

HIST 5845. History of American Capitalism. (3 cr; A-F or Aud. Prereq-Grad student or #) Historiography/history of American capitalism. Crucial events (e.g., market “revolution,” development of industrial cities) focus weekly discussions of new literature. Students analyze theoretical models of capitalism and new work in social, political, and economic history.

HIST 5857. Proseminar: Readings in the History of American Women. (3 cr; A-F or Aud. Prereq-#) An intensive graduate-level readings course. Survey selected significant topics in historical literature, conceptual frameworks, and methodological problems in the history of American women from 1600 to the present.


HIST 5871. Readings in U.S. Intellectual History: 19th-20th Centuries. (3 cr; A-F or Aud. Prereq-#) Definitions of American national identity from 1789 to the present as expressed in politics, religion, literature, painting, music, architecture, and history.

HIST 5877. Asian American History. (3 cr; A-F or Aud) Introduction to key issues, theoretical frameworks, research, and methodologies of Asian American history. Seminar texts that defined the field. Recent scholarship in history and in related disciplines. Emphasis field’s comparative and transnational lines to ethnic studies, Asian studies, and the Americas.

HIST 5881. American Foreign Relations to 1895. (3 cr; A-F or Aud. Prereq-#) Intensive readings in the historiography of American foreign relations with emphasis on American imperialism, domestic courses of foreign policy, and international, political economy, and cultural relations.

HIST 5890. Problems in American Indian History. (3 cr; A-F or Aud. +AMIN 5890. Prereq-#) Intensive consideration of topics in American Indian history. Topics may include social history, history of particular regions, political systems, education, and American Indian policy.

HIST 5900. Topics in European/Medieval History. (1-4 cr [max 16 cr]; A-F only. Prereq-Grad or [advanced undergrad with #]) Selected topics in European or medieval history not covered in regular courses; taught as staffing permits.

HIST 5901. Latin America Proseminar: Colonial. (3 cr; A-F or Aud. Prereq-#) Introduces beginning graduate and advanced undergraduate students to major historical writings on various Latin American themes.

HIST 5902. Latin America Proseminar: Modern. (3 cr; A-F or Aud. Prereq-#) Introduces beginning graduate and advanced undergraduate students to major historical writings on various Latin American themes.

HIST 5910. Topics in U.S. History. (1-4 cr [max 16 cr]; Stdnt Opt. Prereq-Grad or advanced undergrad student with #) Selected topics in U.S. history not covered in regular courses. Taught as staffing permits.

HIST 5920. Topics in African Social History. (3 cr [max 15 cr]; Stdnt Opt. Prereq-Grad or #) Focuses on the experiences of Africans in their home countries. Taught as staffing permits.

HIST 5930. Topics in Ancient History. (1-4 cr [max 16 cr]; A-F or Aud. Prereq-Grad or #) Selected topics in ancient history not covered in regular courses. To be taught as staffing permits and as enrollment warrants.

HIST 5951. Topics in Comparative Third World History. (3-4 cr [max 12 cr]; A-F or Aud. Prereq-Grad student or #) Topics specified in Class Schedule.
HIST 5932. African Historiography and the Production of Knowledge. (3 cr; A-F or Aud. Prereq—Major in African history or [grad student, #])
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 cr; A-F or Aud. Prereq—Previous coursework in Greek or Roman history, #)
Seminar on a selected topic in ancient history.

HIST 5934. Comparative History and Social Theory. (3 cr; A-F or Aud. Prereq—Grad student or [upper-div undergrad, #])
Topics in comparative 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 cr; A-F or Aud. Prereq—Grad student or #)
Current historical methods/sources of African history. Pedagogical issues. Students design their own courses.

HIST 5940. Topics in Modern Chinese History. (1-4 cr [max 16 cr]; Stdt Opt. Prereq—Grad student or [advanced undergrad, #])
Selected topics are negotiated with the instructor.

HIST 5941. Readings in Chinese Documents. (3 cr; A-F or Aud. Prereq—Reading knowledge of Chinese)
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 cr; A-F or Aud. Prereq—Prior history of medicine or history of science course recommended for undergrads)
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. (1-4 cr [max 15 cr]; A-F or Aud. Prereq—Grad or advanced undergraduate with #)
Selected topics in Latin American history not covered in regular courses. Taught as staffing permits.

HIST 5960. Topics in History. (1-4 cr [max 16 cr]; Stdt Opt. Prereq—Grad or [advanced undergrad with #])
Selected topics in history not covered in regular courses. Taught as staffing permits.

HIST 5962. Expansion of Europe. (3 cr; A-F or Aud. Prereq—Grad student, #)
Research seminar on actions of Europeans in wider world, 1350-1790. Based on documents in James Ford Bell Library.

HIST 5964. Comparative Economic History. (3 cr; A-F or Aud. Prereq—)
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 cr [max 16 cr]; A-F or Aud)
Students will carry out publishable-quality research on a quantitative historical topic.

HIST 5971. Proseminar: Editing and Publishing. (3 cr; A-F or Aud)

HIST 5980. Topics in Comparative Women's History. (3-4 cr [max 20 cr]; A-F or Aud. Prereq—Grad student or [advanced undergrad, #])
Cross-cultural/thematic explorations in history of women. Topics vary. May include gender and colonialism, women and class formation, women and religion; sexuality; medical construction of gender; women's narratives as historical sources; gender and politics.

HIST 5990. Readings in Comparative History. (3 cr [max 9 cr]; A-F only. Prereq—)
Students read/discuss historical works that focus on common theme or employ similar methods in different geographic areas. Issues of cross-area comparison. Topics vary (e.g., peasant societies, race/ethnicity, states/nationalism).

HIST 5993. Directed Study. (1-16 cr [max 20 cr]; Stdt Opt. Prereq—Grad student or sr, #, %, @)
Guided individual reading or study.

HIST 5994. Directed Research. (1-16 cr [max 16 cr]; Stdt Opt. Prereq—Grad student or sr, #, @)
Work on a tutorial basis.

HIST 8015. Scope and Methods of Historical Studies. (3 cr; A-F or Aud. Prereq—)
Development of historical study over time (especially in 19th and 20th centuries). Methodologies currently shaping historical research. Theoretical developments within the discipline during 19th and 20th centuries.

HIST 8021. Seminar: Advanced Historical Writing. (3 cr; A-F or Aud. Prereq—Grad student, #)
Students complete a major writing project based on their program needs and progress.

HIST 8022. Politics of Historical Memory. (3 cr [max 6 cr]; A-F or Aud)

HIST 8110. Medieval History: Research Seminar. (3 cr; A-F or Aud. Prereq—, good reading knowledge of Latin, French, one other European language)
Research in medieval European history, using primary source material.

HIST 8232. Cultural Fallout. The Cold War and Its Legacy: Research. (3 cr; A-F or Aud)
Student produce research paper on history/culture of Cold War era as it developed in United States after World War II. Research project builds upon readings from 8231.

HIST 8239. Readings in Gender, Race, Class, and/or Ethnicity in the United States. (3 cr; A-F or Aud. Prereq—)
Dynamics of gender, racial, class, and ethnic relations in U.S. history. Intersections of these forces. Topics vary by instructor.

HIST 8240. Topics in Research in Gender, Race, Class, or Ethnicity in the United States. (3 cr [max 6 cr]; A-F or Aud. Prereq—)
Dynamics of gender, racial, class, and ethnic relations in U.S. history. Intersections of these forces. Topics vary by instructor.

HIST 8245. Human Rights and Crimes Against Humanity: A Global History. (3 cr; A-F or Aud)
Theoretical literature on genocides and human rights and on race/nation. Readings/discussions on meaning of “genocidal” and its codification in international law. Historical cases. Students choose case to research.

HIST 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

HIST 8390. Research in American Indian History. (3 cr; A-F or Aud. Prereq—5890 or AmIn 5890 or #)
Research and writing skills in American Indian history. With instructor and other participants, students identify their research questions, locate sources with which to answer these questions, conduct original research, and produce a substantial research paper.

HIST 8434. Health and Healing in African History. (3 cr; Stdnt Opt)

HIST 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

HIST 8464. Research in Yuan, Ming, and Qing History. (3 cr; A-F or Aud. Prereq—Good working knowledge of classical Chinese, background in history of late imperial China)
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 cr; Stdt Opt. Prereq—Good working knowledge of classical Chinese, background in history of late imperial China)
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 based on these texts.

HIST 8630. Seminar in World History. (3 cr; A-F or Aud. Prereq—)
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 cr [max 9 cr]; A-F or Aud. Prereq—)
Comparative, methodological, theoretical, and topical courses in legal historical research, from ancient world to present. Offerings rotate.

HIST 8644. Legal History Workshop. (3 cr; A-F or Aud. Prereq—)
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. (1-6 cr [max 12 cr]; No grade. 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)

HIST 8709. Seminar: History of Sexuality. (3 cr; A-F or Aud)
Theories of sexuality (by, e.g., Foucault, Butler, deLaurier), their application in history. Topics may include: feminist critique of Foucault and the classics, psychoanalytic approaches to religious transformations such as the Reformation, various forms of gender
transgression, sexuality in colonial encounters, operation of sexual metaphors in political conflict, and AIDS and the writing of history.

HIST 8715. Research on European Women's History, 1450-1750. (3 cr; Stdnt Opt.) Prereq–5715) Research techniques for completing a major research paper based on primary sources.

HIST 8720. Research Seminar on Central European History. (4 cr; max 16 cr; A-F or Aud) Broad research theme/problem: in most cases preparation for dissertation. Students identify primary/secondary sources, conduct research, write paper, and read/comments upon each other’s drafts. Geographic focus varies with instructor, may include Germany or lands of former Habsburg Austrian empire.

HIST 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])


HIST 8857. Seminar: Research in the History of American Women. (3 cr; A-F or Aud. Prereq–5857; #) 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. (5 cr; A-F or Aud. Prereq–5858 or #) 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. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

HIST 8900. Topics in European/Medieval History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8910. Topics in U.S. History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8920. Topics in African History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8930. Topics in Ancient History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8940. Topics in Latin American History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8950. Topics in Asian History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8960. Topics in History. (1-4 cr [max 16 cr]; A-F or Aud) Topics not covered in regular courses.

HIST 8961. Research Seminar: Intellectual History. (5 cr; A-F or Aud) 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 8990. Topics in Comparative History-Research. (3 cr [max 15 cr]; Stdnt Opt. Prereq–#) 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. (1-16 cr [max 16 cr]; A-F or Aud. Prereq–Grad student, #) Students work on tutorial basis. Guided individual reading or study.

HIST 8994. Directed Research. (1-16 cr [max 16 cr]; A-F or Aud. Prereq–#) Work on a tutorial basis.

History of Medicine (HMED)

Medical School

HMED 5002. Public Health Issues in Historical Perspective. (3 cr; Stdnt Opt) 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 5055. Women, Health, and History. (3 cr; Stdnt Opt. Prereq-Grad student or [jr or sr] with prev coursework in hist or #) 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 cr; A-F or Aud. Prereq–#) 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 cr; A-F or Aud) An introductory survey of the history of medicine in Europe and America.


HMED 5310. Seminar: Theories and Methods in Medical History. (3 cr; A-F or Aud) Historiography of the history of medicine.

HMED 5311. Seminar: Theories and Methods in Medical History. (3 cr; A-F or Aud. Prereq–5310) Use of archives, primary sources. Supervised research project.

HMED 5600. Directed Study. (0-4 cr [max 16 cr]; Stdnt Opt. Prereq–#)

HMED 5940. Topics in the History of Medicine. (3-4 cr [max 16 cr]; Stdnt Opt) 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 cr; A-F only) 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 8112. Historiography of Science, Technology, and Medicine. (3 cr; A-F only. Prereq–#) 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 cr; A-F only. +HSCI 8113. Prereq–#) 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 cr; [max 9 cr]; A-F or Aud. Prereq–#) Topics vary.

HMED 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

HMED 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

HMED 8631. Directed Study. (1-6 cr [max 12 cr]; A-F or Aud. Prereq–#)

HMED 8632. Directed Study. (1-6 cr [max 12 cr]; A-F or Aud. Prereq–#)

HMED 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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 2005 may register up to four times, up to 60 combined cr)

HMED 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

HMED 8830. Topics in the History of Science, Technology, and Medicine. (3 cr; max 9 cr; A-F or Aud. Prereq–#) Historical literature of topics common to history of science, technology, and medicine.

HMED 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)
Horticultural Science (HORT)

Department of Horticultural Science

HSCI 8121. Foundations for Research in Ancient Science. (3 cr; A-F or Aud. Prereq-Grad HSCI major or minor or #) Development of natural/mathematical science in ancient Near East and Classical Greece.

HSCI 8125. Foundations for Research in the Scientific Revolution. (3 cr; A-F or Aud. Prereq-Grad HSCI major or minor or #) Development of sciences/natural philosophy, 1500-1725.

HSCI 8131. Industrial Revolutions. (3 cr; A-F only) Development of industrial society, from 1700 through 1850. Emphasizes developments in mechanical engineering sciences. Scientific, economic, political, and social dimensions of industrialization.

HSCI 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master's student, adviser and DGS consent)

HSCI 8421. Social and Cultural Studies of Science. (3 cr; Stdnt Opt) Review of recent work; theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

HSCI 8441. Women in Science: Historical Perspectives. (3 cr; Stdnt Opt. Prereq-#) 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.

HSCI 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

HSCI 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has 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)

HSCI 8977. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 per semester or summer; 10 cr total required (Plan A only))

HSCI 8830. Topics in the History of Science, Technology, and Medicine. (3 cr; Stdnt Opt. Prereq-#) Historical literature of topics common to history of science, technology, and medicine.

HSCI 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 per semester or summer; 24 cr required)

HSCI 8900. Seminar: History of Early Physical Science. (3 cr; Stdnt Opt. Prereq-#) For advanced graduate students; topics in development of natural and mathematical science before 1800.

HSCI 8910. Seminar: History of Modern Physical Sciences. (3 cr; Stdnt Opt. Prereq-#) For advanced graduate students; topics in development of physical sciences since 1800.

HSCI 8920. Seminar: History of Biological Sciences. (3 cr; Stdnt Opt. Prereq-#) For advanced graduate students; topics in development of natural, biological, and medical sciences from Aristotle to the present.

HSCI 8930. Seminar: History of Technology. (3 cr; Stdnt Opt. Prereq-#) For advanced graduate students; topics in development of technology from ancient times to the present.

HSCI 8940. Seminar: History of Science and Technology in the Americas. (3 cr; Stdnt Opt. Prereq-#) For advanced graduate students; topics in development of science and technology, emphasizing the United States and Canada.

HSCI 8950. Seminar: Science and Technology in Cultural Settings. (3 cr; Stdnt Opt. Prereq-#) For advanced graduate students; topics in development of science and technology in or across specific geographic regions or particular cultures.

HSCI 8993. Directed Studies. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq-#)

HSCI 8994. Directed Research. (1-5 cr [max 15 cr]; Stdnt Opt)

Hmong (HMNG)

College of Liberal Arts


Horticultural Science (HORT)

Department of Horticultural Science

College of Food, Agricultural and Natural Resource Sciences


HORT 5009. Pesticides in Horticulture: Their Use and Abuse. (3 cr; A-F or Aud. Prereq-[[ENT 4015 or ENT 4251], PIPA 2001 or #]) History of and practical information about pesticides used by horticulture industry. Pesticide modes of action. Use, application methods, environmental effects. Final three weeks devoted to labs on practical mixing/delivery systems.

HORT 5018. Landscape Operations and Management. (5 cr; Stdnt Opt. Prereq-1001 or #) Business, managerial, and technical aspects of landscape management relative to environmental horticulture and green industry. Tasks associated with maintaining turf and woody/herbaceous plants in landscape. Relationship of those tasks to preparation/ justification of labor, equipment, and supply budgets. Labs, demonstrations, hands-on experiences associated with science and technically-based landscape maintenance/operations.

HORT 5031. Organic Viticulture and Fruit Production. (3 cr; A-F or Aud. Prereq-1001, 3005) or #) 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.


HORT 5090. Directed Studies. (1-6 cr; max 18 cr; Stdnt Opt. Prereq-8 cr upper div Hort courses, #) 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 cr; Stdnt Opt. -AGRO 5131, AGRO 5131, HORT 3131, Prereq-1001 or AGRO 1101 or AGRO 1103 or BIOL 1001 or BIOL 1009 or #) 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 cr; S-N or Aud. -AGRO 8005, BBE 8005, PLPA 8005, SOIL 8005, Prereq-#) Classroom or extension teaching experience in one of the following areas: 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. (1-5 cr; max 5 cr; Stdnt Opt. Prereq-9 grad cr in [ag or bio] science, #) 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. (2 cr; A-F or Aud. Prereq-9 grad cr in ag or bio sciences) Origin, distribution, and evolution of cultivated plants; implication of the effects of evolutionary processes on crop breeding for needs of people today.

HORT 8040. Horticultural Seminar. (1 cr; max 3 cr; Stdnt Opt. Prereq-Grad major in agro or applied plant sciences or Hort or plant brdg or plant path or soil or #) Reports and discussions of problems and investigational work.


HORT 8045. Plant Responses to Environmental Stresses. (3 cr; Stdnt Opt. Prereq-Bioc 3021 or BiocA 4331, PBio 5412) Examined from molecular to organismal levels.

HORT 8090. Graduate Horticultural Research. (1-12 cr; max 18 cr; Stdnt Opt. Prereq-#) Conduct literature, lab, and/or field research with horticultural plants and cropping systems.

HORT 8201. Plant Breeding Principles I. (3 cr; A-F or Aud. -AGRO 8201, Prereq-Stat 5301 or equiv) Principles and 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. Part of a two-semester sequence including Agro 8202.

HORT 8270. Graduate Seminar. (1 cr; A-F or Aud. -AGRO 8270, Prereq-Grad major in [hort or applied plant sciences or ent or agro or plant brdg or plant path or soil] or #) Reports/discussions on problems, investigation work.

HORT 8280. Current Topics in Applied Plant Sciences. (1 cr; S-N or Aud. -AGRO 8280, Prereq-Grad major in [hort or applied plant sciences or ent or agro or plant brdg or plant path or soil] or #) Topics presented by faculty or visiting scientists.


HUMF 8541. Decision Support Systems. (4 cr; A-F or Aud. -IE 8541, Prereq-Undergrad-level computer programming course or #, programming skills recommended) Students build a decision support system for a problem of their choice. How to identify appropriate problems. Styles of DSSs, evaluating their effectiveness.

Human Resource Development (HRD)
Department of Work and Human Resource Education
College of Education and Human Development

HRD 5101. Foundations of Human Resource Development. (1 cr; Stdnt Opt) Introduction to human resource development as a field of study and practice.


HRD 5105. Strategic Planning through Human Resources. (3 cr; A-F or Aud. Prereq-5001 or 5012, 5102, 5103, 5104) The theory and practice of strategically developing, utilizing, and aligning human resources as a major contributor to organizational and quality improvement success.

HRD 5106. Evaluation in Human Resource Development. (3 cr; A-F or Aud) Evaluation of human resource development efforts from the perspective of impact on organizations, work processes, and individuals, plus follow-up decisions.

HRD 5111. Facilitation and Meeting Skills. (1 cr; Stdnt Opt) 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.

HRD 5196. Internship: Human Resource Development. (1-10 cr [max 10 cr]; S-N or Aud. Prereq-5001, 5201 or 5301) Students apply and contract for human resource development positions. Contracts describe specific HRD responsibilities to be fulfilled during internship and theory-to-practice learning outcomes.

HRD 5201. Training and Development of Human Resources. (3 cr; A-F or Aud) Training and development of human resources in organizations. Process phases of analysis, design, development, implementation, and evaluation.

HRD 5202. Training on the Internet. (3 cr; Stdnt Opt) Major concepts, skills, and techniques for giving and receiving training on the Internet.

HRD 5301. Organization Development. (3 cr; A-F or Aud) Introduction to major concepts, skills, and techniques for organization development/change.

HRD 5302. Managing Work Teams in Business and Industry. (3 cr; A-F or Aud. Prereq-2 core courses in HRD) Frameworks and strategies for developing effective work teams. Skill development in facilitating resolution of conflicts in organizations. Provides foundational information as well as practical applications for participants (upper-level and graduate students) to become small team leaders.

HRD 5405. Quality Improvement Through Human Resources. (3 cr; A-F or Aud. Prereq- [5001, 5012, 5301] or 5404) Quality management, productivity improvement theory/practice from a human resource perspective. Organization development/training as integral components of quality improvement. HR role within quality standards. History of quality improvement, contributions of major leaders.

HRD 5408. International Human Resource Development. (3 cr; Stdnt Opt) Problems, practices, programs, theories, and methodologies in human resource development as practiced internationally.

HRD 5409. Planning and Decision-Making Skills. (1 cr; Stdnt Opt) 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.

HRD 5410. Survey of Research Methods and Emerging Research in Human Resource Development. (3 cr; A-F or Aud. Prereq- [Registered, in attendance] at conference of Academy of HRD) 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.

HRD 5496. International Field Study in Human Resource Development. (3 cr; Stdnt Opt. Prereq-5001) Field study of the organization development, personnel training and development, career development, and quality improvement theories and practices in a selected nation.

HRD 5624. Sales Training. (3 cr; A-F or Aud) Strategies and techniques for developing effective sales people.

HRD 5625. Technical Skills Training. (3 cr; Stdnt Opt) 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.

HRD 5626. Customer Service Training. (3 cr; A-F or Aud) Overview of customer service strategies used by successful organizations and training practices used to develop customer-oriented personnel.

HRD 5627. Management and Supervisory Development. (3 cr; Stdnt Opt) Problems, practices, programs, and methodologies relating to the training and development of managers and supervisors, including needed competencies, needs assessment, delivery modes, and evaluation.

HRD 5770. Special Topics in Human Resource Development. (1-4 cr [max 12 cr]; Stdnt Opt) Issues, methods, and knowledge in HRD areas. Topics vary.


HRD 5023. Employment and Labor Law for the HRIR Professional. (2 cr; A-F only. Prereq-[[At least 60 sem cr or 75 qtr cr], 2.00 GPA] or grad student or #) Application of statutes and case law to work settings. Civil rights and equal opportunity. Discrimination and harassment. Compensation and benefits. Employee protection and privacy, labor relations. Emphasizes application and ability to recognize legal aspects of HRIR issues.


HRD 5026. Innovative HR Leadership in the Context of Change and Uncertainty. (2 cr; Stdnt Opt. Prereq-[[At least 60 cr], 2.00 GPA] or grad student or %; grad majors must register A-F) Overview of leadership in managing human resources. Historical evolution. Major theories/models. Principles of effective HR leadership in practice. Effects of uncertainty/change on leadership style/practice. HR leadership as powerful management tool.

HRD 5028. Leadership and Personal Development. (2 cr; A-F only) Effective/ethical leadership; Leadership theory. Personal leadership strengths/vulnerabilities. Exercises, role playing, giving/receiving feedback. Students create leadership development plan.


HRD 5991. Independent Study in Human Resources and Industrial Relations. (1-8 cr [max 8 cr]; Stdnt Opt. Prereq-% or #) Individual readings or research topics.
HRIR 8000. Graduate Topics in Human Resources and Industrial Relations. (1-8 cr [max 8 cr]; Stdnt Opt. Prereq–HRIR MA student or Sch Mgmt approval; grad majors must enroll A-F only) Selected graduate topics of current relevance to human resource management and industrial relations.


HRIR 8012. Applied Quantitative Methods in Human Resources and Industrial Relations. (2 cr, Stdnt Opt. Prereq–[8011, 8031, 8041, 8051, 8061, 8071, grad HRIR major or %; grad majors must register A-F]) Evaluation of applied statistical research in human resources and industrial relations. Appropriate statistical inferences/applications. Sampling issues, multiple regression, advanced topics.


HRIR 8014. Human Resource Information Systems. (2 cr; Stdnt Opt. Prereq–Grad HRIR major or %; grad majors must enroll A-F only) Hardware and database fundamentals, software applications, security issues, vendor evaluation, system and software development and design issues, and strategies for gaining user acceptance.

HRIR 8021. Introduction to Human Resources and Industrial Relations. (3 cr; Stdnt Opt. Prereq–HRIR 3021, Econ 1101, Econ 1102, Psy 1001, grad HRIR majors must enroll A-F only) Human resource management in contexts of labor markets and organizations. Valuing, employing, developing, motivating, and maintaining human resources in an industrial society. Staffing, training, and development; organizational behavior and theory; compensation and benefits; labor market analysis; and labor relations and collective bargaining.

HRIR 8022. Field Project. (4 cr; Stdnt Opt. Prereq–[8011, 8031, 8041, 8051, 8061, 8071, grad HRIR major or %; grad majors must register A/F, must have instructors consent to drop course) Teams formulate and execute study of actual business problem faced by business, non-profit, or governmental organization, generally in Twin Cities.

HRIR 8023. International Human Resource Management. (2 cr; Stdnt Opt. Prereq–Grad HRIR major or %) Strategies for effective management. Analysis of cross-cultural differences in values, norms, and practices, and how they affect organizational behavior/performance. Implications for designing HR practices in multinational organizations and international contexts.

HRIR 8031. Staffing, Training, and Development. (4 cr; Stdnt Opt. Prereq–Psy 1001, grad HRIR major or %; grad majors must enroll A-F only) Introduction to staffing processes (recruitment, selection, promotion, demotion, transfer, dismissal, layoff, retirement). Strategic, institutional theory and techniques as mechanisms for influencing individual and organizational outcomes, such as performance, satisfaction, and climate.

HRIR 8032. Staffing and Selection: Strategic and Operational Concerns. (2 cr; Stdnt Opt. Prereq–[8031, HRIR grad student or %; HRIR grad students must register A/F] Theory/practice related to staffing decisions (recruitment, selection, promotion, transfer, dismissal, layoff, retirement) in organizations. Legal environment in which staffing decisions are made. Staffing from strategic/organizational perspectives.

HRIR 8033. Employee Training: Creating a Learning Organization. (2 cr; Stdnt Opt. Prereq–[8031, HRIR grad student or %; HRIR grad students must register A/F] Theory, research, practice related to design/implement employee training programs. Instructional design, training techniques, transfer of training, program evaluation/costing. Role of employees, firm policies/practices.

HRIR 8034. Employee Development: Creating a Competitive Advantage. (2 cr; Stdnt Opt. Prereq–[8031 or %, grad HRIR major or %; grad majors must enroll A-F only] Career development and planning, employee and management development techniques, and organizational and employee concerns related to mobility, job stress, balancing work and family, obsolescence and plateauing, and cross-cultural assignments.

HRIR 8041. Design and Management of Organizations. (4 cr; Stdnt Opt. Prereq–Econ 1101, Econ 1102, Psy 1001 or %; grad HRIR major or %; grad majors must enroll A-F only) 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 8042. Organizational Structure and Performance. (2 cr; Stdnt Opt. Prereq–[8041 or %, grad HRIR major or %; grad majors must register A-F] How different organizational practices (e.g., employee empowerment, job enrichment, profit sharing, employee stock ownership, individual incentives, information sharing, integration mechanisms) affect organizations in their competitiveness, profitability, workplace safety, employment stability, and wages. Cohere system of organizational practices.

HRIR 8043. Comparative Organizations and HRM Systems. (2 cr; Stdnt Opt. Prereq–[8041 or %, grad HRIR major or %; grad majors must register A/F] Variations in organizational practices related to variations in ownership (profit, nonprofit, government, cooperatives), economic systems, culture, technology, global pay program outcomes. Demographic influences on compensation strategies/processes. HR professional as consultant.

HRIR 8044. Motivation and Work Behavior in Contemporary Organizations. (2 cr; Stdnt Opt. Prereq–[8041 or %, grad HRIR major or %; grad majors must enroll A-F only] In-depth study of major theories in microlevel organizational behavior. Accountability, organization citizenship behaviors, forms of organizational attachment, motivation, and issues of equity and justice.

HRIR 8045. Organizational Development, HR Metrics, and the Balanced Scorecard. (2 cr; Stdnt Opt. Prereq–[8041 or %; grad HRIR major or %] Nature/conduct of organizational change. Enhancing organizational effectiveness, improving quality of work life, increasing productivity, and facilitating problem solving through diagnostics, interventions, metrics, and scorecards. Intervention/evaluation strategies/processes. HR professional as consultant.


HRIR 8052. Compensation Theory and Applications. (2 cr; Stdnt Opt. Prereq–[8051 or %; grad HRIR major or %; grad majors must enroll A-F only] Relationship between economic and psychological theories and the design and operation of compensation programs. Demographic influences on compensation program outcomes. Statistical analysis applied to pay program design and administration. Global pay variations. Current pay issues and controversies.

HRIR 8053. Employer-Sponsored Employee Benefit Programs. (2 cr; Stdnt Opt. Prereq–[8011, 8051 or %, grad HRIR major or %; grad majors must enroll A-F only] Design and administration of nonmandatory compensation benefit programs: medical expense insurance, pensions, profit sharing plans, disability, and other employee benefits. Effects of providing benefits on workers’ incentives with regard to performance, acquisition and maintenance of human capital, mobility, and risk sharing.

HRIR 8061. Introduction to Labor Market Analysis. (4 cr; Stdnt Opt. Prereq–Econ 1101, Econ 1102 or %, grad HRIR major or %; grad majors must enroll A-F only) 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 cr; Stdnt Opt. Prereq–[8061 or %, grad HRIR major or %; grad majors must enroll A-F only] Case studies used to diagnose strategy.

HRIR 8063. Human Resources and Organizational Performance. (2 cr; Stdnt Opt. Prereq–[8061 or %, grad HRIR major or %; grad majors must enroll A-F only] Impact of human resource policies and practices on organizational productivity and effectiveness. Role of government, unions, and private sector institutions on organizational effectiveness.

HRIR 8064. Topics in Micro Labor Market Analysis. (2-4 cr; max 3 cr) Stdnt Opt. Prereq–[8061 or %, HRIR PhD student or %; grad majors must enroll A-F only] May include micro aspects of unemployment, implicit contracts and efficiency wages, investment in human capital, occupational choice, job search, job matching and turnover, migration, labor force participation, and government program evaluation.
**HRIR 8065. Topics in Macro Labor Market Analysis.** (2-4 cr [max 3 cr]; Stdnt Opt. Prereq-8001 or #; HRIR PhD student or %; grad majors must enroll A-F only)
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 8071. Labor Relations and Collective Bargaining.** (4 cr; Stdnt Opt. Prereq-Econ 1101, Econ 1102 or #, grad HRIR major or %; grad HRIR major or %; grad majors must enroll A-F only)
Evolution of U.S. labor unions and public policy, bargaining environment and structure, goals and negotiations, contract administration and results. International comparisons, labor-management cooperation, and newly emerging issues.

**HRIR 8072. Labor Movements in a Changing World.** (2 cr; Stdnt Opt. Prereq-8007 or #, grad HRIR major or %; grad majors must enroll A-F only)
Labor movement philosophies. Critical evaluation of labor movement growth and adjustment to environmental change. Domestic and international perspectives of labor movement innovations.

**HRIR 8073. Dispute Resolution: Labor Arbitration.** (2 cr; Stdnt Opt. Prereq-8007 or #, grad HRIR major or %; grad majors must enroll A-F only)
Arbitration to resolve grievances and impasses arising out of the collective bargaining agreement’s administration and negotiation. Arbitration law and legal issues, procedures and practices, case presentation, management rights, discipline and discharge, evidence, contract language interpretation, and remedies. Newly emerging approaches.

**HRIR 8074. Labor-Management Negotiations.** (2 cr; Stdnt Opt. Prereq-8007 or #, grad HRIR major or %; grad majors must enroll A-F only)

**HRIR 8101. HRIR in Practice: Strategy, Execution, and Ethics.** (2 cr; Stdnt Opt. Prereq-8001, 8051, 8051, 8071, 8141, 8241, HRIR grad major)
Types of strategies. Developing/executing HRIR strategies. Project management. Ethical frameworks, issues, and considerations in HRIR.

**HRIR 8102. Capstone Project.** (2 cr; Stdnt Opt. Prereq-8001, 8011, 8051, 8071, 8141, 8241, HRIR grad major)
Application of related knowledge, concepts, and methods to a practical problem in human resources and industrial relations. Benchmarking of related best practices in research and in practice. Full development, analysis, and proposed recommendations for implementation or improvement of the selected problem.

**HRIR 8141. Organizational Theory Foundations of High-Impact HRIR.** (2 cr; Stdnt Opt. Prereq-8001, HRIR MA student or %)
Economic aspects of individual/group behavior in organizations. Individual/collective rationality, information, incentives, coordination problems, contracts. Impacts on HRIR decisions/outcomes. Solutions/approaches to problems in organizations at micro/macro levels.

**HRIR 8241. Organizational Behavior Foundations of High-Impact HRIR.** (2 cr; Stdnt Opt. Prereq-8001, HRIR PhD major or %)

**HRIR 8333. FTE: Master’s.** (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

**HRIR 8444. FTE: Doctoral.** (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

**HRIR 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. 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)

**HRIR 8777. Thesis Credits: Master’s.** (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**HRIR 8811. Advanced Quantitative Research Methods in Human Resources and Industrial Relations.** (2-4 cr [max 3 cr]; Stdnt Opt. Prereq-HRIR core or #, HRIR PhD student or %; grad majors must enrol A-F only)
General linear model and its assumptions and violations; simultaneous equations; pooling cross-section and time series; limited qualitative dependent variable models; sample selection models; hazard models. Emphasizes application to human resources and industrial relations.

**HRIR 8812. Seminar: Human Resources and Industrial Relations Research Methodology.** (2-4 cr [max 8 cr]; Stdnt Opt. Prereq-HRIR PhD student or %; grad majors must enrol A-F only)
Application in research projects.

**HRIR 8821. Seminar: Human Resources and Industrial Relations Systems.** (1-4 cr [max 3 cr]; Stdnt Opt. Prereq-HRIR core or #, HRIR PhD student or %; grad majors must enrol A-F only)
Thought and research in the field. Investigating, integrating, and synthesizing more traditional related disciplines, theories, and research into interdisciplinary body of knowledge concerned with human resource and industrial relations problems and employment relationships.

**HRIR 8830. Seminar: Staffing, Training, and Development.** (1-4 cr [max 8 cr]; Stdnt Opt. Prereq-8031 or #, HRIR PhD student or %; grad majors must enrol A-F only)
Concepts, problems, and research.

**HRIR 8840. Seminar: Organization Theory and Behavior.** (1-4 cr [max 6 cr]; Stdnt Opt. Prereq-8041 or #, HRIR PhD student or %; grad majors must enrol A-F only)
Application in human resources and industrial relations research/practice.

**HRIR 8850. Seminar: Compensation and Reward.** (1-4 cr [max 8 cr]; Stdnt Opt. Prereq-8051 or #, HRIR PhD student or %; grad majors must enrol A-F only)
Relevant theoretical models; formulation of research into compensation and reward issues.

**HRIR 8860. Seminar: Analysis of Current Labor Market Theory and Empirical Research.** (1-4 cr [max 6 cr]; Stdnt Opt. Prereq-8061 or #; HRIR PhD student or %; grad majors must enrol A-F only)
Functions and operations of labor markets, theory, and research.

**HRIR 8870. Seminar: Labor Relations and Collective Bargaining.** (1-4 cr [max 8 cr]; Stdnt Opt. Prereq-8071 or #, HRIR PhD student or %; grad majors must enrol A-F only)
Analysis of contemporary theoretical and empirical research.

**HRIR 8888. Thesis Credit: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

**HRIR 8991. Independent Study in Human Resources and Industrial Relations.** (1-8 cr [max 8 cr]; A-F orAud. Prereq-#)
Individual readings and/or research projects.

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**Industrial Engineering (IE)**

**Department of Mechanical Engineering**

**Institute of Technology**

IE 5080. Topics in Industrial Engineering. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq-Upper div or grad student)
Topics vary each semester.

IE 5111. Systems Engineering I. (2 cr; A-F or Aud. Prereq-IT upper div or grad student)
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 cr; A-F or Aud. Prereq-[Math 2123 or Math 2373 or equiv.] [one semester of probability or statistics]; [IT upper div or grad student])
Survey of Operations Research models/methods in deterministic/stochastic settings. Linear programming, integer programming, networks, forecasting, Markov chains, and queuing systems. Examples from various application areas, such as systems engineering, logistics, design, and project management.

IE 5113. Systems Engineering II. (4 cr; A-F or Aud. Prereq-5111, a course on basic probability, IT upper div or grad student)
Systems engineering thinking/techniques presented in 5111. Hands-on techniques applied to specific problems. Topics pertinent to effectiveness of design process. Practices and organizational/award structure to support collaborative, globally distributed design team.

IE 5441. Engineering Cost Accounting and Cost Control. (4 cr; A-F or Aud)

IE 5511. Human Factors and Work Analysis. (4 cr; A-F or Aud. Prereq-HUMF 5211, ME 5211. Prereq-Upper div IT or grad student)
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.

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For definitions of course numbers, symbols, and abbreviations, see page 214. 317
Course Descriptions

IE 5512. Applied Ergonomics. (4 cr; A-F or Aud. Prereq–Upper div IT or grad student, 5511) 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 cr; A-F or Aud. Prereq–Upper div IT or grad student) 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 cr; Stdnt Opt. Prereq–5521 or equiv; upper div or grad student in CNR) Quality engineering/management economics of quality, statistical process control design of experiments, reliability, maintainability, availability.

IE 5531. Engineering Optimization I. (4 cr; Stdnt Opt. Prereq–Upper div or grad student or CNR) Linear programming, simplex method, duality theory, sensitivity analysis, interior point methods, integer programming, branch-and-bound/dynamic programming. Emphasizes applications to production/logistics, including resource allocation, transportation, facility location, networks/flows, scheduling, production planning.

IE 5541. Project Management. (4 cr; Stdnt Opt. Prereq–Upper div or grad student) Introduction to engineering project management. Analytical methods of selecting, organizing, budgeting, scheduling, and controlling projects, including risk management, team leadership, and program management.


IE 5551. Production Planning and Inventory Control. (4 cr; Stdnt Opt. Prereq–CNR or upper div or grad student) Inventory control, supply chain management, demand forecasting, capacity planning, aggregate production and material requirement planning, operations scheduling, and shop floor control. Quantitative models used to support decisions. Implications of emerging information technologies and of electronic commerce for supply chain management and factory operation.


IE 5333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)
IE 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)


IE 5534. Advanced Topics in Operations Research. (1-4 cr max 8 cr; Stdnt Opt. Prereq–5531, 8532) Special topics determined by instructor. Examples include Markov decision processes, stochastic programming, integer/combinatorial optimization, and queuing networks.


IE 5552. Advanced Topics in Production, Inventory, and Distribution Systems. (4 cr max 8 cr; Stdnt Opt. Prereq–5551) Cutting edge research issues in production, inventory, and distribution systems. Topics vary: stochastic models of manufacturing systems, stochastic inventory theory, multi-echelon inventory systems and supply chains, supplier-retailer and supplier-manufacturer coordination, supplier and warehouse networks, business logistics, and supply chain.

IE 6566. Doctoral Pre-Thesis Credits. (1-6 cr [max 8 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for first/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)
IE 8773. Graduate Seminar. (1 cr; S-N or Aud) Recent developments.
IE 8774. Graduate Seminar. (1 cr; S-N or Aud. Prereq–8773) Recent developments.

IE 8777. Thesis Credits: Master’s. (1-16 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr required (Plan A only))
IE 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)
IE 8951. Plan B Course. (1 cr; S-N or Aud) Structured environment in which students can complete M.S. Plan B project.
IE 8953. Plan B. (2 cr; A-F or Aud. Prereq–8951) Structured environment in which students can complete M.S. Plan B project.

Information and Decision Sciences (IDSC)

Department of Information and Decision Sciences
Curtis L. Carlson School of Management


IDSC 8511. Conceptual Topics and Research Methods in Information and Decision Sciences. (4 cr; Stdnt Opt. Prereq–Business admin PhD student or #) 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 cr; Stdnt Opt. Prereq–Business admin PhD student or #) Why it is hard to develop efficient/effective information systems, what can be done to improve situation. Defining efficiency/efficacy in development process and in systems. Producing/evaluating artifacts (constructs, models, methods, tools) that enable more efficient/effective information systems to be developed.

IDSC 8711. Cognitve Science. (4 cr; Stdnt Opt. Prereq–Business admin PhD student or #) 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 cr max 4 cr; Stdnt Opt. 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/deceit others.
IDSC 8800. Research Seminar in Information and Decision Sciences. (4 cr; max 20 cr; Stdnt Opt. Prereq-Business admin PhD student or #) 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 cr; max 20 cr; Stdnt Opt. Prereq-Business admin PhD student or #) New areas of research, research methods, issues.

IDSC 8892. Readings in Information and Decision Sciences. (1-8 cr; max 16 cr; Stdnt Opt. Prereq-Business admin PhD student or #) 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. (1-8 cr; max 16 cr; Stdnt Opt. Prereq-Business admin PhD student or #) Individual research on an approved topic appropriate to student’s program and objectives.

Infrastructure Systems Engineering (ISE)
Center for the Development of Technological Leadership
Institute of Technology

ISE 5101. Project Management. (3 cr; A-F or Aud. Prereq-ISE student) Broad areas in project management and leadership. Emphasizes practical understanding of business/ engineering project management. Project planning, scheduling, controlling. Budgeting, staffing, task/cost control. Communicating with, motivating, leading, and managing conflict among team members. Lectures, discussions, experiential exercises.


ISE 5500. Public Interactions. (1 cr; max 2 cr; A-F or Aud. Prereq-ISE student) Techniques for effective public communication. How to run a public hearing. Resources for publishing public notices. Sequence course, in three parts.


ISE 8105. Capstone Project. (1-2 cr; max 3 cr; A-F or Aud. Prereq-ISE student) Integrates knowledge from courses in Master’s program with job experience. Complete written proposal, conduct project, and report results in written and oral form. Project involves aspect of design, management, or operation of some feature of infrastructure.

ISE 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser approval, DGS approval)

Innovation Studies (IS)

College of Continuing Education

IS 5001. Introduction to Innovation Studies. (1-4 cr; max 4 cr; A-F or Aud. Prereq-%) 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. (1-4 cr; max 4 cr; A-F or Aud. Prereq-Completion of IS requirements, %) 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. (1-4 cr; max 24 cr; A-F or Aud. Prereq-%) Innovation studies topics.

IS 5950. Special Topics. (1-4 cr; max 12 cr; A-F or Aud. Prereq-%) Special interdisciplinary topics.

Insurance and Risk Management (INS)

Industrial Relations Center

Curtis L. Carlson School of Management


Interdisciplinary Archaeological Studies (INAR)

College of Liberal Arts

INAR 5100. Topics in Interdisciplinary Archaeological Studies. (3 cr; A-F or Aud. Prereq-InAr grad major or #) Topics specified in the Class Schedule.

INAR 5004. Method and Theory in Archaeology. (3 cr; A-F or Aud. Prereq-InAr grad major or #) Survey and evaluation of archaeological approaches to non-literate, material evidence for past human activities and societies.

INAR 5100. Interdisciplinary Seminar. (3 cr; A-F or Aud. Prereq-InAr grad major or #) Review and evaluation of approaches to interdisciplinary research; themes vary. Leadership and research shared by staff, visitors, and students.

INAR 8200. Directed Readings. (1-7 cr; max 7 cr; Stdnt Opt. Prereq-InAr grad major or #)

INAR 8300. Directed Research. (1-7 cr; max 7 cr; Stdnt Opt. Prereq-InAr grad major or #)

INAR 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

INAR 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

For definitions of course numbers, symbols, and abbreviations, see page 214.
INAR 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 1 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)

INAR 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required (Plan A only))

INAR 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

Interpersonal Relationships Research (IREL)

College of Education and Human Development

IREL 8001. Proseminar in Interpersonal Relationships Research. (1 cr [max 2 cr]; S-N or Aud. Prereq-Grad IRel minor) 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 cr; S-N only. Prereq-Grad IRel minor, [one prior course in multiple regression or structural equation modeling], Stdnt Opt. Prereq-Grad IRel minor) Survey of topics in design/analysis of research on behavior in two-person interactions.

IREL 8360. Seminar: Topics in Interpersonal Relationships Research. (1-3 cr [max 6 cr]; Stdnt Opt. Prereq-Grad IRel minor or #) Intensive study of topics.

Introduced Species and Genotypes (ISG)

ISG 8031. Cooperative Learning Practicum. (1 cr; A-F only. Prereq-8021) 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.

ISG 8032. Italian Travelers: From the Enlightenment to the Present. (3 cr [max 12 cr]; Stdnt Opt. Prereq-8031) Literary representations of travel, migration, immigration, exile, and tourism in Italy, from Enlightenment to present.

ISG 8209. Trecento Literature: Ruling the Canon. (4 cr [max 16 cr]; Stdnt Opt. Prereq-3201, 3202 or #) Works of Boccaccio and Petrarch and their role in establishing the canon of Italian vernacular literature. Taught in English also as MSt 5610.

ISG 8289. The Narrow Door: Women Writers and Feminist Practices in Italian Literature and Culture. (4 cr [max 16 cr]; Stdnt Opt. Prereq-3205) Focuses on issues of gender, sexual difference, equality, and emancipation raised by Italian women writers and thinkers from the 19th century to the present.

ISG 8305. Staging the Self: Theater and Drama in Modern Italy. (4 cr [max 16 cr]; Stdnt Opt. Prereq-3305) 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 Cinstremen.

ISG 8333. FTE: Masters. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

ISG 8336. Seminar: Topics in Interpersonal Relationships Research. (1-3 cr [max 6 cr]; Stdnt Opt. Prereq-Grad IRel minor or #) Intensive study of topics.

Japanese (JPN)

Department of Asian Languages and Literatures


Professor of English, University of Minnesota, 2009-10 Graduate School Catalog
JPN 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

JPN 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

JPN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 16 total required if DGS approves before summer 2007)

JPT 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Master’s student or summer; 10 cr total required [Plan A only])

JPT 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Master’s student or summer; 24 cr required)

Jewish Studies (JWST)

Department of Classical and Near Eastern Studies

College of Liberal Arts


JWST 5111. Problems in Historiography and Representation of the Holocaust. (3 cr; Stdnt Opt. = HIST 5285) Prereq—JwSt 5121 or RelS 5321 or #)

Focuses on issues connected with the Holocaust.

Inclusiveness of other groups, Holocaust vs. Shoah,

historiographical conflicts about perpetrators, an examination of the problems of representation in literature and art, problems of narrative theology after Auschwitz.

JWST 5112. Jewish Mysticism, Magic, and Kabbalah. (3 cr; A-F or Aud. = JWST 3112) Mystical traditions from early rabbinic traditions to Zohar (Book of Zohar) in 13th century. Literature of heavenly ascent (Hekhalot, Merkavah), precursors of Zohar.


JWST 5113. Scripture and Interpretation. (3 cr; A-F or Aud. = RELS 5513) Idea of divine revelation, its impact upon religion/literature. How history of Bible’s creation, transmission, and interpretation help us think critically about role of idea of revelation in religious traditions.

What is revelation? How does belief that a text is revealed affect the way it is read within the community for which it constitutes revelation?

JWST 5200. Topics in Jewish Studies. (5-4 cr [max 8 cr]; Stdnt Opt) Topics specified in Class Schedule.

JWST 5992. Directed Readings. (1-12 cr [max 12 cr]; Stdnt Opt. Prereq—#) Guided individual reading or study.

Journalism and Mass Communication (JOUR)

School of Journalism and Mass Communications

College of Liberal Arts


JOUR 5101. Health Writing. (3 cr; A-F or Aud. Prereq—[[3004W or 3004Y], [3101 or 310H], [3121, [jour major or approved ICP major or BIS major or IDM major]] or enrolled in MA in health journalism or grad student or #) Overview/techniques of news reporting/writing. Complex health topics. Techniques of other forms of health writing, including health feature writing and health new media/mediacommunication.

JOUR 5131. Capstone: In-Depth Reporting. (3 cr; A-F or Aud. Prereq—[[3004W or 3004Y], [3101 or 310H], [3121, [jour major or approved IDM major or ICP major or BIS major]] or grad student) Techniques/issues of special project stories. Explanatory, investigative, civic, and literary or ethnographic journalism. Topics (e.g., civil rights, governmental malfeasance, health care problems) typically involved in these stories.

JOUR 5155. Capstone: Database Reporting. (3 cr; A-F only. Prereq—[[3004W or 3004Y], [3101 or 310H], [3121, [jour major or approved IDM major or ICP major or BIS major]] or grad student) 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, and produce maps/graphics.

JOUR 5174. Capstone: Magazine Editing and Production. (4 cr; A-F or Aud. Prereq—[[3004W or 3004Y], [3101 or 310H], [3155 or 3173W or 3321 or 4202], [jour major or approved IDM major or ICP major or BIS major]] or grad student) Writing, editing, illustration, design, layout, and photocomposition of print or Web magazine. Emphasizes reporting, writing substantive stories. Students work in groups with varying specializations.

JOUR 5195. Online Media Creation and Design. (3 cr; A-F or Aud. = JOUR 5195H, JOUR 8195) Prereq—[3004W or 3004Y, 3101, 3121, 3155 or 3173W or 3321 or 4202], [jour major or approved IDM major or ICP major or BIS major]) or grad student) Design. Cross-sectional, experimental, and time-based designs. Decision making that inform media-based interventions.

JOUR 5543. Public Health Campaign Evaluation. (3 cr; A-F or Aud. Prereq—JOUR 5541, enrolled in MA in health journalism or grad student or jour major or mass comm minor or approved IDM major or ICP major or BIS major) or #) 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 cr; A-F or Aud. Prereq—Non-jour major or jour major with course appr on prog plan or [pre-jour with adviser approval]) Whether/how/which traditional media laws/regulations apply to the Internet. Developing law of communication on Internet, global/ethical issues.

JOUR 5601W. History of Journalism. (3 cr; A-F or Aud. Prereq—Jour major or jour major or approved IDM major or ICP major or BIS major; IDL sections are open to non-majors; prereq do not apply to IDL sections) Development of American media, from beginnings in Europe to present day. Rise of film/radio/television/Internet. Relation of communications development to political, economic, social trends.

JOUR 5606W. Literary Aspects of Journalism. (3 cr; A-F or Aud. = ENGW 5606) Prereq—Jour major or jour major or approved IDM major or ICP major or BIS major; IDL sections are open to non-majors; prereq do not apply to IDL sections) Literary aspects of journalism as exemplified in, and influenced by, works of American/British writers, past/present. Lectures, discussions, weekly papers, critiques.
Course Descriptions

JOUR 5613. History of the Documentary. (3 cr; A-F or Aud. Prereq--Non-jour major or jour major with course appr on prog plan or prejour with adviser approval)

Social history of photography, film, video. Informational, documentary, propaganda, and entertainment functions of visual communication. Rise/influence of visual media industries and of public-image making.

JOUR 5725. Management of Media Organizations. (3 cr; A-F or Aud. Prereq--Non-jour major or jour major with course appr on prog plan or prejour with adviser approval)


JOUR 5771. Media Ethics: Principles and Practice. (3 cr; A-F or Aud. Prereq--Non-jour major or [jour major, course appr on prog plan] or [pre-jour, adviser approval])

Connecting theoretical approaches to media ethics with real-life case studies. History of ethical standards in print, broadcast, photojournalism, public relations, and advertising. Making ethical judgments in complex situations.

JOUR 5777. Contemporary Problems in Freedom of Speech and Press. (5 cr; A-F or Aud. +LAW 5030. Prereq--Jour major or jour minor or approved IDIM major or ICP major or BIS major) Legal/constitutional derivation of freedom of speech. Emphasizes case law, statutes, judicial issues. Leading cases in privacy torts, prior restraint, news gatherings/dissemination. Access to courts/government, including via the Internet. Legal-research techniques.

JOUR 5825. World Communication Systems. (3 cr; A-F or Aud. Prereq--Non-jour major or jour major with course appr on prog plan or prejour with adviser approval)

Mass media systems of the world, described/analyzed regionally/nationally. Historical roots. Social, economic, cultural context. Contemporary conditions/prospects. Relevance of journalism/mass communication to international affairs.

JOUR 5990. Special Topics in Mass Communication: Professional. (3 cr; max 6 cr; A-F or Aud. Prereq--Jour major or jour minor or approved IDIM major or ICP major or BIS major) Professional-skills-learning opportunity not regularly offered. Topics specified in Class Schedule.

JOUR 5991. Special Topics in Mass Communication: Context. (3 cr; max 6 cr; A-F or Aud. Prereq--Jour major or jour minor or approved IDIM major or ICP major or BIS major) Special context topics not regularly offered. Topics specified in Class Schedule.

JOUR 5993. Directed Study. (1-3 cr; max 6 cr; A-F or Aud. Prereq--Jour major or jour minor or approved IDIM major or ICP major or BIS major) GPA of at least 3.00, @, %, #)

Directed study projects.

JOUR 8001. Studies in Mass Communication I. (3 cr; A-F or Aud)

Introduction to key concepts, theories, and methods in study of mass communication from social sciences perspective. Survey of research literature using individual/structural approaches.

JOUR 8002. Studies in Mass Communication II. (3 cr; A-F or Aud. Prereq--8001)

Literature on history of the field, cultural and humanistic approaches to its study, and legal and ethical issues.

JOUR 8003. The Changing Media Environment. (3 cr; A-F or Aud. Prereq--Journalism graduate students)

Nonprofessional skills course. Prepares entering graduate students to work in the changing media environment, emphasizing its political, social, economic, legal, ethical and technological implications nationally and globally; students produce scholarly research about changing media.

JOUR 8191. Health Journalism: Introduction to Health and Medical Journalism. (3 cr; A-F or Aud. Prereq--Enrolled in MA in health journalism or #)

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 cr; A-F or Aud. Prereq--Enrolled in MA in health journalism or #)

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 cr; A-F or Aud. Prereq--Enrollment in MA in health journalism or #) 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 cr; A-F only. Prereq--[5101, 8191] or enrolled in MA in health jour) 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 editor/manager at that institution and a faculty instructor. With faculty permission, may lead to capstone project for 8193.

JOUR 8195. Seminar: Online Media Creation and Design. (3 cr; A-F or Aud. Prereq--JOUR 5195H) JOUR 5195H. Prereq--Health journalism MA grad student or #) Concepts/development of online media products. Health news and informational opportunities in new media.


JOUR 8201. Factors Affecting Communication Strategy. (3 cr; A-F only. Prereq--Strat Comm MA grad major) Literature/research concerning identification/analysis of the media and environmental, regulatory, competitive, and economic factors that affect the development of communication strategy.


JOUR 8203. Integration of Communication Strategies Across Media. (3 cr; A-F only. Prereq--8202, 8201, 8202, strat comm MA grad major) 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 cr; A-F only. Prereq--8203, Strat Comm MA grad major) Examination, evaluation, and application of concepts/methods to evaluate effectiveness of strategic communication campaigns and their components.

JOUR 8205. Cases in Strategic Communication. (3 cr; A-F only. Prereq--8203, strat comm MA grad major) 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 cr; max 6 cr; A-F only. Prereq--8205, strat comm MA grad major) Project to develop a case study analysis concerning development, implementation, and evaluation of a strategic communication campaign.

JOUR 8317. Seminar: Visual Communication Research. (3 cr; A-F or Aud. Prereq--5316, [[8001, 8002] or #]) Theoretical approaches, analysis of research methods, development of research designs/projects.

JOUR 8333. FTE: Master’s. (1 cr; No grade. Prereq--Master’s student, adviser and DGS consent)

JOUR 8442. Seminar: Broadcast News. (3 cr; A-F or Aud. Prereq--4442 or #)

Major issues. Confrontations between federal government and network news departments. Historical studies.

JOUR 8444. FTE: Doctoral. (1 cr; No grade. Prereq--Doctoral student, adviser and DGS consent)


JOUR 8502. Seminar: Multi-method research in Mass Communication. (3 cr; A-F or Aud. Prereq--8501, [EPsy 5260 or equiv or &EPsy 5260]) Qualitative/quantitative 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 8514. Seminar: Mass Communication Theory. (3 cr; A-F or Aud. Prereq--8001, 8002) Research paradigms, concepts, and findings for developing a general theory of mass communication.


JOUR 8620. Seminar: Advertising Research. (3 cr [max 12 cr]; A-F or Aud. Prereq–5251 or #) Advertising as persuasive communication. Current research/theory related to advertising decision-making process.

JOUR 8631. Seminar: Mass Media and Social Change. (3 cr; A-F or Aud. Prereq–5001 or 5002 or equiv) Interplay between social theories and media studies. Pragmatism, structural-functionalism, Marxism, political economy, cultural studies, globalization.


JOUR 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

JOUR 8671. Seminar: Communication Ethics--Public/Civic Journalism. (3 cr; A-F or Aud) Historical underpinnings, philosophical debate, theoretical dynamics, legal concerns, ethical implications.


JOUR 8675. Seminar: Issues in Information Access and Communication. (3 cr; A-F or Aud) Societal, industry, technological, and policy aspects/developments that affect information access, particularly through mass media.


JOUR 8679. Seminar: Research Methods in Media Ethics and Law. (3 cr; A-F or Aud) Research at intersection of first amendment and media ethics.

JOUR 8681. Seminar: Media and Globalization. (3 cr; A-F or Aud. Prereq–4801 or 5825 or #) Main problems/currents. Concepts, research, policy relevant to global development. Issues of freedom/constraint, media technology, role of journalism in world affairs.

JOUR 8721. Seminar: Communication Agencies as Social Institutions. (3 cr; A-F or Aud) Influence/education of mass communication, internal dynamics of media organizations, criticism/modes of reform. Theoretical frameworks for analysis.

JOUR 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; No grade. Prereq--Max 18 cr per semester or summer; 10 cr total required (Plan A only))

JOUR 8801. Seminar: Comparative Research in Mass Communication, a Cross-National Approach. (3 cr; A-F or Aud. Prereq–4801 or 5825) Comparative research designs/strategies. Analysis of production, presentation, transmission, and consumption of mass media products/services (particularly news, entertainment, and information) across national borders. Theoretical concerns, empirical problems, policy. Ethical issues involving research on form/content of mass communication within/between countries.

JOUR 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq--Max 18 cr per semester or summer; 24 cr required)

JOUR 8990. Special Problems in Mass Communication. (3-4 cr [max 12 cr]; A-F or Aud) Topics specified in Class Schedule.

JOUR 8993. Directed Study. (1-6 cr [max 6 cr]; A-F or Aud. Prereq--Grad mass comm major or minor, #, #) Directed study.

Kinesiology (KIN)

School of Kinesiology

College of Education and Human Development

KIN 5001. Foundations of Human Factors/Ergonomics. (3 cr; A-F or Aud. + HUMF 5001) 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 cr; A-F or Aud) 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 cr; A-F or Aud) Different approaches to providing physical education service and related movement interventions for persons with disabilities. Topics: movement behavior foundations, movement skill progressions, unique considerations for specific impairments, and sport for persons with disabilities.

KIN 5111. Sports Facilities. (3 cr; A-F or Aud. Prereq--Kin or Grad student or MEEd student) Steps in planning/building facilities for athletics, physical education, and sport for college, professional, and public use.

KIN 5115. Event Management in Sport. (3 cr; A-F or Aud. Prereq--Grad student, #) Techniques/principles of planning, funding, and managing sport events. College championships, non-profit events, benefits, professional events.

KIN 5122. Applied Exercise Physiology. (3 cr; A-F or Aud. Prereq--4385 or equiv or #) 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 cr; A-F only. Prereq--3126W or grad student) 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. Sport Psychology. (3 cr; Stdnt Opt. Prereq--3126 or equiv or #) Theory and research in sport psychology. Focus on the psychological study of human behavior in sport and physical activity settings.

KIN 5136. Psychology of Coaching. (3 cr; Stdnt Opt) Psychological dimensions of coaching across age levels, including coaching philosophy, leadership, communication skills, motivation, and mental skills training for performance enhancement.


KIN 5711. Foundations of Kinesiology. (3 cr; A-F or Aud. Prereq--Kin major or #) 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 5796. Practicum: Developmental/Adapted Physical Education. (1-4 cr [max 4 cr]; 3 cr Aud. Prereq--5103 or 5104 or 5104 or #; KIN undergraduate pre-teaching with sr status are limited to 2 practicum hrs) Observation of, participation in physical education instruction for students with disabilities. Current issues in development/adapted physical education. Exchange of ideas/problems.


KIN 5737. Sport and Society. (3 cr; A-F or Aud. Prereq--3126W, grad student or #) Sport, sporting processes, social influences, systems. Structures that have effected and exist within/among societies, nations, and cultures. Contemporary issues such as social differentiation, violence, and honesty.
KIN 5375. Competitive Sport for Children and Youth. (3 cr; Stdnt Opt.)
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 Disease Prevention and Management. (3 cr; A-F or Aud. Prereq- Undergrad (physiology or biology))
Exercise testing/prescription with modifications required because of special considerations associated with aging, gender differences, environmental conditions, or presence of medical conditions.

KIN 5421. Sport Finance. (3 cr; A-F or Aud. Prereq-Grad student or #)
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 cr; A-F or Aud. Prereq- [3385, 4385, KIN 4508] or #)
Theoretical constructs, in-depth description of procedures used in exercise science research and clinical settings. Laboratory exercises, lectures.

KIN 5461. Foundations of Sport Management. (3 cr; A-F or Aud. Prereq- KIN 4925 or rec or postbac or grad student or #)
Theories/techniques in administration/management of sport enterprises. Organizational theory/policy, practical examples of sport management skills/strategies.

KIN 5485. Advanced Electrocardiogram, Graded Exercise Testing, and Prescription. (3 cr; A-F or Aud. Prereq- [3385, 4385] or #)
Introduction to electrocardiogram. Placement/interpretation, use in clinical exercise testing and exercise prescription. Hands-on experience in electrocardiogram for exercise testing.

KIN 5505. Human-Centered Design - Principles and Applications. (3 cr; Stdnt Opt. *KIN 5505*)
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. Women in Sport and Leisure. (3 cr; A-F or Aud. +REC 5511)
Critically examines women’s involvement in/ contributions to sport, physical activity, and leisure.

KIN 5601. Sport Management Ethics and Policy. (3 cr; A-F or Aud. Prereq-MEd or grad student or #)
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 cr; A-F or Aud. Prereq-Kin or Rec grad student or #)
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 cr; A-F only. Prereq: KIN 4925 or SPST 4641 or exercise physiology course or #)
Current scientific literature on physiological adaptation through training/conditioning for sport. Applying methods and research tools to improve physiological adaptation through training/conditioning with sport specificity.

KIN 5696. Practicum in Kinesiology. (1-6 cr [max 6 cr]; 5-N or Aud. Prereq-Grad student in KIN, #)
Practical experience in kinesiology under supervision of a University adviser and an agency supervisor.

KIN 5720. Special Topics in Kinesiology. (1-8 cr [max 8 cr]; Stdnt Opt. Prereq-Kin upper div undergrad or grad student or #)
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 cr; A-F or Aud. Prereq-Grad student or #)

KIN 5723. Psychology of Sport Injury. (3 cr; Stdnt Opt. Prereq-Intro psych course)
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 cr; A-F or Aud. Prereq-Grad/initial licensure or #)
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 5740. Topics: Coaching of Individual, Dual, or Team Sports. (1-9 cr [max 9 cr]; A-F or Aud)
Instruction at the advanced level, including analyses of skills, game strategies, specific techniques of coaching, and methods of training and conditioning.

KIN 5801. Legal Aspects of Sport and Recreation. (4 cr; A-F or Aud. Prereq-Kin or rec major)
Legal issues related to recreation, park, and sport programs/facilities in public/private sectors.

KIN 5941. Neural Basis of Movement. (3 cr; A-F or Aud. Prereq- [f3111, CBH 1027] or equiv) [Phsl 3501 or equiv]

KIN 5981. Research Methodology in Kinesiology, Recreation, and Sport. (3 cr; A-F or Aud. +REC 5981)
Thesis in research in kinesiology, recreation, and sport. Focuses on methodology, design. Focuses on student-selected topics/problems.

KIN 6001. Special Topics: Human Factors/ Ergonomics. (2-3 cr [max 3 cr]; Stdnt Opt. Prereq-Grad/initial licensure in good standing, grad HumF minor)

KIN 8002. Proseminar in Human Factors/ Ergonomics. (1 cr [max 2 cr]; A-F or Aud. Prereq-Grad/initial licensure in good standing, grad HumF minor)
Issues/concerns tailored to interests of faculty/students regarding human factors/ergonomics. Interaction of performance/behavior with design factors in performance environment.

KIN 8122. Seminar: Exercise Physiology. (2-6 cr [max 6 cr]; A-F or Aud. Prereq-5122 or equiv or #)
Classic and contemporary literature in exercise physiology and allied disciplines, emphasizing contributions of major leaders in the field and opportunities for interdisciplinary research.

KIN 8126. Seminar: Sport Psychology. (3 cr; A-F or Aud. Prereq-5126 or instr approval)
Literature, theoretical constructs, research methodology, design. Focuses on student-selected topics/problems.

KIN 8128. Doctoral Sport Management Seminar. (3 cr; A-F only. +REC 8128. Prereq-PhD student, #)
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 cr; A-F or Aud. Prereq-4132 or equiv or #)
Contemporary research literature focusing on motor skill development from before birth to senescence. Emphasizes interaction between physical, environmental, and performer constraints, and coordination/control of movement.

KIN 8135. Seminar: Motor Control and Learning. (3 cr [max 6 cr]; A-F or Aud. Prereq-4135 or equiv or #)
Advanced reading and discussion of research on motor control, motor learning, and human performance.

KIN 8211. Perception and Action. (3 cr; Stdnt Opt. Prereq-[CEHD or Psy] grad student or #)
Survey of theory/research on use of perceptual information for control of action. Focuses on 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 cr; No grade, Prereq-Master’s student, adviser and DGS consent)

KIN 8444. FTE: Doctoral. (1 cr; No grade, Prereq-Doctoral student, adviser and DGS consent)

KIN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for PhD/2nd year, requires 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)

KIN 8669. Internship: Applied Sport Psychology. (3-6 cr [max 6 cr]; 5-N or Aud. Prereq-5126, 8126, Kin PhD student, #)
Supervised internship; emphasis on educational sport psychology approaches to athletic performance enhancement and psychological adjustment to sport injury.
KIN 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or sum-10 cr using required (Plan A only))

KIN 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

KIN 8980. Graduate Research Seminar in Kinesiology. (1 cr [max 9 cr]; S-N or Aud. Prereq—Grad Kin major, #)

Reporting and discussion of student and faculty research activity.

KIN 8985. Research Problems in Kinesiology. (1-9 cr [max 9 cr]; S-N or Aud. Prereq—Kin PhD student or #)

Research Problems in Kinesiology

Laboratory Medicine and Pathology (LAMP)

Department of Laboratory Medicine and Pathology

Medical School

LAMP 5100. General and Systemic Pathology for Dental Students. (4 cr; A-F or Aud. Prereq—Regis dental student)

Causes, courses, mechanisms and outcomes of disease. Required as preparation for clinical dental practice and oral pathology.

LAMP 5125. Chronobiology. (2-6 cr [max 6 cr]; O-N or Aud)

How to interpret biologic time series and how to use them in practice as well as in designing chronobiology experiments. Chronobiologic procedures of data collection and analysis, interpretation of the output in clinical practice.

Landscape Architecture (LA)

Department of Landscape Architecture

College of Design

LA 5201. Making Landscape Spaces and Types. (6 cr; A-F or Aud. Prereq—B.E.D. accelerated status or LA grad or #)

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 cr; S-N or Aud)

Introduction to field techniques for site analysis, including vegetation, soil, and landfill description. One-week session, before fall term, at lake Itasca Forestry and Biological Station.

LA 5203. Ecological Dimensions of Space Making. (6 cr; A-F or Aud. Prereq—LA major or #; recommended for both BED and Grad students)

Design studio experience drawing on ecological, cultural, aesthetic influences to explore development of design ideas responsive to ecological issues and human experience.

LA 5204. Landscape Ecology. (3 cr; Stndt Opt. Prereq—B.E.D. accelerated status or LA grad student or #)

Relationships among spatial patterns, temporal patterns, ecological processes in landscape. Factors affecting landscape patterns, measurement of landscape pattern, material transport through landscapes, effects of landscape pattern on population dynamics, landscape planning.

LA 5301. Introduction to Landscape Architecture Drawing. (3 cr; Stndt Opt. =LA 1301. Prereq—Grad student or accelerated B.E.D. student)

Perceiving/representing material environment. Sketching/drawing conventions, visual phenomena/form.

LA 5351. AutoCAD I. (3 cr; Stndt Opt. Prereq—B.E.D. major or LA grad or #; may not be taken for graduate credit)

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 3-D drawing capabilities. Use of dimension variables, attributes, blocks, symbols, and creation of customized menus.

LA 5352. AutoCAD II. (3 cr; Stndt Opt. Prereq—Arch 5351 or LA 5351. B.E.D. major or LA grad or #; may not be taken for graduate credit)

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 cr; S-N or Aud. =ARCH 5371. Prereq—B.E.D. accelerated status or LA grad or #)

Introduction to current techniques, programs, and new editions of computer programs, and their application to landscape architecture computing.

LA 5372. Computer Methods II. (1 cr; S-N or Aud. =ARCH 5372. Prereq—Arch/ARCH 5371. LA grad or #)

Current techniques and computer programs, and their application to landscape architecture computing.

LA 5373. Computer Methods III. (3 cr; Stndt Opt. =ARCH 5373. Prereq—LA grad or #)

Advanced techniques and computer programs, and their application to landscape architecture computing in design, theory, and technology.

LA 5374. Representation for Landscape Architectural Construction. (3 cr; Stndt Opt)


LA 5400. Topics in Landscape Architecture. (1-3 cr [max 12 cr]; Stndt Opt. Prereq—B.E.D. accelerated status or LA grad or #)

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. (1-3 cr [max 12 cr]; Stndt Opt. Prereq—#)

LA 5402. Directed Studies in Landscape Architecture History and Theory. (1-6 cr [max 12 cr]; Stndt Opt. Prereq—#)

Independent studies under the direction of landscape architecture faculty.

LA 5403. Directed Studies in Landscape Architecture Technology. (1-6 cr [max 12 cr]; Stndt Opt. Prereq—#)

Independent studies under the direction of landscape architecture faculty.

LA 5404. Directed Studies in Landscape Architecture Design. (1-6 cr [max 12 cr]; Stndt Opt. Prereq—#)

Independent studies under the direction of landscape architecture faculty.

LA 5405. Interdisciplinary Studies in Landscape Architecture. (1-6 cr [max 12 cr]; A-F or Aud. Prereq—LA grad or #)

Research, planning, or design projects. Topics vary.

LA 5406. Urban Design Journal. (3-4 cr [max 4 cr]; A-F or Aud. Prereq—Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark)

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. (3-4 cr [max 4 cr]; A-F or Aud. Prereq—Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark)

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 cr [max 4 cr]; A-F or Aud. Prereq—Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark)

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 cr; A-F or Aud. Prereq—One course in history at 1xxx or higher)

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 cr; A-F or Aud)

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 5571. Landscape Construction: Landform Systems and Spatial Performance. (3 cr; A-F or Aud. Prereq—Accelerated BED student or LA grad student)

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 cr; A-F or Aud. Prereq—[5201, 5203, plant identification course] or #)

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 cr; A-F or Aud. Prereq—[5372, 5402, 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.

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

LA 5574. Identification of Minnesota Flora. (3 cr; A-F or Aud. Prereq-BED accelerated status or LA grad student or #) 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 5721. Proseminar in Metropolitan Design. (3 cr; A-F or Aud. ARCH 5721, Prereq—[Arch 5711 or equiv], enrollment in CMD prog.) Reading seminar. Exploration of the contemporary city. Dynamics that created contemporary urban spatial patterns. Planning/design theories that have guided public interventions in the built environment. Thematic texts, classroom discussions.

LA 5790. Special Topics in Metropolitan Design. (3 cr [max 6 cr]; A-F or Aud. ARCH 5790. Prereq-Enrollment in CMD prog or #)

LA 8201. Designing Landscapes for Dwelling and Settlement. (6 cr; A-F or Aud. Prereq—8203, 5571, grad LA major, &8202 or #) 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 techniques. Requires concurrent registration in LA 8202.

LA 8202. Design of Planned Developments. (2-3 cr; max 6 cr; Stdnt Opt. Prereq—Grad LA major or #) 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 cr; A-F or Aud. Prereq—8203, grad LA major, co concurrent enrollment 8204 or #) 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 cr; A-F or Aud. Prereq—Grad LA major or #) 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. (6-8 cr; max 8 cr; Stdnt Opt. Prereq—2 yrs of studio, grad LA major or #) 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 8301. Landscape Architecture: Research Issues and Methods. (3 cr; A-F or Aud. Prereq—8201 or 82201, grad LA major or #) Alternative methodological approaches to landscape architectural research and consideration of their appropriateness for contemporary research topics.

LA 8302. Professional Practice. (3 cr; A-F or Aud. Prereq—8205, grad LA major or #) 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 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

LA 8400. Topics in Landscape Architecture. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq—Grad LA major or #) 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. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq—Grad LA major or #) Current topics in landscape architecture. Seminar offered by regular or visiting faculty in their area of specialization. Subject matter varies with instructor.

LA 8402. Directed Studies in Landscape Architecture History and Theory. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq—Grad LA major or #) Advanced independent studies under direction of landscape architecture faculty.

LA 8403. Directed Studies in Landscape Architecture Technology. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq—Grad LA major or #) Advanced independent studies under direction of landscape architecture faculty.

LA 8404. Directed Studies in Landscape Architecture Design. (1-6 cr [max 6 cr]; Stdnt Opt. Prereq—Grad LA major or #) 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 cr; A-F or Aud. Prereq—Grad land arch major or #) 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 cr; Stdnt Opt. Prereq—Grad land arch major or #) Historic and modern design devices that alter one’s sense of spatial control and arrangement to create illusionary situations in exterior environment. Organized to form 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 cr; A-F or Aud. Prereq—Grad land arch or arch major or #) 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 Landscape. (3 cr; A-F or Aud. Prereq—Arch land or arch grad student with 1 yr design or #) Exercises and projects in site manipulation to adjust structures and attendant uses and circulation to specific land parcels.

LA 8554. Project Programming. (1 cr [max 3 cr]; A-F or Aud. Prereq—8203, grad land arch major or #) Individual research in preparation for final studio.

LA 8555. Advanced Landscape Planning and Design. (6 cr; A-F or Aud. Prereq—8205, grad land arch major or #) Advanced studies in area of student’s choice.

LA 8574. Landscape Storm Water Management. (3 cr; Stdnt Opt. Prereq—8201, grad land arch major or #) 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, small storm sewer systems, run-off systems, sedimentation, and erosion control systems).


LA 8741. Metropolitan Design Workshop and Optional Seminar. (3-6 cr [max 6 cr]; A-F or Aud. Prereq—Enrollment in CMD prog or #) Introduction to discipline/methodologies of urban design. Contributing fields/issues, including government/community goals, land use, housing, economic development, natural resources, services, and transportation. Implementation program.

LA 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required (Plan A only))

Language, Teaching, and Technology (LGTT)

Institute of Linguistics, ESL, and Slavic Languages and Literatures

College of Liberal Arts

LGTT 5101. Applications of Technology in Language Teaching. (3 cr; Stdnt Opt. = LGTT 5110) Explore uses of technology in language teaching; theoretical background, demonstrations, and applications.


LGTT 5710. Special Topics in Language Teaching and Technology. (1 cr [max 3 cr]; Stdnt Opt) Examine, evaluate, apply specific area of technology to K-higher education, second/foreign language teaching/learning in classroom, independent study, distance education environments.


326 University of Minnesota 2009-10 Graduate School Catalog
Latin (LAT)  
Department of Classical and Near Eastern Studies  
College of Liberal Arts  
LAT 5001. Intensive Latin. (3 cr; Stdnt Opt. =LAT 1001, LAT 111H, Prereq—Prev experience in another foreign language is desirable)  
Covers material usually taught over two semesters.  
LAT 5003. Intermediate Latin Prose: Graduate Student Enrollment. (3 cr; Stdnt Opt. =LAT 3003, Prereq—Grad level of at least [C- or S] in [1002 or 5001] or #, grad student)  
LAT 5004. Intermediate Latin Poetry for Graduate Students. (3 cr; Stdnt Opt. =LAT 5200, Prereq—[5003 or equiv], grad student)  
LAT 5100. Advanced Reading. (3 cr [max 18 cr]; Stdnt Opt. Prereq—[3004, at least two years of college level Latin] or %)  
Reading in Latin texts/authors. Texts/authors vary each term.  
LAT 5200. Advanced Reading in Latin: Medieval Lyric. (3 cr [max 18 cr]; Stdnt Opt. =LAT 5004, Prereq—[3004 or equiv or #])  
Reading course. Authors of late antiquity, Middle Ages, and Renaissance. Topics specified in Class Schedule.  
LAT 5701. Latin Prose Composition. (3 cr; Stdnt Opt. Prereq—Grad student or %)  
Latin grammar, syntax, diction, and prose style. Graduated exercises in prose composition.  
LAT 5702. Text Criticism. (3 cr; Stdnt Opt. Prereq—Grad student or %)  
LAT 5703. Epigraphy. (3 cr; Stdnt Opt. Prereq—Grad student or %)  
Practical/overview 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 5704. Latin Paleography. (3 cr; Stdnt Opt. Prereq—Grad student or %)  
Analysis of various hands used in manuscripts of Latin authors, with attention to date/provenance. Transmission of ancient Latin literature.  
LAT 5705. Introduction to the Historical-Comparative Grammar of Greek and Latin. (3 cr; Stdnt Opt. =GRK 5701, Prereq—Two yrs college [Greek or Latin] or %)  
Historical/comparative grammar of Greek/Latin, from proto-Indo-European origins to classical norms.  
LAT 5706. History of Latin. (3 cr; Stdnt Opt. Prereq—Grad student or %)  
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 cr [max 6 cr]; S-N only. Prereq—Enrolled in a grad program in Department of Classical/Near Eastern Studies)  
Practice in reading Latin texts at sight.

LINGUISTICS (LING)  
Institute of Linguistics, ESL, and Slavic Languages and Literatures  
College of Liberal Arts  
LING 5001. Introduction to Linguistics. (4 cr; Stdnt Opt. =LING 3001, LING 3001H)  
Prereq—grad or #)  
Phonetics, phonology, morphology, syntax, semantics, and historical-comparative linguistics; language learning and psycholinguistics; language universals; language in society.  
LING 5005. Applications of Linguistics. (3 cr; Stdnt Opt. Prereq—3001 or 3001H or 5001 or 5001H or 5001 or #)  
Relationships between linguistics and neighboring disciplines. Applications to practical fields such as lexicography, orthography, translation/interpreting, language planning, reading, language teaching, bilingual education, education of the deaf, and correction of language disorders. Computer applications, forensic applications. Topics vary.  
LING 5101. Language Types and Linguistic Universals. (3 cr; Stdnt Opt. Prereq—[5001 or 5001H or 5001 or 5001H or 5001 or #])  
Comparison of languages and language types. Cross-linguistic similarities/universals of language, their explanation.  
LING 5105. Field Methods in Linguistics I. (4 cr; Stdnt Opt. Prereq—[5001 or 5001H or 5001 or 5001H or 5001 or #])  
Techniques for obtaining/analyzing linguistic data from unfamiliar languages through direct interaction with a native speaker.  
LING 5106. Field Methods in Linguistics II. (4 cr; Stdnt Opt. Prereq—[5001, 5001H, 5001, 5001, 5001 or #])  
Techniques for obtaining/analyzing linguistic data from unfamiliar languages through direct interaction with a native speaker.  
LING 5201. Syntactic Theory I. (3 cr; Stdnt Opt. Prereq—[5001 or 5001H or 5001 or 5001H or 5001 or 5001 or #])  
Concepts/issues in current syntactic theory.  
LING 5202. Syntax II. (3 cr; Stdnt Opt. Prereq—5201)  
Foundation in modern syntactic theory. Syntactic phenomena in various languages. Emphasizes syntactic argumentation, development of constraints on grammar formalisms.  
LING 5205. Semantics. (3 cr; Stdnt Opt. Prereq—5201 or #)  
Analysis of sentence meaning. Semantic properties. Relations such as analyticity, entailment, quantification, and genericity. Philosophical background, formal techniques of semantic analysis, how sentence meaning depends on word meaning, syntax, and context. The role of semantics in grammatical theory.  
LING 5206. Linguistic Pragmatics. (3 cr; Stdnt Opt. Prereq—5201 or #)  
The analysis of linguistic phenomena in relation to beliefs and intentions of language users; speech act theory, conversational implicature, presupposition, information structure, relevance theory, discourse coherence.

For definitions of course numbers, symbols, and abbreviations, see page 214. 327


LING 5303. Phonology II. (3 cr; Stdnt Opt. Prereq–5302 or #) Phonology of human languages. Preparation for reading papers in the literature and for doing research in phonology.

LING 5461. Conversation Analysis. (3 cr; Stdnt Opt. =COMM 5461. Prereq–3001 or 3001H or 5001 or #) Discourse processes. Application of concepts through conversation analysis.

LING 5462. Field Research in Spoken Language. (3 cr; Stdnt Opt. =COMM 5462. Prereq–3001 or 3001H or 5001 or #) Transcribing/analyzing talk and movement related to talk. Applying concepts to recorded conversations.

LING 5501. Introduction to Language Acquisition. (3 cr; Stdnt Opt. Prereq–3001 or 3001H or 5001 or #) First/second language acquisition.


LING 5701. Sociolinguistics. (3 cr; Stdnt Opt. Prereq–3001 or 3001H or 5001 or #) Social determinants of linguistic diversity, variation, and change. Topics may include social and regional dialects, language style/register, style-code-switching, quantitative study of speech, linguistic/social inequality.


LING 5801. Introduction to Computational Linguistics. (3 cr; Stdnt Opt. Prereq–5201 or programming experience or #) Methods/issues in computer understanding of natural language. Programming languages, their linguistic applications. Lab projects.

LING 5802. Computational Linguistics. (3 cr; Stdnt Opt. Prereq–5801 or #) Computer processing of natural language. Applications to such areas as speech recognition and information extraction.

LING 5900. Topics in Linguistics. (1-4 cr [max 12 cr]; Stdnt Opt) Topics vary. See Class Schedule.

LING 5931. Morphology and Syntax of Contemporary English. (3 cr; Stdnt Opt. Prereq–3001 or 3001H or 5001 or #) Linguistic analysis of word/sentence structure of contemporary English. Focuses on data from recorded/written texts.

LING 5932. Topics in the Structure of Modern English. (3 cr [max 12 cr]; Stdnt Opt. Prereq–[3001 or 3001H or 5001, 5201 or 5931]) Aspects of the morphology, syntax, or semantics/pragmatics of modern English. Emphasizes analysis of written or recorded texts. Topics vary.


LING 6005. Research Paper Workshop. (3 cr [max 12 cr], S-N or Aud. Prereq–[5105, 5202, 5205, 5302] or [#, grad ling major]) Workshop on research methodology/writing in Linguistics.

LING 8105. Field Methods in Linguistics I. (4 cr [max 8 cr]; Stdnt Opt. Prereq–[5001, 5201, 5302, grad linguistics major] or #) Structural analysis of unknown language through work with a native speaker.

LING 8106. Field Methods in Linguistics II. (4 cr [max 8 cr]; Stdnt Opt. Prereq–[5001, 5201, 5302, grad linguistics major] or #) Structural analysis of unknown language through work with a native speaker.

LING 8200. Topics in Syntax and Semantics. (3 cr [max 9 cr]; Stdnt Opt. Prereq–5202, 5205 or #) Syntactic and semanticstudies of modern English, with particular emphasis on the interface between the two.


LING 8221. Formal Semantics of Natural Language. (3 cr; A-F or Aud; =PHIL 8182. Prereq–Phil 5201 or #) Truth-conditional model-theoretic semantics applied to treatment of opacity, intensionality, quantification, and related phenomena in natural language.

LING 8300. Topics in Phonetics and Phonology. (3 cr [max 9 cr]; Stdnt Opt. Prereq–5302 or #) Current issues in phonological theory. Topics vary.

LING 8333. FTE: Master’s. (1 cr; No grade; Prereq–Master’s student, adviser and DGS consent) LING 8444. FTE: Doctoral. (1 cr; No grade; Prereq–Doctoral student, adviser and DGS consent)

LING 8500. Topics in Second Language Acquisition. (3 cr [max 9 cr]; Stdnt Opt. Prereq–5001 or #) Based on review of published research, students design and carry out their own studies, writing/presenting research results at end of term. Focuses on first or second language acquisition, or both, depending on instructor.

LING 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

LING 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

LING 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)


LING 8920. Topics in Language and Cognition. (3 cr [max 6 cr]; Stdnt Opt. Prereq–5001 or #) 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. (1-4 cr [max 15 cr]; Stdnt Opt. Prereq–#) Independent Study

Logic Management (LM)

Department of Marketing and Logistics Management

Curtis L. Carlson School of Management

LM 8892. Readings in Logistics Management. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq–Adviser consent or #) Readings useful to student’s individual program or objectives that are not available in regular courses.

LM 8894. Graduate Research in Logistics Management. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq–Adviser consent or #) Individual research on an approved topic appropriate to student’s program and objectives.

Management (MGMT)

Department of Strategic Management and Organization

Curtis L. Carlson School of Management


MGMT 5480. Topics in Natural Resources. (3 cr; A-F only) Specific topic for each offering.

MGMT 8101. Theory Building and Research Design. (4 cr; Stdnt Opt. Prereq–Business admin PhD student or #) Problem formulation, conceptual modeling, theory building, and research design in the social and behavioral sciences.

Management of Technology (MOT)

Institute of Technology

MOT 5991. MOT Independent Study. (1-3 cr; S-N or Aud. Prereq–MOT grad student) Independent study in MOT-related topic.


MOT 8113. Operations Management for Competitive Advantage. (2 cr; A-F or Aud. Prereq–Grad MOT major) 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 cr; A-F only. Prereq–Grad MOT major) 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 8211. Managing Organizations in a Technological Environment. (2 cr; A-F or Aud. Prereq–Grad MOT major) 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 8213. Macroevironment of Technology. (2 cr; A-F or Aud. Prereq–Grad MOT major) Development of scenarios for 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 cr; A-F only. Prereq–Grad MOT major) Tools/techniques for technology forecasting, assessment, and strategic analysis for decision making in business/government. Technology dynamics, R&D strategy, portfolio management, resource allocation.


MOT 8221. Managing Information Resources in Technology-based Organizations. (1 cr; A-F or Aud. Prereq–Grad MOT major) 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 cr; A-F or Aud) 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 8234. Capstone Project. (.5-2 cr max 2 cr; A-F or Aud. Prereq–Completion of two semesters, grad MOT major) 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 cr; No grade. Prereq–Master’s student, adviser and DGS consent)
MOT 8910. Corporate Responsibility. (1 cr; A-F or Aud. Prereq–Grad MOT major) 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 8930. Topics in Emerging Technologies. (1.5 cr; S-N or Aud. Prereq–MOT grad student) 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 8950. International Management of Technology Project. (1.5 cr; A-F or Aud. Prereq–MOT grad student) 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.

Managerial Communications (MCOM)

Business Career Center

Curtis L. Carlson School of Management

MCOM 5400. Managerial Communications for the HR Professional. (2 cr; A-F only. Prereq–HRIR student) Memo writing, oral presentations, and team communication required of HR professional. Emphasizes hands-on, experiential learning, including videotaping.

MCOM 5500. Strategic Managerial Communication (Comprehensive Course). (4 cr; max 8 cr; A-F only. Prereq–MBA student) Communication strategies at three levels: interpersonal, teams, and external relations. Students compare communication styles. Organizational, persuasive, and language strategies.

MCOM 5510. Persuasive Writing in Business. (2 cr; A-F only. Prereq–MBA student) Writing to motivate/affect change. Form/content, techniques of persuasion. Producing polished text. Writing with power.

MCOM 5520. Persuasive Writing in Business: Non-Native Speakers of English. (2 cr; A-F only. Prereq–MBA student, non-native English speaker) Writing to motivate/affect change. Form/content, techniques of persuasion. Producing polished text. Writing with power.


Manufacturing Systems (MS)

Institute of Technology

MS 5101. Manufacturing Strategy and Operations Management. (3 cr; A-F or Aud. Prereq–Grad MS major) Strategic roles of manufacturing, process technology, operations management, and market strategies; their impact on manufacturing. Overview of operations functions such as demand forecasting, capacity planning, inventory planning, inventory control, materials management, Kanban & JIT, facility selection, strategic alliances, and outsourcing.


MS 5105. Financial Decision Making in Manufacturing. (2 cr; max 3 cr; A-F or Aud. Prereq–Grad MS major) Fundamental topics in engineering economics, such as risk and uncertainty, capital cost accounting, time value of money, investments, and capital. Skills developed in budget management, capital cost justification, cost estimation, value engineering, equipment acquisition and replacement, and creating business plans.

MS 5106. Intelligent Decision Support Systems in Engineering. (3 cr; A-F or Aud. Prereq–Grad MS major) Methods for identifying where to apply DSSs, technologies for building them, strategies for evaluating their effectiveness. Examples from many engineering areas.

MS 5107. Simulation of Manufacturing Systems. (1 cr; A-F or Aud. Prereq–Grad MS student) Using integrated simulation/animation environment to create, analyze, and evaluate realistic models for various manufacturing, assembly, and material handling systems. Experimental design for simulation. Random number generation, selecting input distributions, evaluating simulation output.

MS 5199. Topics in Manufacturing Systems. (1 cr; max 7 cr; A-F or Aud. Prereq–Grad MS student) See Class Schedule.

MS 5201. Project Management. (1 cr; A-F or Aud. Prereq–Grad MS major) Practical understanding of project management. Project planning, scheduling, budgeting, staffing, task and cost control, and communicating with, motivating, and managing team members.

MS 5202. Technology Forecasting. (1 cr; A-F or Aud. Prereq–Grad MS major) Introduction to methods of technology assessment/forecasting. Applications to history of technology/industry. Technological developments and their economic, social, and industrial impacts.


MS 5204. Automated Machining Processes. (1 cr; A-F or Aud. Prereq–Grad MS major) Description and demonstration of automated machine tools and machining cells. Machining center configuration and operation, machine tool controller, machining code generation, in-process sensing and control, cell controllers, and system simulation.


MS 5207. Design for Manufacturability. (1 cr; A-F or Aud. Prereq–Grad MS major) Machine design practice plans for assembly of components into systems. Basic design principles.

MS 5208. Plasma Processing. (1 cr; A-F or Aud. Prereq–Grad MS major) Plasma coating processes, manufacturing issues. Details of technologies such as plasma spraying and diamond deposition. Lab demonstrations.

MS 5209. Micro Electrical Mechanical Systems. (1 cr; A-F or Aud. Prereq–Grad MS major) Introduces MEMS by presenting various microfabrication techniques such as integrated circuit microfabrication processes, bulk micromachining, bonding, and high-spectrum processes. MEMS design processes. MEMS applications. Future of MEMS.

MS 5210. Robotics. (1 cr; A-F or Aud. Prereq–Grad MS major)

MS 5502. ISE: Public Interactions. (1 cr [max 4 cr; A-F or Aud. Prereq-ISE grad student]) Techniques for effective public communication. How to run a successful public hearing. Resources for publishing public notices.

MS 5900. Directed Study. (1-3 cr; A-F or Aud) Directed study/research in manufacturing systems. Topics chosen in collaboration with instructor.

MS 8335. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DG5 consent)

MS 8760. Computer-assisted Product Realization: Capstone Project. (4 cr; A-F or Aud. Prereq-Manufacturing systems major) Students experience the complete part design to production process. Manufacturing process design and commercial software packages for use, in part, in process design.

Marathi (MAR)

Department of Asian Languages and Literatures
College of Liberal Arts

MAR 5992. Directed Readings. (3-5 cr [max 12 cr]; Stdnt Opt. Prereq-#, %, &@) Individualized guided reading or study of modern Marathi texts.

MAR 5994. Directed Research. (3-5 cr [max 12 cr]; Stdnt Opt. Prereq-#, %, &@) Direct research on a subject agreed upon by student and instructor.

Marketing (MKTG)

Department of Marketing and Logistics Management
Curtis L. Carlson School of Management

MKTG 6812. Consumer Attitudes and Persuasion. (4 cr; A-F or Aud. Prereq-Doctoral student or [master’s program student, #]) How people process information for making judgments. How people acquire and mentally organize information, how such data are related to prior knowledge, and how this knowledge or processes performed on it guide judgments.

MKTG 8831. Seminar: Inter-Organizational Relations. (4 cr; Stdnt Opt. Prereq- MBA 6210 or equiv, business admin PhD student or #) 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 8851. Seminar: Marketing Management and Strategy. (4 cr; Stdnt Opt. Prereq- MBA 6210 or equiv, business admin PhD student or #) Topics in marketing management and formulation and implementation of marketing strategies. Exposes students to diversity of thought, within marketing and the strategic management literature.

MKTG 8690. Seminar: Marketing Topics. (4 cr [max 8 cr; Stdnt Opt. Prereq- MBA 6210 or equiv, business admin PhD student or #]) Current topics and problems of interest considered in depth. Topics vary with each offering.

MKTG 8892. Readings in Marketing. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq- MBA 6210 or equiv, business admin PhD student or #) Readings useful to student’s individual program and objectives that are not available in regular courses.

MKTG 8894. Graduate Research in Marketing. (1-8 cr [max 16 cr]; Stdnt Opt. Prereq- MBA 6210 or equiv, business admin PhD student or #) Individual research can approach topic appropriate to student’s program and objectives.

Master of Business Taxation (MBT)

Department of Strategic Management and Organization
Curtis L. Carlson School of Management


MBT 5200. Tax Accounting Methods and Periods. (4 cr; A-F or Aud. Prereq-ACCT 5135, MBT student) 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 5223. Tax-exempt Organizations. (2 cr; A-F or Aud. Prereq-ACCT 5135, MBT student) 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 5236. Introduction to Taxation of Business. (2 cr; A-F or Aud. Prereq-ACCT 5135 or Acct 5135) Introduction to income tax laws governing taxation of corporations, partnerships, limited liability companies, limited liability partnerships, and S corporations. Students write research memoranda.


MBT 5326. Mergers and Acquisitions II. (2 cr; A-F or Aud) Current corporate transactions serve as case studies for analyzing tax consequences of various transaction structures. Participants prepare present value models of related tax consequences to corporations/shareholders involved. Use of Section 338(b)(10) for acquisitions of S corporations, international acquisitions.


MBT 5335. Taxation of the Small Business Corporation. (2 cr; A-F or Aud. Prereq-5230, MBT student) 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 cr; A-F or Aud. Prereq-Acct 5135, MBT student) Reviews tax consequences associated with formation, operation, and dissolution of a partnership.


MBT 5351. Wealth Transfer II (Estate Planning). (2 cr; A-F or Aud. Prereq-Acct 5135, MBT student) Topics related to planning transfer of property during lifetime and at death.

MBT 5355. Income Taxation of Fiduciaries. (2 cr; A-F or Aud. Prereq-Acct 5135, MBT student) Simple, complex, and revocable trusts; estates; accumulation distributions, income in respect of decedent; trust accounting income and principal; distributable net income; terminations; and excess distributions.

For definitions of course numbers, symbols, and abbreviations, see page 214.

MBT 5360. State and Local Taxation. (2 cr; A-F or Aud. Prereq-ACCT 5135, MBT student) 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 cr; A-F or Aud) 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 5370. Taxation of Property Transactions. (2 cr; A-F or Aud. Prereq-ACCT 5135, MBT student) 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 gain problems.

MBT 5373. Taxation of Inventories. (2 cr; A-F or Aud. Prereq-ACCT 5135, MBT student) Valuation, charitable contributions of inventory, acquisition of going-business valuation, uniform capitalization requirements, retail inventory method, accounting method changes. As related to LIFO, background, economic considerations, election, conformity, costing, pooling, methods, Inventory Price Index Computations (IPIC).

MBT 5376. Taxation of Financial Instruments. (2 cr; A-F or Aud) How financial products/derivatives are used and the tax consequences that result. Trends/developments.


MBT 5381. Tax Aspects of International Business II. (2 cr; A-F or Aud. Prereq-5380, MBT student) Foreign tax credit, Subpart F planning opportunities, international structuring (joint ventures, use of entity classification regulations). Transfer pricing, foreign currency. Legislative, regulatory, and judicial developments.

MBT 5390. Topics in Taxation. (1-4 cr. max 160 cr; A-F or Aud. Prereq-ACCT 5135, MBT student) Topics vary.

MATS 8204. Computational Methods and Applications to Problems in Materials Science and Engineering. (2 cr; A-F or Aud. Prereq-Grad student, knowledge of programming languages such as Fortran) Implementation of computational methods/applications to numerical problems in materials science and engineering. Emphasizes implementation to applications.

MATS 8211. Physical Chemistry of Polymers. (4 cr; Stdt Opt. +CHEM 8211, CHEM 8211. Prereq-Undergrad physical chem or #) 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 8212. Solid State Reaction Kinetics. (3 cr; Stdt Opt. Prereq-8002) Reactions between ceramic solids in terms of transport mechanisms. Thermodynamics of point defects in binary and ternary ionic solids, diffusion in the bulk and along line and surface defects, chemical and electrochemical potential gradients, reactions at interfaces, physical examples drawn from oxidation and solid/solid reactions of ceramics.


MATS 8215. Electronic Ceramics. (3 cr; A-F or Aud. Prereq-#) Electronic properties of ceramics; electronic and ionic conduction; dielectric behavior; ferroelectric, piezoelectric, pyroelectric, and electroropic properties. Relationships between structure (crystal structure, microstructure) and properties. Introduction to applications (e.g., capacitors, sensors, actuators).

MATS 8216. Contact and Fracture Mechanics. (3 cr; A-F or Aud) Theories of indention contact and fracture resistance emphasizing structure/property relationships. Surfaces, thin film interfaces, coatings, and bulk behavior. Theoretical basis and experimental techniques for measuring mechanical behavior at the nano-scale. Lab exercises.


MATS 8221. Synthetic Polymer Chemistry. (4 cr; A-F or Aud. +CHEM 8221, CHEM 8221. Prereq-Undergrad polymer chemistry course, undergraduate physical chemistry course or #) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

MATS 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

MATS 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

MATS 8666. Doctoral Pre-Thesis Credits. (1-6 cr; max 12 cr) No grade. 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)

MATS 8777. Thesis Credits: Master’s. (1-18 cr; max 18 cr per semester or summer; 10 cr total required [Plan A only])

MATS 8888. Thesis Credit: Doctoral. (1-24 cr; max 100 cr) No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

MATS 8993. Directed Study. (1-12 cr; max 12 cr) Stdt Opt)

MATS 8994. Directed Research. (1-12 cr; max 12 cr) Stdt Opt)

MATS 8995. Special Topics. (1-4 cr; max 4 cr) Stdt Opt)

New or experimental courses offered by department or visiting faculty.

Mathematics (MATH)

School of Mathematics

Institute of Technology

MATH 5067. Actuarial Mathematics I. (4 cr; Stdt Opt. Prereq-4065, one sem [4xxx or 5xxx] [probability or statistics course]) Future lifetime random variable, survival function. Insurance, life annuity, future loss random variables. Net single premium, actuarial present value, net premium, net reserves.


MATH 5075. Mathematics of Options, Futures, and Derivative Securities I. (1 cr; Stdt Opt. Prereq-Two yrs calculus, basic computer skills) 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 cr; A-F or Aud. Prereq-5075) 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 5285H. Honors: Fundamental Structures of Algebra I. (4 cr; Stdt Opt. Prereq-[2243 or 2573 or 2575], [2283 or 2574 or 3283]) 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 cr; Stdt Opt. Prereq-5285) 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 cr; Stdt Opt. Prereq-[2243 or 2573 or 2575], [2283 or 2574 or 3283]) 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 8141. Applied Logic. (3 cr; A-F or Aud) Applications of techniques of mathematical logic to other areas of mathematics and computer science. Sample topics: complexity of computation, computable analysis, unsolvability of diophantine problems, program verification, database theory.

MATH 8142. Applied Logic. (3 cr; A-F or Aud) Applications of techniques of mathematical logic to other areas of mathematics, computer science. Complexity of computation, computable analysis, unsolvability of diophantine problems, program verification, database theory.

MATH 8151. Axiomatic Set Theory. (3 cr; A-F or Aud. Prereq–5165 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 cr; A-F or Aud. Prereq–5151 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 8172. Model Theory. (3 cr; A-F or Aud. Prereq–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 cr; A-F or Aud. Prereq–8172 or #) Types of elements. Prime models, homogeneity, saturation, categoricity in power. Forking.

MATH 8190. Topics in Logic. (1-3 cr [max 12 cr]; A-F or Aud) Offered for one year or one semester as circumstances warrant.

MATH 8201. General Algebra. (3 cr; A-F or Aud. Prereq–4xxx algebra or equiv or #) Groups through Sylow, Jordan-Holder 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 cr; A-F or Aud. Prereq–8201 or #) Classical field theory through Galois theory, including solvable equations. Symmetric, Hermitian, orthogonal, and unitary form. Tensor and exterior algebra. Basic Wedderburn theory of rings; basic representation theory of groups.

MATH 8207. Theory of Modular Forms and L-Functions. (3 cr; A-F or Aud. Prereq–8202 or #) Zeta and L-functions, prime number theorem, Dirichlet's theorem on primes in arithmetic progressions, number formulas; Riemann hypothesis; modular forms and associated L-functions; Eisenstein series; Hecke operators, Poincaré series, Euler products; Ramanujan conjectures; Theta series and quadratic forms; waveforms and L-functions.

MATH 8208. Theory of Modular Forms and L-Functions. (3 cr; A-F or Aud. Prereq–8207 or #) Applications of Eisenstein series: special values and analytic continuation and functional equations of L-functions. Trace formulas. Applications of representation theory. Computations.

MATH 8211. Commutative and Homological Algebra. (3 cr; A-F or Aud. Prereq–8202 or #) Selected topics.

MATH 8212. Commutative and Homological Algebra. (3 cr; A-F or Aud. Prereq–8211 or #) Selected topics.

MATH 8245. Group Theory. (3 cr; A-F or Aud. Prereq–8245 or #) Permutations, Sylow’s theorems, representations of groups on groups, semi-direct products, solvable and nilpotent groups, generalized Fitting subgroups, p-groups, co-variation on p-groups.

MATH 8253. Algebraic Number Theory. (3 cr; A-F or Aud. Prereq–8250 or #) 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. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–Math 8201, Math 8202; offered for one year or one semester as circumstances warrant.)

MATH 8271. Lie Groups and Lie Algebras. (3 cr; A-F or Aud. Prereq–8270 or #) 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 cr; A-F or Aud. Prereq–8271 or #) Solvable and nilpotent Lie algebras and Lie groups; Lie's and Engel's theorems; semisimple Lie algebras; cohomology of Lie algebras; Whitehead's lemma and Levi's theorem; classification of complex semisimple Lie algebras and compact Lie groups; representation theory.

MATH 8280. Topics in Number Theory. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8201 or #) Offered for one year or one semester as circumstances warrant.)

MATH 8300. Topics in Algebra. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–Grad math major or # offered as one yr or one sem cr as circumstances warrant) Selected topics.

MATH 8301. Manifolds and Topology. (3 cr; A-F or Aud. Prereq–[Some point-set topology, algebra] or #) Classification of compact surfaces, fundamental group/covers spaces. Homology group, basic cohomology. Approach to degree of a map, invariance of domain/dimension.


MATH 8306. Algebraic Topology. (3 cr; A-F or Aud. Prereq–8301 or #) Singular homology, cohomology theory with coefficients. Eilenberg-Steenrod axioms, Mayer-Vietoris theorem.

MATH 8307. Algebraic Topology. (3 cr; A-F or Aud. 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 cr; No grade. Prereq–Master's student, adviser and DGS consent)

MATH 8360. Topics in Topology. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8301 or #, offered as one yr or one sem cr as circumstances warrant) Selected topics.

MATH 8365. Riemannian Geometry. (3 cr; A-F or Aud. Prereq–8301 or basic point-set topology or #) Riemannian metrics, curvature. Bianchi identities, Gauss-Bonnet theorem, Meyer's theorem, Cartan-Hadamard theorem.

MATH 8366. Riemannian Geometry. (3 cr; A-F or Aud. Prereq–8365 or #) Gauss, Codazzi equations. Tensor calculus, Hodge theory, spinors, global differential geometry, applications.

MATH 8370. Topics in Differential Geometry. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8301 or 8365; offered for one yr or one sem as circumstances warrant) Current research in Differential Geometry.

MATH 8380. Topics in Advanced Geometry. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8301, 8365) Current research.


MATH 8386. Calculus of Variations and Minimal Surfaces. (3 cr; A-F or Aud. 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.

For definitions of course numbers, symbols, and abbreviations, see page 214.
MATH 8387. Mathematical Modeling of Industrial Problems. (3 cr; A-F or Aud. Prereq–4xxx numerical analysis, some computer experience or #) Mathematical models from physical, biological, social systems. Emphasizes industrial applications. Modeling of deterministic/probabilistic, discrete/continuous processes; methods for analysis/computation.


MATH 8390. Topics in Mathematical Physics. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8601; offered for one yr or one sem as circumstances warrant) Current research.

MATH 8401. Mathematical Modeling and Methods of Applied Mathematics. (3 cr; A-F or Aud. Prereq–4xxx numerical analysis and applied linear algebra or #) Dimension analysis, similarity solutions, linearization, stability theory, design, and characterization of type. Fourier series and integrals, wavelets, Green’s functions, weak solutions and distributions.


MATH 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent) MATH 8445. Numerical Analysis of Differential Equations. (3 cr; A-F or Aud. Prereq–4xxx numerical analysis, 4xxx partial differential equations or #) 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 cr; A-F or Aud. Prereq–8445 or #) 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. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–Grad math major or #; offered as one yr or one sem as circumstances warrant) Selected topics.

MATH 8470. Topics in Mathematical Theory of Continuum Mechanics. (1-3 cr [max 12 cr]; A-F or Aud) Offered for one year or one semester as circumstances warrant.

MATH 8501. Theory of Ordinary Differential Equations. (3 cr; A-F or Aud. Prereq–4xxx ODE or #) 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 8505. Applied Dynamical Systems and Bifurcation Theory I. (3 cr; A-F or Aud. 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 cr; A-F or Aud. Prereq–5527 or #) 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. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8502) Current research.

MATH 8530. Topics in Ordinary Differential Equations. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–8502) Offered for one year or one semester as circumstances warrant.

MATH 8540. Topics in Mathematical Biology. (1-3 cr [max 12 cr]; A-F or Aud) Offered for one year or one semester as circumstances warrant.

MATH 8571. Theory of Evolutionary Equations. (3 cr; A-F or Aud. Prereq–8502 or #) 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 8580. Topics in Evolutionary Equations. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8572 or #; offered for one yr or one sem as circumstances warrant)


MATH 8590. Topics in Partial Differential Equations. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–8602; offered for one yr or one sem as circumstances warrant) Research topics.

MATH 8600. Topics in Advanced Applied Mathematics. (1-3 cr [max 12 cr]; Stdtnt Opt) Offered for one yr or one semester as circumstances warrant. Topics vary. For details, contact instructor.

MATH 8601. Real Analysis. (3 cr; A-F or Aud. Prereq–5616 or #) Set theory/fundamentals. Axiom of choice, measures, measure spaces, Borel/Lebesgue measure, integration, fundamental convergence theorems, Riesz representation.


MATH 8603. Topics in Real Analysis. (3 cr or [max 12 cr]; A-F or Aud. Prereq–8602 or #; offered for one yr or one sem as circumstances warrant) Current research.

MATH 8641. Spatial Ecology. (3 cr; S-N or Aud. Prereq–Two semesters calculus, theoretical population ecology or four semesters more robust calculus, course in statistics or probability or #) Introduction: role of space in population dynamics and interspecific interaction; includes single species and multispecies models, deterministic and stochastic theory, different modeling approaches, effects of implicit/explicit space on competition, pattern formation, stability diversity and invasion. Recent literature. Computer lab.

336 University of Minnesota 2009-10 Graduate School Catalog

MATH 6852. Theory of Probability Including Measure Theory. (3 cr; Stdnt Opt. Prereq–6851 or #) 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 stochastic calculus.


MATH 6855. Stochastic Calculus with Applications. (3 cr; Stdnt Opt. Prereq–8654 or 8659 or #) Stochastic integration with respect to martingales, Ito’s formula, applications to business models, filtering, and stochastic control theory.

MATH 6859. Stochastic Processes. (3 cr; Stdnt Opt. Prereq–8652 or #) In-depth coverage of various stochastic processes and related concepts, such as Markov processes and sequences, renewal sequences, exchangeable sequences, stationary processes, Poisson point processes, Levy processes, interacting particle systems, diffusions, and stochastic integrals.

MATH 6860. Topics in Probability. (1-3 cr [max 12 cr]; Stdnt Opt) Offered for one year or one semester as circumstances warrant.

MATH 6866. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

MATH 6868. Combinatorial Theory. (3 cr; A-F or Aud) 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 6869. Combinatorial Theory. (3 cr; A-F or Aud. Prereq–8668 or #) Further topics in enumeration, including symmetric functions, Schensted correspondence, and standard tableaux; non-enumervative combinatorics, including graph theory and coloring, matching theory, connectivity, flows in networks, codes, and extremal set theory.

MATH 6880. Topics in Combinatorics. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–Grad math major or #; offered as one yr or one sem cr as circumstances warrant) Selected topics.


MATH 8773. Thesis Credits: Master’s. (0-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

MATH 8790. Topics in Complex Analysis. (1-3 cr [max 12 cr]; A-F or Aud. Prereq–8702 or #; offered for one yr or one sem as circumstances warrant) Current research.

MATH 8801. Functional Analysis. (3 cr; A-F or Aud. Prereq–8602 or #) Motivation in terms of specific problems (e.g., Fourier series, eigenfunctions). Theory of compact operators. Basic theory of Banach spaces (Hahn-Banach, open mapping, closed graph theorems). Frechet spaces.

MATH 8802. Functional Analysis. (3 cr; A-F or Aud. Prereq–8801 or #) Spectral theory of operators, theory of distributions (generalized functions), Fourier transformations and applications. Sobolev spaces and pseudo-differential operators. C-star algebras (Gelfand-Naimark theory) and introduction to von Neumann algebras.

MATH 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

MATH 8990. Topics in Mathematics. (1-6 cr [max 24 cr]; S-N or Aud. Prereq–#) Readings, research.

MATH 8991. Independent Study. (1-6 cr [max 24 cr]; S-N or Aud. Prereq–#) Individually directed study.

MATH 8992. Directed Reading. (1-6 cr [max 24 cr]; S-N or Aud. Prereq–#) Individually directed reading.

MATH 8993. Directed Study. (1-6 cr [max 24 cr]; S-N or Aud. Prereq–#) Individually directed study.

MATH 8994. Topics at the IMA. (0-3 cr [max 6 cr]; Stdnt Opt) Current research at IMA.

Mathematics Education (MTHE)
Department of Curriculum and Instruction
College of Education and Human Development

MTHE 5011. Algebraic Structures in School Mathematics. (3 cr; Stdnt Opt. Prereq–Tchg exp or insr consent) 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 cr; Stdnt Opt. Prereq–Enrollment in math initial licensure program) Pedagogy, content, and instructional strategies for teaching school geometry. Content and issues relevant to the geometry curriculum. Instructional materials and technology appropriate for geometry. Each offering will focus on either elementary/middle or middle/secondary grade levels.

MTHE 5100. Topics in Mathematics Education. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq–Ed or grad student) 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 cr; Stdnt Opt. Prereq–Tchg license or student elem ed MEd or special ed or #) Modern trends, methods, and materials used to convey mathematical ideas.

MTHE 5155. Rational Number Concepts and Proportionality. (3 cr; Stdnt Opt. Prereq–Educ student or #) 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. (1-3 cr [max 3 cr]; Stdnt Opt) 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 cr; Stdnt Opt) 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 cr; Stdnt Opt) 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.

For definitions of course numbers, symbols, and abbreviations, see page 214.
Course Descriptions

MTHE 5305. Middle School Mathematics Methods. (2 cr; A-F only. Prereq: Elem ed licensure student) 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 5313. Teaching and Learning Mathematics in the Middle School. (3 cr; Stdnt Opt. Prereq-Tchg exper or #) Mathematics learning, instruction methods, mathematics topics, and assessment procedures appropriate for the middle grades. Examination of newer curricular materials. Illustration of successful instructional techniques. Discussion of the relationship between the nature of the learner and effective instruction.


MTHE 5355. Mathematics for Diverse Learners. (3 cr; Stdnt Opt. Prereq-Teaching license or student in elem ed or special ed or #) 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 cr; Stdnt Opt) Technology—including computers, programmable and graphing calculators, and video—as instructional tools in mathematics: design and evaluation of technology-based mathematics lessons; the effect of technology on the mathematics curriculum; managing the technology-enriched classroom.

MTHE 5696. Student Teaching in Mathematics. (1-8 cr [max 8 cr]; S-N only. Prereq-MEd/initial licensure student or #) Student teaching in secondary school mathematics classes.

MTHE 5993. Directed Studies in Mathematics Education. (2 cr [max 3 cr]; S-N or Aud. Prereq-Math ed MEd student, #) Secondary school classroom teaching project to improve specific teaching skills, planned by student, approved/directed by student’s adviser.

MTHE 8501. Theory and Classical Research in Mathematics Education. (3 cr; Stdnt Opt. Prereq-Grad math educ major) Critical review of research and relevant theoretical formulations; criteria for appraising research methods; educational implications.


MTHE 8591. Seminar: Mathematics Education. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq-Math educ PhD student) Problems of mathematics instruction from kindergarten through junior college; opportunity to develop proposals and design models for empirical research.

MTHE 8995. Problems: Mathematics Education. (1-6 cr [max 12 cr]; Stdnt Opt. Prereq-MA or PhD educ major with math educ concentration) Students survey most recent literature and design and prepare research reports on special topics.

Mechanical Engineering (ME)

Department of Mechanical Engineering

Institute of Technology

ME 5080. Topics in Mechanical Engineering. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq-IT upper div or grad student, submission of permission form, #) Topics vary each semester.

ME 5090. Advanced Engineering Problems. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq-ME upper div, #) Independent research project with faculty adviser in mechanical engineering, typically related to adviser’s research interests. Student contacts adviser to develop project description well before project’s start date.

ME 5091. Vapour Cycle Systems. (4 cr; A-F or Aud. Prereq-IT upper div or grad student) Vapor compression and absorption refrigeration systems; heat pumps; vapor power cycle analysis, regeneration, reheat, compound cycle modifications, combined gas turbines—vapor cycle systems.

ME 5103. Thermal Environmental Engineering. (4 cr; A-F or Aud. Prereq-IT upper div or grad 3322 or 3323) 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 cr; A-F or Aud. Prereq-5103, [IT upper div or grad student]) 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 cr; A-F or Aud. Prereq-IT upper div or grad student) 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 5115. Air Quality and Air Pollution Control. (4 cr; A-F or Aud. Prereq-IT upper div or grad student) Air pollution sources, atmospheric transport, transformations, fate, and emissions control. Air pollution meteorology, dispersion, chemistry of secondary pollutant formation, standards and regulations. Control devices and techniques for gaseous and particulate emissions. Cyclones, electrostatic precipitators, wet and dry scrubbers, combustion modification.

ME 5116. Cleanroom Technology and Particle Monitoring. (4 cr; A-F or Aud. Prereq-IT upper div or grad student) Fundamentals of cleanroom technology for microelectronics manufacturing; airborne and liquidborne 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 5228. Introduction to Finite Element Modeling, Analysis, and Design. (4 cr; A-F or Aud. Prereq-IT upper div or grad 3211, AEM 3031, CSCI 1113, MatS 2001) 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 cr; A-F or Aud. Prereq-IT upper div or grad, 3222, CSCI 1113 or equiv) 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 cr; A-F or Aud. Prereq-IT upper div or grad, 3222 or equiv, basic kinematics and dynamics of machines; knowledge of CAD packages such as Pro-E recommended) Analytical methods of kinematic, dynamic, and kinetoelastodynamic analysis and synthesis of mechanisms. Computerized design for function, path, and motion generation based on Burmeister theory.


ME 5248. Vibration Engineering. (4 cr; Stdnt Opt. Prereq-IT upper div or grad, 3281) 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 5286. Robotics. (4 cr; A-F or Aud, Prereq- [3281 or equiv], [upper div ME or AEM or CSci or grad student])
Manipulator forward/inverse kinematics, homogeneous transformations, coordinate frames, Jacobian/velocity control, task primitives/programming, computational issues for path trajectories. Reaction forces, manipulator dynamics/control. Vehicle kinematics, dynamics, and guidance. Lab project demonstrates concepts.

ME 5312. Solar Thermal Technologies. (4 cr; A-F or Aud. Prereq- [3333, IT upper div] or grad student)

ME 5341. Case Studies in Thermal Engineering and Design. (4 cr; A-F or Aud. Prereq- IT upper div or grad student, 3231, 3322)
Characteristics of applied heat transfer problems: nature of problem specification, incompleteness of needed knowledge base, accuracy issues. Categories of applied heat transfer problems (e.g., materials processing, turbomachinery, cooling of electronic equipment, biomedical thermal therapeutic devices, heat exchangers, HVAC systems).

ME 5344. Thermodynamics of Fluid Flow with Applications. (4 cr; A-F or Aud. Prereq- upper div or grad student, 3231, 3322)

ME 5348. Heat Transfer in Electronic Equipment. (4 cr; Stdt Opt. Prereq- [3333 or 3324], IT upper div or grad student)

ME 5351. Computational Heat Transfer. (4 cr; A-F or Aud. Prereq- IT upper div or grad student, 3322)
Numerical solution of heat conduction and analogous physical processes. Develop and use a computer program to solve complex problems involving steady and unsteady heat conduction, flow and heat transfer in ducts, flow in porous media, and other special applications.

ME 5361. Plasma-Aided Manufacturing. (4 cr; A-F or Aud. EEE 561L. Prereq-Grad or IT upper div, ME 3321, ME 3322 or equiv)
Properties of plasmas as a processing medium, process control and system design considerations using specific examples of plasma spray coating, welding, and microelectronics processing.

ME 5381. Biological Transport Processes. (4 cr; A-F or Aud. BMEN 531, CHEN 5753, Prereq- IT upper div or grad student, ECE 5322 or CHEN 5103 or #)

ME 5446. Introduction to Combustion. (4 cr; A-F or Aud. Prereq-IT upper div or grad student, 3321, 3322)
Thermodynamics, kinetics, energy and mass transport, and pollutants in reacting systems. Reactors, laminar and turbulent flows. Ignition, quenching, and flame structure. Combustion in reciprocating engines, furnaces, and turbines, with emphasis on internal combustion engine performance and emissions.

ME 5461. Internal Combustion Engines. (4 cr; A-F or Aud. Prereq-IT upper div or grad student, 3321, 3322 or better)
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 and complementary labs.

ME 5462. Gas Turbines. (4 cr; A-F or Aud. Prereq-IT upper div or grad student, 3321, 3322)
Gas turbine cycles, regeneration, recuperation, reheating, cooling, combined cycle plants, and thermochemical regeneration. Axial and radial flow compressors and turbines; combustor designs, energy analysis, emissions, and noise. Turbojet, fan, turboprop engine performance. Stationary power plants, vehicular propulsion, hybrid vehicles.

ME 5666. Modern Thermodynamics. (4 cr; A-F only. Prereq-3531 or equiv)
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. Major classes, components, and applications of MEMS. Stability and accuracy of algorithms, convergence issues; linear/nonlinear situations. Implicit, explicit, mixed, and variable time discretization approaches; modal-based methods for engineering problems.

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 5824. Topics in Design. (4 cr; max 12 cr; A-F or Audit)
Topics vary with each offering.

ME 5825. Computational Nanomechanics. (5 cr; Stdt Opt. Prereq-IT grad student)
Fundamentals of mechanical properties in nanometer scale. Role of discrete structure and underlying atomistic, 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 5824. Fundamentals of Microelectromechanical Systems (MEMS). (4 cr; A-F only)
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/ manufacturing of a MEMS device/prototype system.

ME 5826. Topics in Modeling and Analysis of Manufacturing Processes. (4 cr; max 12 cr; A-F or Aud. Prereq-3231, AEM 3016)

ME 5826. Properties and Fabrication of Plastics and Composites. (4 cr; A-F or Aud. Prereq-3231, AEM 3031, MAE 5001)

ME 5828. Advanced Control System Design. (4 cr; A-F or Aud. Prereq-5228)

ME 5828. Control of Nonlinear Systems. (4 cr; A-F or Aud. Prereq-5281)

ME 5828. Topics in Dynamics and Control. (2-4 cr; max 12 cr; A-F or Aud. Prereq-5281)
Topics vary with each offering.

ME 8333. FTE: Master’s. (4 cr; No grade. Prereq-Master’s student, adviser and DGS consent)
ME 8337. Experimental Methods in the Thermal Sciences. (5 cr; A-F or Aud)
Planning experiments. Uncertainty, qualification, visualization, analogies. Temperature, pressure, heat flux, and flow measurements. Signal processing and analysis. Introduction to optical diagnostics.
Course Descriptions

ME 8341. Conduction. (3 cr; A-F or Aud. Prereq-Undergrad class in heat transfer or #)

ME 8342. Convection. (3 cr; A-F or Aud. Prereq-Grad level course on fundamentals of fluid mechanics that has a substantial component on viscous flows or #)

ME 8343. Radiation. (3 cr; A-F or Aud. Prereq-Undergrad class in heat transfer or #)


ME 8361. Molecular Gas Dynamics. (3 cr; A-F or Aud. —AE 8231. Prereq-IT-Grad student)

ME 8362. Introduction to Plasma Technology. (3 cr; A-F or Aud. Prereq-8361)

ME 8381. Bioheat and Mass Transfer. (3 cr; Stdnt Opt. Prereq-IT grad student, upper-division transport/fluids course; [physics, biology] recommended)
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 cr [max 6 cr]; A-F or Aud)
Topics vary according to instructor.

ME 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

ME 8462. Turbomachinery. (3 cr; A-F or Aud. Prereq-IT grad student, 3321, 3322 or equiv or #)
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. (1-6 cr [max 12 cr]; No grade. 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)

ME 8772. Advanced Transportation Technologies Seminar. (1 cr; S-N or Aud. —CE 8215)
Advanced technologies specifically related to transportation. Topics draw from core science/ technology areas of human factors, intelligent vehicles, traffic modeling/management, sensing, communications, and controls.

ME 8773. Graduate Seminar. (1 cr; S-N or Aud. Prereq-IT grad student)
Recent developments.

ME 8774. Graduate Seminar. (1 cr; S-N or Aud. Prereq-8773)
Recent developments.

ME 8775. Technical Communication. (1 cr; S-N or Aud)
One-day workshop on presenting a seminar. Students deliver one-hour seminar on technical topic and attend nine other technical seminars.

ME 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

ME 8794. Mechanical Engineering Research. (1-4 cr [max 10 cr]; Stdnt Opt. Prereq-#)
Directed research.

ME 8800. Modern Developments in Mechanical Engineering. (1 cr [max 2 cr]; S-N or Aud. Prereq-IT grad student)
Seminars on topics in engineering science of importance to mechanical engineers. Invited scholars deliver five-lecture series on each topic; two to five topics each semester.

ME 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

ME 8951. Plan B. (1 cr; S-N or Aud)
Structured environment in which students can complete a M.S. Plan B project.

ME 8953. Plan B. (2 cr; A-F or Aud. Prereq-8951)
Structured environment in which students can complete a M.S. Plan B project.

Medicinal Chemistry (MEDC)

Department of Medicinal Chemistry

College of Pharmacy

MEDC 5185. Principles of Biomolecular Simulation. (3 cr; Stdnt Opt. Prereq-Chem 3502 or #)
Molecular simulation for students in medicinal chemistry, pharmacaceutics, biochemistry, and chemical physics.

MEDC 5202. Research and Development Process of Pharmaceutical Products. (2 cr; S-N or Aud)
New drug development process in the U.S. pharmaceutical industry.

MEDC 5245. Introduction to Drug Design. (3 cr; A-F or Aud. —CHEM 5245, PHAR 6245. Prereq-Chem)
Concepts that govern design/discovery of drugs. Physical, biorganic, medicinal chemical principles applied to explain rational design, mechanism of action of drugs.

MEDC 5294. Advanced Methods in Quantitative Drug Analysis. (3 cr; A-F or Aud. Prereq-#)
Quantitative methods (HPLC, GC, TLC, and immunoassays) for analysis of drugs and metabolites in biological fluids. Advanced techniques such as capillary electrophoresis, supercritical fluid chromatography, GC-MS, LC-MS, and tandem mass spectrometry. Chromatographic theory and statistical approaches to method validation.

MEDC 5495. Viistas in Medicinal Chemistry Research. (1 cr; S-N or Aud)
Selected topics of contemporary interest in medicinal chemistry.

MEDC 5700. General Principles of Medicinal Chemistry. (2 cr; A-F or Aud. Prereq-MEDC grad student or #)
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 cr; A-F or Aud. 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 8100. Medicinal Chemistry Seminar. (1 cr [max 6 cr]; Stdnt Opt. Prereq-Grad Major or #)
Current topics.

MEDC 8353. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

MEDC 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

MEDC 8500. Design of Chemotherapeutic Agents. (2 cr; A-F or Aud. Prereq-5600 or #)
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 cr; A-F or Aud. 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. (1-6 cr [max 12 cr]; No grade. 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)

MEDC 8700. Advanced Concepts in Drug Design. (2 cr; A-F or Aud. —CHEM 8700, PHAR 6247H. Prereq-5600 or #)
Current approaches to rational design of drugs.

MEDC 8760. Design of Peptidomimetics. (2 cr; A-F or Aud. 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. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

MEDC 8800. Medicinal Chemistry Laboratory Techniques. (1-2 cr [max 4 cr]; S-N or Aud. Prereq-Grad med chem major or #)
Experiential rotations in medicinal chemistry research laboratories.

MEDC 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)
MEDC 8900. Research in Medicinal Chemistry. (1-4 cr [max 8 cr]; A-F or Aud. Prereq–Grad med chem major or #) Study and experimental investigation.

Medieval Studies (MEST)
Center for Medieval Studies
College of Liberal Arts
MEST 5610. Advanced Topics in Medieval Studies. (3-4 cr [max 15 cr]; Stdt Opt. Prereq–One yr work in some area of Middle Ages, reading knowledge of appropriate language, #) From late antiquity through end of Middle Ages (circa 300-1500 A.D.). Current topics specified in Class Schedule.

MEST 5993. Directed Studies in Medieval Studies. (1-3 cr [max 6 cr]; Stdt Opt. Prereq–Reading knowledge of appropriate language, #) Directed study with one of the core faculty of medieval studies program.

MEST 6010. Medieval Studies Colloquium. (3 cr [max 9 cr]; Stdt Opt) Lectures by and discussions with faculty and visiting speakers.

MEST 6110. Seminar in Medieval Studies. (5-4 cr [max 48 cr]; A-F or Aud. Prereq–Appropriate languages, #) Offered when feasible.

Microbial Engineering (MICE)
BioTechnology Institute
College of Biological Sciences
MICE 5309. Biocatalysis and Biodegradation. (3 cr; Stdt Opt. +BIOC 5309. Prereq–chemistry through organic chemistry; knowledge of word processing, e-mail, access to World Wide Web, access to college-level science library recommended) Assessing validity of information on biocatalysis and biodegradation; fundamentals of microbial catabolic metabolism as it pertains to biodegradation of environmental pollutants; biocatalysis for specialty chemical synthesis; display of this information on the World Wide Web.

MICE 5355. Advanced Fermentation and Biocatalysis Laboratory. (1 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]], #) 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 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

MICE 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

MICE 8920. Teaching Practicum. (1 cr [max 4 cr]; Stdt Opt. Prereq–Grad MIE major) Supervised experience in classroom, laboratory, and/or recitation instruction; develops skills in effective use of instructional techniques, materials, tests, and measurements.

MICE 8990. Biotechnology Seminar. (1 cr [max 2 cr]; Stdt Opt. Prereq–First-yr students enroll 5-N, as they do not make a presentation; second-yr students enroll A-F, as they present a seminar) Student presentations of thesis research and presentations by invited speakers.

Microbiology (MICB)
Department of Microbiology
Medical School
MICB 5205. Microbiology and Immunology for Medical Students. (7 cr; A-F only. Prereq–MicB 3301, MicB 4131) Basic/clinical human immunology, medical microbiology. Molecular/ cellular basis of immune responses, tolerance. Immunologic disease, serology, antimi crobial agents, chemotherapy. Basic/basic microbiology, parasitology, mycology, virology. Unifying principles governing pathogenesis. Diseases are grouped with organisms important in differential diagnosis.

Microbiology, Immunology, and Cancer Biology (MICA)
Department of Microbiology
Medical School
MICA 5000. Practicum: Teaching. (1 cr [max 4 cr]; A-F or Aud. Prereq.–[MIMP or MICAB] grad major or #) Supervised experience in lab instruction. Use of instructional materials, tests/measurement.

MICA 8002. Structure, Function, and Genetics of Bacteria and Viruses. (4 cr; A-F or Aud. Prereq.–[One undergrad or grad course each in [microbiology, genetics, biochemistry]] or #) Structure, function, and metabolism of microorganisms. Microbial genetics. Molecular virology.

MICA 8003. Immunity and Immunopathology. (4 cr; Stdt Opt. Prereq–Upper level undergrad immunology course or #) Lymphocyte activation, signal transduction in lymphocytes, antigen receptor genetics, antigen presentation, lymphoid anatomy, adaptive immune responses to microbes, immunodeficiency, immunopathology, cytokines, transplantation, autoimmunity.


MICA 8005. Topics in Microbiology, Immunology, and Cancer Biology. (1-4 cr [max 4 cr]; Stdt Opt. Prereq–8001, two of [8002 or 8003 or 8004]) Colloquium format. Readings/discussion on specialized topic.

MICA 8006. Protein Sequence Analysis. (5 cr; Stdt Opt. Prereq–Biochem course, knowledge of UNIX operating system recommended) DNA and protein sequence and protein structure databases; protein sequence analysis; methods for display of sequence comparison and prediction results; Genetics Computer Group (GCG) sequence analysis programs; and current literature and research problems.

MICA 8007. Cell Biology and Biochemistry of the Extracellular Matrix. (3 cr; A-F or Aud. +BIOC 8007. Prereq–8002 or 8004 or #) Concepts in cell adhesion and tissue composition and importance of cell adhesion in tissue function and disease. Topics range from structure/function/assembly of tissue components to cellular adhesion mechanisms.


MICA 8010. Microbial Pathogenesis. (3 cr; A-F or Aud. Prereq–MICA 8003 or #) Colloquium format. In-depth reading, discussion and/or presentation on microbial 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 cr; A-F or Aud. Prereq.–MICA 8003 or #) Colloquium format. Current approaches being used to target protective responses of various mucosal tissues to pathogens, current approaches being used to target protective vaccination to mucosal tissues. Lectures, journal club format.

MICA 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

MICA 8371. Mucosal Immunobiology. (3 cr; A-F or Aud. +CMB 8371, OBIO 8371, BIOC 8001 or #) 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 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

MICA 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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 admited before summer 2007 may register up to four times, up to 60 combined cr)

MICA 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

MICA 8888. Thesis Credits: Doctoral. (1-12 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)
Molecular Cellular Developmental Biology and Genetics (MCDG)

College of Biological Sciences

MCDG 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

MCDG 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

MCDG 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

MCDG 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required (Plan A only))

MCDG 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

MCDG 8900. Student Research Seminar. (1 cr [max 10 cr]; S-N or Aud. Prereq—Grad MCDG or BMBB major %) Presentation/discussion of student thesis research.

MCDG 8910. Journal Presentations. (1 cr [max 2 cr]; S-N or Aud. Prereq—Grad MCDG or BMBB major %) Discussion of original scientific literature.

MCDG 8920. Special Topics. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq—Grad MCDG or BMBB major %) Special Topics Course in the Molecular, Cellular, Developmental Biology and Genetics Program, including Itasca Research.

MCDG 8950. Teaching Practicum. (1 cr [max 2 cr]; S-N or Aud. Prereq—Grad MCDG major %) 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. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq—MCDG grad student or %) Directed Studies.

MCDG 8994. Research. (1-5 cr [max 10 cr]; S-N or Aud. Prereq—MCDG grad student %) Independent research determined by student’s interests, in consultation with faculty mentor.

Museum Studies (MST)

Bell Museum of Natural History

MST 5011. Museum History and Philosophy. (3 cr; A-F or Aud. Prereq—#) Historical and philosophical roots of museum development in Europe and North America from the Renaissance to modern day museums and history centers. Emerging philosophical issues faced by museums today.

MUS 5250. Chorus. (1 cr [max 6 cr]; Stdnt Opt. Prereq-Choral and/or instrumental music background; audition.) University Women’s Chorus, Men’s Chorus, Concert Choir and Choral Union. Choruses participate in a variety of programs exploring both Western and non-Western repertoires from the Middle Ages through the 20th century. Concerts include touring, and collaborative campus and community performances.

MUS 5240. University Singers. (1 cr [max 8 cr]; A-F or Aud. Prereq-audition.) Mixed chorus members 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 cr; A-F or Aud. Prereq-12 cr in MUsA 1304, grad music student) or #) Vocal literature of major/minor composers from 17th century to present. Structure, style, performance practice.

MUS 5242. Vocal Literature II. (3 cr; A-F or Aud. Prereq-12 cr in MUsA 1104 or MUsA 1304, grad music major) or #) Vocal literature of major and minor composers from 17th century to present; structure, style, and performance practice.


MUS 5270. Voice Practicum. (1 cr [max 2 cr]; Stdnt Opt. Prereq-Undergrad sr vocal major or #) Teaching voice class or individual students with peer and faculty feedback. Assist in class voice instruction or teach two students weekly in conjunction with two one-hour observation labs. May be taken for two semesters.

MUS 5271. Diction for Singers I. (2 cr; A-F or Aud. Prereq-12 cr MUsA 1304 or grad music major or #) Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used.

MUS 5272. Diction for Singers II. (2 cr; A-F or Aud. Prereq-12 cr MUsA 1304 or grad music major or #) Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used.

MUS 5275. Vocal Pedagogy I. (3 cr; Stdnt Opt. Prereq-Sr vocal major or #) Advanced study of voice/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 cr; A-F or Aud. Prereq-Sr vocal major or #) History of solo vocal performance; selection and preparation of beginning level solo vocal repertoire; development of vocal performance skills (interpretation, expression, artistic, recital programming, and vocal career counseling.

MUS 5279. Group Voice: Performance/Pedagogy. (2-5 cr; A-F or Aud. Prereq-performance voice track) or #) 2 cr per sem; upper div student or grad student) or #) Foundations/fundamentals of speech/singing. Vocal production, anatomy, physiology, terminology. Application of vocal techniques in learning/performance repertoire. Teaching methods, including voice/motion exercises.


MUS 5336. Jazz Arranging. (3 cr; A-F or Aud. Prereq-3502 or #) Beginning techniques of arranging for jazz combo and ensemble, vocal and instrumental.

MUS 5340. Jazz Ensemble. (1 cr [max 6 cr]; A-F or Aud. Prereq-audition, #) A 20-member performing organization covering significant jazz compositions and arrangements written specifically for this medium.

MUS 5341. Jazz Pedagogy. (2 cr; A-F or Aud. Prereq- #) Teaching methods of vocal and instrumental jazz improvisation, basic arranging techniques, and jazz history; bibliographies and materials.


MUS 5400. University and Campus Bands. (1 cr [max 10 cr]; Stdnt Opt) Lab course.

MUS 5410. University Wind Bands. (1 cr [max 14 cr]; A-F or Aud. Prereq-audition, #) Wind ensemble and symphony bands perform standard and contemporary literature; concerts and tour appearances. Players from all colleges may participate.

MUS 5420. Orchestra. (1 cr [max 8 cr]; A-F or Aud. Prereq-audition, #) Wind ensemble and symphony bands perform standard and contemporary literature; concerts and tour appearances. Players from all colleges may participate.

MUS 5421. Suzuki Violin Pedagogy I. (2 cr; A-F or Aud. Prereq-Violin major or #) Philosophy and teaching techniques of Japanese pedagogue Shinichi Suzuki and their applications in Western culture. Discussion, playing experience, and observation of children’s lessons in the MacPhail Center Suzuki Program.

MUS 5422. Suzuki Violin Pedagogy II. (2 cr; A-F or Aud. Prereq-Suzuki Pedagogy I or #) Philosophy and teaching techniques of Japanese pedagogue Shinichi Suzuki and their applications in Western culture. Discussion, playing experience, and observation of children’s lessons in the MacPhail Center Suzuki Program.

MUS 5423. Suzuki Pedagogy Practicum. (1 cr; A-F or Aud. Prereq-&(5420 or 5422). grad music student) or #, grad consent) Supervised teaching of both individual and group lessons. Instructor provides periodic critiques from observation of live or videotaped lessons.


MUS 5427. Violin Pedagogy I. (2 cr; A-F or Aud. Prereq-Violin or viola major or #) Private teaching of violin students at beginning, intermediate, and advanced levels. Discussion and demonstrations of pedagogical techniques.

MUS 5428. Violin Pedagogy II. (2 cr; A-F or Aud. Prereq-Violin or viola major or #) Private teaching of violin students at beginning, intermediate, and advanced levels. Discussion and demonstrations of pedagogical techniques.

MUS 5430. New Music Ensemble. (1 cr [max 8 cr]; A-F or Aud. Prereq-#) Study/performance of contemporary ensemble (including small chamber orchestra) literature. Historical/theoretical analysis of works performed.

MUS 5440. Chamber Ensemble. (1 cr [max 8 cr]; A-F or Aud. Prereq-audition, #) Performance of chamber music; duos, trios, quartets, quintets, and other ensemble combinations for instruments and/or voices.

MUS 5450. Orchestral Repertoire. (1-5 cr [max 9 cr]; A-F or Aud. Prereq-#) Investigation of practical and performance problems in standard orchestral repertoire with regard to style and interpretation.

MUS 5460. Ensemble for the Performance of Early Music, c900-1750. (1 cr [max 6 cr]; A-F only) Performance of medieval, renaissance, and baroque music (sacred and secular) according to traditions established from c900 to 1750. Ensemble consists of a chamber chorus and consort instruments. Repertoire includes Gregorian chant, masses, motets, chansons, madrigals, and choral/instrumental movements from cantatas, oratorios, passions, all in original languages.

MUS 5461. Guitar Literature I: History and Repertoire before 1900. (2 cr; Stdnt Opt) Early history of classical guitar through its repertoire/composers. Related instruments such as renaissance lute, vihuela, baroque guitar, and baroque lute. Development of modern classical instrument.

MUS 5462. Guitar Literature II: History and Repertoire since 1900. (2 cr; Stdnt Opt) Repertoire/composers, concert/recording artists, and instrumental innovation of Segovia/post-Segovia eras.

MUS 5464. Cello Pedagogy. (2 cr; A-F or Aud) 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 5466. Guitar Pedagogy. (2 cr; A-F or Aud. Prereq-Guitar principal or major or #) Historical survey of methods and etudes from late 18th century to present, reflecting variety of content and approach. Works by Aguado, Sor, Giuliani, Tarrega, Segovia, Carlevaro, Duncan, Izraels, Dodgson, and Brindle.

MUS 5471. Woodwind Literature and Pedagogy I. (1 cr; A-F or Aud. Prereq-Music major or #) A study of the major teaching materials for the woodwind instruments including methods, duets, and solos used primarily for pedagogical reasons.

MUS 5472. Woodwind Literature and Pedagogy II. (1 cr; A-F or Aud. Prereq-audition, #) A study of chamber music involving one or more woodwind instruments. May include additional instruments such as piano, strings, and/or voice.
**Course Descriptions**

**MUS 5473.** History and Acoustics of Single Reed Instruments. (2 cr; A-F or Aud. Prereq—Music major or A-F cr in music or #) Study of clarinet and saxophone history and literature, mechanical design and development, acoustics, modern schools of performance, selected teaching and performance techniques.

**MUS 5480.** University Brass Choir. (1 cr [max 8 cr]; Stdnt Opt. Prereq—audition, #) 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 concert halls.

**MUS 5481.** Trumpet Pedagogy. (2 cr; Stdnt Opt. Prereq—Sr or grad in music or #) Principles of trumpet pedagogy. Discussion of literature, history, and current teaching aids.

**MUS 5485.** Transcription for Winds. (2 cr; Stdnt Opt. Prereq—5502 or #) Principles of transcription with score and parts. Smaller projects that involve arrangements and original compositions.

**MUS 5490.** Percussion Ensemble. (1 cr [max 10 cr]; A-F or Aud. Prereq—#) 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 5491.** Percussion Literature I. (2 cr; A-F or Aud. Prereq—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 5541.** 16th-Century Counterpoint. (3 cr; A-F or Aud. Prereq—5501, 5502 or pass basic skills exam) Polyphonic counterpart in modal style of Renaissance. Writing exercises in species counterpoint and in two-, three- and four-part. Cantus firmus techniques, mixed values, invertible counterpart, canon. Representative works by Josquin, Lassus, Palestrina, Victoria, and others. Renaissance treatises by Artusi, Banchieri, Duruta, Morley, Zarlino, and others.

**MUS 5550.** Class Composition. (2 cr [max 8 cr]; A-F or Aud. Prereq—5502 or #) 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 cr; A-F or Aud. Prereq—5502) 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 cr; A-F or Aud. Prereq—5561) 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 cr; A-F or Aud. Prereq—5502) Theory/analysis of tonal music using principles developed by Heinrich Schenker. Basic concepts, notation, their application to excerpts/short pieces from 18th/19th centuries.

**MUS 5573.** Analysis of Late-Romantic Orchestral Literature. (3 cr; A-F or Aud. Prereq—5502 or Theory IV Exam or # 5504 or equiv recommended) Introduction to advanced tonal analysis. Corpus of dramatic orchestral music by Wagner, Strauss, Tchaikovsky, Rimsky-Korsakov, Moussorgsky, and Rachmaninoff as focus for projects and classroom discussions related to chromatic harmony, form, and orchestration.


**MUS 5592.** Computer Music II: Interactive Techniques and Theory. (3 cr; A-F or Aud. Prereq—5591 or #) Topics such as filtering, formant synthesis, reverberation techniques, and additive synthesis. Work with interactive MIDI applications.

**MUS 5597.** Music and Text. (3 cr; A-F or Aud. Prereq—5502) Designed for music majors only, this course gives an introduction to the analysis of music with texts such as art song and opera.

**MUS 5611.** Resources for Music Research. (3 cr; A-F or Aud. Prereq—5503) 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 5610.** Topics in Opera History. (3 cr [max 6 cr]; A-F or Aud. Prereq—grad music major or #) Study of specific operas. Development of opera in context of other artistic, social, cultural, and political events, movements, and changes. Periods/countries vary each semester.

**MUS 5621.** Baroque Music and Its Contexts. (3 cr; A-F or Aud. Prereq—Grad music major or #) 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 cr; A-F or Aud. Prereq—Grad music major or #) 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.

**MUS 5647.** 20th-Century European/American Music. (3 cr; Stdnt Opt. Prereq—5602 or equiv, 5501 or equiv, 12 undergraduate cr in music history) Emphasizes major artistic movements, stylish 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 cr; A-F or Aud. Prereq—5603, 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 5666.** Stravinsky. (3 cr; A-F or Aud. Prereq—5502, 12 cr music history) Analysis and criticism of representative works; aesthetic concerns as expressed in writings of Stravinsky and others; influence upon European and American composers; biographical issues and contributions to artistic life, particularly the ballet.

**MUS 5668.** Beethoven's Symphonies. (3 cr; A-F or Aud. Prereq—5603, #) 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 5804.** Folk and Traditional Musics: Selected Cultures of the World. (3 cr; A-F or Aud. Prereq—1801 or 1802 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. (1-4 cr [max 15 cr]; Stdnt Opt) Each offering focuses on a single topic. Topics specified in Class Schedule.

**MUS 5993.** Directed Studies. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq—#, @) Guided individual reading or study.

**MUS 8110.** Sonata Seminar. (2 cr [max 8 cr]; A-F or Aud. Prereq—Grad student in accompanying/conducting) Reducing orchestra scores, representing orchestral reductions at piano, working with conductors. Conductors join course in mid-semester.

**MUS 8131.** Advanced Keyboard Skills. (2 cr; A-F or Aud. 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 cr; A-F or Aud. 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 accomplishment skills at harpsichord/organ.

**MUS 8151.** Seminar in Organ Repertoire. (3 cr; A-F or Aud. Prereq—Grad student in music or #) 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 cr [max 8 cr]; A-F or Aud. Prereq—[French, German, Italian diction], accompanying or DMA voice emphasis or MM voice emphasis by audition) Advanced performance (Lieder, melodie, opera) emphasizing coaching techniques and performance skills of pianists and singers.

**MUS 8171.** Song Repertoire and Performance for Pianists and Singers: German Lieder. (2 cr; A-F or Aud. Prereq—[Grad student with major in vocal performance or in accompanying or in piano], #) Surveys standard German-language song repertoire: Mozart, Schubert, Schumann, Brahms, Strauss, Wolf.
MUS 8172. Song Repertoire and Performance for Pianists and Singers: French Melodies. (2 cr; A-F or Aud. Prereq.—Grad student with major in vocal performance or in accompanying or in piano) # Surveys standard French melodies: Faure, Chausson, Duparc, Debussy, Ravel, Poulenc, Caplet, Roussel, Satie.

MUS 8173. Song Repertoire and Performance for Pianists and Singers (20th and 21st Centuries). (2 cr; A-F or Aud. Prereq.—Grad student, [major in vocal performance or accompanying or in piano], # Surveys standard English songs from Elizabethan Age to present, Italian songs, “bel canto” tradition.

MUS 8175. Song Repertoire and Performance for Pianists and Singers: Russian, Spanish, and other languages. (2 cr; A-F or Aud. Prereq.—Grad student with major in vocal performance or in accompanying or in piano) # Surveys standard songs in Russian, Spanish, and other languages: Turina, Obra, Granados, Nino, Rodrigo, Montsalvatge, Guinot, Tchaikovsky, Rachmaninoff, Prokofiev, Stravinsky, Shostakovich. International Phonetic Alphabet.

MUS 8181. Operatic Accompaniment Skills and Repertoire. (2 cr; A-F or Aud. Prereq.—Grad student with major in accompanying or in conducting) Development of skills required in operatic accompaniment, 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 cr; A-F only. Prereq.—Grad student in music or #) Opera history 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 cr; A-F only. Prereq.—Grad student in music or #) Opera history 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. Song Study: Choral. (3 cr; A-F or Aud. Prereq.—#) Analysis of various choral scores ranging from Renaissance through 20th century. Reading of choral and choral/orchestral scores at piano, including scores with C clef and transposing instrument.

MUS 8255. Choral Literature: Baroque Era to the Present. (3 cr; A-F or Aud. Prereq.—#) Survey of sacred and secular choral works.

MUS 8299. Performance in Choral Conducting. (3 cr; A-F or Aud. Prereq.—#) Preparation and performance of choral conducting recital, with supporting paper.

MUS 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

MUS 8424. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

MUS 8450. Graduate Seminar in Conducting. (3 cr [max 32 cr]; A-F or Aud. Prereq—Grad student in conducting or #) 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 8471. Wind Ensemble/Band Conducting I. (4 cr; A-F or Aud. Prereq.—Wind conducting emphasis or #) Seminar in wind band repertory of 18th, 19th, and 20th centuries emphasizing stylistic and period practices; techniques of score study, analysis, and interpretation. Practical conducting experience.

MUS 8472. Wind Ensemble/Band Conducting II. (4 cr; A-F or Aud. Prereq.—Wind conducting emphasis or #) Seminar in study of music for small wind ensembles and Harmoniemusik tradition; rehearsal techniques and strategies. Music since 1990; contemporary notation systems; rehearsal techniques and strategies. Practical conducting experience.


MUS 8480. Orchestral Conducting. (4 cr [max 16 cr]; A-F or Aud. Prereq.—#) Seminar in orchestral conducting techniques, including work with diverse orchestral, operatic, choral, and dance repertoires of differing styles and periods; 17th century to present.

MUS 8489. Performance and Document: Orchestral Conducting. (3 cr; A-F or Aud. Prereq.—#) Preparing and performing full orchestral conducting program with supporting document.

MUS 8490. Choral Conducting. (4-12 cr [max 12 cr]; A-F or Aud. Prereq.—#) Prepare students for careers in conducting. Students study musical scores and conducting/rehearsal techniques.

MUS 8501. Music Theory Pedagogy. (3 cr; A-F or Aud. Prereq.—Grad student in music or #) Comprehension of pedagogical philosophies/methods in music theory. Pedagogical literature, practice teaching, curriculum design.

MUS 8550. Composition. (3 cr [max 12 cr]; A-F or Aud. Prereq.—#) Creation of original musical works in various instrumental and vocal forms; advanced development of writing and realization of musical ideas.

MUS 8560. Readings in Music Theory. (3 cr [max 12 cr]; A-F or Aud. Prereq.—#) 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 cr [max 4 cr]; A-F or Aud. Prereq.—Composition emphasis or #) Aesthetic and professional issues in composition. Survey of professional activities, including résumé and grant writing and concert production.

MUS 8571. Composers’ Laboratory. (3 cr [max 12 cr]; A-F or Aud. Prereq.—#) Preparing original music composition to specification for possible radio/TV/theater/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 cr [max 12 cr]; A-F or Aud. Prereq.—#) Seminar. Sample topics: string quartets of Beethoven, chamber music of Brahms, significant works by tonal composers.

MUS 8581. Schenkerian Theory and Analysis I. (3 cr; A-F or Aud. 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 notation modeled after presentation in Schenker’s [Counterpoint].

MUS 8582. Schenkerian Theory and Analysis II. (3 cr; A-F or Aud. Prereq.—#) 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 cr; A-F only. Prereq.—[3502, 3512] or equiv placement examl, #; grad-level Schenkerian analysis recommended) 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 cr [max 12 cr]; A-F or Aud. Prereq.—Grad music major, #) Seminar explores literatures of 20th-century art music.

MUS 8631. Seminar: Music in Medieval Europe. (3 cr; A-F; Aud. Prereq.—Undergrad music degree) 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 cr; A-F; Aud. Prereq.—Undergrad music degree) 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 cr [max 12 cr]; A-F or Aud. Prereq.—Musicology or theory emphasis or #) Topics vary, readings, research, strategies, and methods.

MUS 8644. Seminar: Advanced Research in Historical Musicology. (3 cr; A-F or Aud. Prereq.—Undergrad music degree) 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 8645. Current Musicology: Readings. (3 cr; A-F or Aud. Prereq.—Musicology or theory emphasis or #) Readings and topics in recent scholarly and analytical work.
MUS 8524. Accompanying/Coaching: Beyond Requirement.
MUSA 8501 through MUSA 8524 are private instruction. The prerequisites are (2-4 cr [max 8 cr]; A-F or Aud. Prereq–#).

MUSA 8501. Piano: Beyond Requirement.
MUSA 8502. Harpsichord: Beyond Requirement.
MUSA 8503. Organ: Beyond Requirement.
MUSA 8504. Voice: Beyond Requirement.
MUSA 8506. Viola: Beyond Requirement.
MUSA 8507. Cello: Beyond Requirement.
MUSA 8508. Double Bass: Beyond Requirement.
MUSA 8509. Flute: Beyond Requirement.
MUSA 8511. Oboe: Beyond Requirement.
MUSA 8512. Clarinet: Beyond Requirement.
MUSA 8513. Saxophone: Beyond Requirement.
MUSA 8514. Bassoon: Beyond Requirement.
MUSA 8516. Trumpet: Beyond Requirement.
MUSA 8517. Trombone: Beyond Requirement.
MUSA 8518. Euphonium: Beyond Requirement.
MUSA 8519. Tuba: Beyond Requirement.
MUSA 8520. Percussion: Beyond Requirement.
MUSA 8521. Harp: Beyond Requirement.
MUSA 8522. Guitar: Beyond Requirement.

Music Education (MUED)

School of Music


MUED 5211. Foundations of Music Education. (3 cr; A-F or Aud) An overview of the historical, philosophical, and psychological foundations of music education.

MUED 5313. Youth Music: Preferences, Influences, and Uses. (3 cr; A-F or Aud. Prereq–Grad student in music or music education or %) Youth music preferences and their determinants. How music influences youth behavior. Students/teachers’ uses of commercial styles.

MUED 5350. Student Teaching in Classroom Music. (4-8 cr [max 8 cr]; A-F or Aud. Prereq–Music ed major, %) 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 5433. Techniques and Materials: Choral Ensembles. (2 cr; A-F or Aud. Prereq–Music or music ed major or %) Research and literature on vocal and choral music education; choral curriculum issues; repertoire selection; rehearsal techniques.
MUED 5450. Student Teaching in Vocal Music. (4-8 cr; max 8 cr; A-F or Aud. Prereq—Music ed major, #) 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. (4-8 cr; max 8 cr; A-F or Aud. Prereq—Music ed major, #) Supervised teaching and observing of instrumental music in elementary, junior high, and senior high schools. Weekly seminar emphasizing classroom management, curriculum development, and administration of music programs.

MUED 5611. Teaching Music with Related Arts. (2 cr; A-F or Aud) Methods and materials for teaching music in cultural context including other art forms.

MUED 5631. African Performing Arts in Education. (3 cr; A-F only. Prereq—Grad student in [music or other arts or education] or #) 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 cr; A-F or Aud) Contemporary approaches for teaching percussion in the schools; development of curricular materials and practice in performance techniques.

MUED 5650. Student Teaching Seminar. (2 cr; A-F or Aud. Prereq—At least C- in all required [music, music education, professional education] courses) Reflective practice during student teaching. Developing materials for professional employment (e.g., resume, portfolio).

MUED 5664. Teaching Music with Technology. (5 cr; A-F or Aud) Home page development techniques, software/materials, audio/video utilities, research applications.

MUED 5669. Psychology of Music. (3 cr; A-F or Aud. Prereq—Psy 1001 or Psy 3604 or #) 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. (1-4 cr [max 16 cr]; A-F or Aud. Prereq—Grad student in [music education/therapy or education] or #) Focuses on single topic, specified in Class Schedule.

MUED 5800. Group Music Leadership Skills. (3 cr; A-F or Aud. Prereq—[[Completion of MUS 1151, MUS 1152] or MUS 1155], music therapy major) or #) 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 Management in Music Settings. (4 cr; A-F only. Prereq—[MUS 5005] or #) 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 5805. Music Therapy Methods and Procedures II. (4 cr; A-F only. Prereq—[MUS 5004] or #) 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. (5 cr; A-F or Aud. Prereq—[MUS 5005] or #) 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. (4 cr; A-F only. Prereq—Grad music therapy student or #) 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. (5 cr; A-F only. Prereq—Grad music therapy major or #) 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. (0-13 cr [max 13 cr]; S-N or Aud. Prereq—Music Therapy major, #) Six-month resident internship in music therapy at an affiliated, approved hospital or clinic.

MUED 5991. Independent Study. (1-4 cr [max 8 cr]; A-F or Aud. Prereq—Music ed or music therapy major or grad, %, **) Independent study project organized by the student in consultation with the appropriate instructor.

MUED 8112. Introduction to Research Methods and Design in Arts Education. (3 cr; A-F or Aud. Prereq—Grad student in [music or music education], %) Methods and research designs employed in investigating education issues in the arts. Reporting results. Proposal development. Bibliographic skills for conducting a review of related research literature. Common analytical techniques.

MUED 8115. Assessment in Arts Education. (3 cr; A-F or Aud. Prereq—Grad student in [music or music education], %) Methods for assessing unique challenges in artistic achievement: performances, products, and other artistic achievements. Assessment design. Interpretation for large-/small-scale assessments in performance, classroom, and clinical settings.

MUED 8118. Qualitative Research in Arts Education. (3 cr; A-F or Aud. Prereq—Grad student in [arts or education], %) A theoretical, practical and systematic approach to qualitative research in arts education. Students participate in a joint field exploration or work in a setting relevant to their long-term research interests.

MUED 8119. Advanced Applications of Research Methods. (3 cr; A-F only. Prereq—Grad music education student or #) Application of research methods/design. Emphasizes both quantitative and qualitative methods. Contemporary procedures/theories of data collection, management, analysis, and interpretation.

MUED 8211. Foundations of Music Education. (3 cr; A-F or Aud. Prereq—Grad student in [music or music education] or #) Major historical, philosophical, sociological, and psychological foundations of music education. Primary literature in the field. Role and current state of music education.

MUED 8280. Seminar: Current Trends in Music Education. (5 cr [max 30 cr]; A-F only. Prereq—%) Current issues/trends in music education: philosophical, historical, psychological, and pedagogical. Course’s focus varies, reflecting the dynamic nature of the field.


MUED 8282. Seminar: Historical Issues. (3 cr; A-F or Aud. Prereq—Doctoral student in music or music education or #) Issues in historical foundations of music education.

MUED 8283. Seminar: Psychological Issues. (3 cr; A-F or Aud. Prereq—Doctoral student in music or music education or #) Issues in psychological foundations of music education.

MUED 8284. Seminar: Research and Scholarly Issues. (3 cr; A-F or Aud. Prereq—Doctoral student in music or music education or #) 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 cr; No grade. Prereq—Master’s student, adviser and DGS consent)


MUED 8900. Seminar: Music Education Doctoral Seminar. (1 cr [max 8 cr]; A-F only. Prereq—%) 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. (1-8 cr [max 8 cr]; A-F or Aud. Prereq—%)
Course Descriptions

Nanoparticle Science and Engineering (NPSE)
Institute of Technology
NPSE 8001. Introduction to Nanoparticle Science and Engineering. (3 cr; A-F or Aud)
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 characteristic methods for nanoparticles, to novel nanoparticle-based materials and devices.

NPSE 8002. Nanoparticle Science and Engineering Laboratory. (3 cr; A-F or Aud. Prereq-8001, IT grad student or #)
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 cr; S-N or Aud. Prereq-IT grad student or #)
Broad overview of current research in nanoparticle science and engineering. Topics include areas of nanoparticle synthesis, nanoparticles characterization, nanoparticle-based materials and devices, environmental impact of nanoparticles, and instrumentation for nanoparticle research. Speakers from the University of Minnesota as well as external experts.

Natural Resources Science and Management (NR)
Department of Forest Resources
College of Food, Agricultural and Natural Resource Sciences
NR 8333. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)
NR 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)
NR 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)
NR 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])
NR 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

Neuroscience (NSC)
Medical School
NSC 5031W. Perception. (3 cr; Stndt Opt. +PSY 5031W. Prereq-Psy 5031 or Psy 5031 or #)
Computational, cognitive, 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 cr; Stndt Opt. +PSY 5037. Prereq-Psy 5031 or #)
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 5201. Computational Neuroscience I: Membranes and Channels. (3 cr; Stndt Opt. +PHSL 5201. Prereq-calculus through differential equations)
Comprehensive examination of membrane and ion channels using UNIX workstations to simulate their properties. Hodgkin-Huxley model, nonlinear dynamic systems, voltage- and ligand-gated ion channels, impulse propagation.

NSC 5202. Theoretical Neuroscience: Systems and Information Processing. (3 cr; Stndt Opt. Prereq-5201, 5102W recommended)

NSC 5461. Cellular and Molecular Neuroscience. (4 cr; A-F or Aud. Prereq-NSC grad student or #)
Lectures by team of faculty, problem sets in important physiological concepts, discussion of original research papers.

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 cr; A-F or Aud. +ENT 5481)
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. Advanced Survey of Biomedical Neurosciences. (2 cr; Stndt Opt. Prereq-#; intended for members of biomedical community or students with advanced scientific backgrounds)
Current topics in biomedical neuroscience, accompanied by supporting, fundamental concepts. Intensive, one week course.

NSC 5551. Itasca Cell and Molecular Neurobiology Laboratory. (4 cr; S-N or Aud. Prereq-Neuroscience grad student or #)
Intensive lab introduction to cellular and molecular aspects of research techniques in contemporary neurobiology; held at Itasca Biological Station. Electrophysiological investigations of neuronal properties, neurobiological assays of transmitter action, and immunohistochemical studies in experimental preparations.

NSC 5561. Systems Neuroscience. (4 cr; A-F or Aud. Prereq-NSC grad student or #)

NSC 5561. Behavioral Neuroscience. (3 cr; A-F or Aud. Prereq-Grad NSC major or grad NSC minor or #)
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 in Disease. (2-3 cr [max 3 cr]; Stndt Opt. +NSU 5667. Prereq-#)
Basic clinical/pathological features, pathogenic mechanisms. Weekly seminar course.

NSC 5668. Neurodegeneration and Repair. (2 cr; Stndt Opt. Prereq-#)
Pathogenic mechanisms of neuronal death, neurodegenerative disease, neuronal repair. Weekly seminar course.

NSC 8026. Neuro-Immune Interactions. (3 cr; Stndt Opt. +CMB 8561, PHCL 8026, PSY 8026. Prereq-5561, McIB 4131)
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 8021. Cognitive Neuroscience. (4 cr; A-F only +CGSS 8041. Prereq-#)

NSC 8207. Seminar: Psychopharmacology. (1-3 cr [max 12 cr]; Stndt Opt. +PHCL 8207, PSY 8070. Prereq-#)
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 8211. Developmental Neurobiology. (3 cr; A-F or Aud. Prereq-Neuroscience grad student or #)
How neuronal types develop. Emphasizes general mechanisms. Experimental data demonstrating mechanisms.

NSC 8216. Selected Topics in Autonomic and Neuroendocrine Regulation. (1 cr; S-N or Aud. +PHSL 8216. Prereq-#)
Advanced seminar. Course is offered fall and spring semesters.

NSC 8217. Systems and Computational Neuroscience. (2 cr; S-N or Aud. Prereq-5561 or #)
Advanced seminar.

NSC 8221. Neurobiology of Pain and Analgesia. (3 cr; Stndt Opt. Prereq-#)
Pain and analgesia. Course is triennial.

NSC 8222. Central Regulation of Autonomic Function. (3 cr; A-F or Aud. +PHSL 8222. Prereq-5561)
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 cr; Stndt Opt. +OTOL 8247)
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.
Neuroscience Department (NSC)

Neuroscience Department (NSCI)

Department of Neuroscience

Medical School

NSC 5101. Introduction to Neuroscience for Graduate Students. (3 cr; A-F or Aud. Prereq- BioC 6301 or BioC 5331; 4 cr, A-F or Aud. Prereq- BioC 5301 or BioC 4331), %: intended for graduate students outside neuroscience program who require comprehensive intro to neuroscience.

NSC 5110. Dental Neuroscience for Graduate Students. (2 cr; A-F or Aud. Prereq- BioC 5201, BioC 5202, BioC 4204; *: intended for grad students who require a comprehensive grad-level neuroscience course)

NSC 5111. Medical Neuroscience for Graduate Students. (5 cr; A-F or Aud. Prereq- BioC 5201; BioC 5202, BioC 5203, BioC 4204; *: intended for grad students who require a comprehensive medical neuroscience course)

NSC 5540. Advanced Survey of Biomedical Neuroscience. (2 cr; Stdnt Opt. Prereq- #: intended for members of biomedical community or students with advanced scientific backgrounds)

Current topics in biomedical neuroscience. Supporting, fundamental concepts. Intensive, one week course.

NSC 5913. BrainU 101: Neuroscience in the Classroom. (3 cr; A-F or Aud. Prereq- [Elementary or middle school or high school or preservice] teacher, #: application)

Two-week summer workshop. Week one focuses on training teachers in neuroscience through lectures, activities, and discussion sessions. Week two focuses on designing inquiry-based classroom investigations based on neuroeducation science given during week one. Follow-up activities held during the academic year include BrainU staff/faculty classroom presentations and use of training materials.

NSC 5914. BrainU 201: Neuroscience in the Classroom. (3 cr; A-F or Aud. Prereq- [BioC 5100], #: application)

One-week summer workshop. Focuses on critiquing previously implemented neuroscience class activities, developing assessment tools, learning peer mentoring, and expanding neuroscience content knowledge.

Follow-up activities held during academic year include BrainU staff/faculty classroom presentations, use of training materials, and peer mentoring sessions.

NSC 5915. BrainU 203: Neuroscience in the Classroom. (2 cr; A-F or Aud. Prereq- [BioC 5100], 5914, #: application)

Focuses on critiquing previously implemented neuroscience class activities and assessment tools, and expanding neuroscience content knowledge. Follow-up activities held during academic year include BrainU staff/faculty classroom presentations, use of training materials and implementation of neuroscience investigations.

NSC 5916. BrainU 101: Neuroscience in the Classroom. (3 cr; A-F or Aud. Prereq- #: intended for high school teachers)

Four-week summer workshop. Focuses on concepts in neuroscience, Neurobiology of learning. Effects of drugs. Lectures, activities, discussion, designing investigations. In 2009-10, held in Winona. In 2010-11, held in Duluth.

BrainU staff/faculty classroom presentations, use of training materials, and peer mentoring sessions.

NURS 5030. Clinical Foundations. (7 cr; A-F or Aud. Prereq- Admission to postbaccalaureate certificate nursing program)


NURS 5031. Human Response to Health and Illness: Adults and Elders. (6 cr; A-F or Aud. Prereq- Professional master of nursing [MN] student)

Individual responses to health/illness, in context of families/environments. Clinical component emphasizes application of nursing process in adult/elderly populations.


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 cr; A-F or Aud. Prereq- Nursing postbaccalaureate certificate prog)

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. Clinical Seminar: Nursing Care of Clients With Complex Health Conditions. (2 cr; A-F or Aud. Prereq- Nursing postbaccalaureate certificate prog)

Exemplar cases from students. clinical settings used as basis for development of clinical decision-making. Critical analysis of current/emergent nursing care issues associated with caring for complex/diverse populations.

NURS 5035. Practical Nursing Care for Complex Health Conditions. (4 cr; A-F or Aud. Prereq- Nursing postbaccalaureate certificate prog or master of nursing program)

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 cr; Stdnt Opt. Prereq- Grad student or sr Nursing Honor student or upper div Honors or #: Global health issues from interdisciplinary perspective. Emphasizes ethnical/cultural sensitivity/complexities. Students propose realistic actions that could be taken to resolve these issues.

NURS 5113. Web-based Teaching and Learning Strategies. (2 cr; S-N or Aud)

Skills necessary to design, produce, implement, and evaluate effective technology enhanced learning environments. Pedagogical/technological issues surrounding teaching with technology.
Course Descriptions

NURS 5115. Interprofessional Health Care Informatics. (3 cr; A-F or Aud) 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 5411. Ethical Issues in Health Care of Elders. (3 cr; Stdt Opt. Prereq-Grad student or nursing sr or #) Health care related ethical issues that confront elders, their families, health care providers, and society.

NURS 5710. Research Topics. (1-16 cr [max 16 cr]; Stdt Opt. +PUBH 6770) Exploration of research topic to meet individual student needs.

NURS 5712. Decision Making in Health Care. (2 cr; Stdt Opt. Prereq-Grad student or #) Selected classical conceptual models of decision making, their particular perspectives/limitations/ usefulness for decision making about health care issues. Models/components used to assess, evaluate, test, or help healthy people, patients, families, health care professionals, or policy making groups in making health care decisions.

NURS 5813. Scholarly Leadership. (1 cr; S-N or Aud; Prereq-Advanced doctoral nursing student, #) Implications of dissertation research on advancing science, clinical practice, and leadership in nursing and health care. Principles of scholarly collaboration.

NURS 5200. Holistic Health Assessment and Therapeutics for Advanced Practice Nurses. (3 cr; Stdt Opt. Prereq-Nursing grad student or professional master of nursing [MN] student) Health assessment knowledge skills for advanced practice nursing practice with patients across age span, including pregnancy. Selected nursing interventions, complementary therapies for application to specific populations/illnesses.

NURS 5202. Introduction to Complementary Healing Practices. (3 cr; Stdt Opt) Historical and cultural context of the allopathic and complementary healing traditions. Philosophies and paradigms of selected complementary therapies and culturally based healing traditions; descriptions of selected interventions.


NURS 5221. Refugee Health: Trauma, Stress, and Coping. (5 cr; Stdt Opt. Prereq-Grad student or #) 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 5223. Assessment of Psychopathology for Advanced Practice Psychiatric/Mental Health Nursing. (4 cr; Stdt Opt. Prereq-Nurs grad or #) Advanced concepts from nursing theory and research, social sciences, neuropsychology, and neurophysiology used 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 for Advanced Practice Psychiatric/Mental Health Nursing. (3 cr; Stdt Opt. Prereq-Grad student or RN [with master’s degree] or #) Program of study in psychiatric nursing with an emphasis on psychopharmacology.

NURS 5500. Nursing Topics. (1-4 cr [max 8 cr]; Stdt Opt. Prereq- #) 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 5501. Sociopolitical Context of Women’s Health. (1-2 cr [max 3 cr]; S-N or Aud. Prereq-Grad student) Women’s health issues from multidisciplinary perspective. Sexual/reproductive health issues across life span. Sociocultural issues affecting health, such as poverty/nutrition.

NURS 5604. Advanced Health Assessment and Interventions with Adolescents. (2 cr; Stdt Opt. Prereq-CPsy 5303 or equiv or #) Advanced assessment and intervention strategies for clinical practice with adolescents.


NURS 5602. Spirituality and Nursing Practice. (3 cr; Stdt Opt. Prereq-For undergrad cr: nurs sr or RN; for grad cr: nurs grad student or #) Exploration of the concept of spirituality as integral to the whole person. Discussion of spiritual nursing care interventions.

NURS 5603. Transcultural Nursing: Theories and Issues. (2 cr; Stdt Opt. Prereq- Cultural anth course or #) Study of cultural factors that influence theories, issues, and nursing care practices in diverse cultures and subcultures. Emphasis on nursing within international systems of health care and nursing practices related to various health-illness systems in this country and worldwide.

NURS 5605. The ‘M’ Technique. (1 cr; S-N or Aud. Prereq-Undergrad nursing student or grad student in health sciences or health professional) Scientific/theoretical foundations/practice of ‘m’ technique, a touch therapy for promoting relaxation by topically administering essential oils. Appropriate applications. Demonstration/practice of technique. Interdisciplinary course.


NURS 5608. American Indian Health and Health Care. (2 cr; Stdt Opt. Prereq-Upper div or grad student or #) 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 5830. Advanced Clinical Nursing. (1-6 cr [max 6 cr]; Stdt Opt. Prereq-Grad nursing major, #) Independent study or faculty seminar on special clinical topic.
NURS 5900. Introduction to Principles and Practice of Anesthesia. (6 cr; A-F or Aud. Prereq–Grad student in nurse anesthesia) Administration of anesthesia. Application in operating room setting under one-to-one guidance of Certified Registered Nurse Anesthetist (CRNA).

NURS 5901. Basic Principles and Practice of Nurse Anesthesia. (2 cr; A-F or Aud. Prereq–5900 or equiv) Students apply principles of anesthesia to formulate nurse anesthesia care plans for care of adults undergoing anesthesia.


NURS 5920. Nurse Anesthesia Care: Advanced Principles for Special Populations. (6 cr; A-F or Aud. Prereq–5910) Examination/application of principles used to deliver anesthesia by nurse anesthetists to special populations.

NURS 5925. Grant Writing and Critique. (1 cr; Stdnt Opt. Prereq–Grad student or #) Self-paced course. Online modular format. How to write proposals. Students select a research or program grant to critique, applying knowledge obtained through learning modules.

NURS 5940. Contemporary Issues in Nurse Anesthesia. (2 cr; S-N only. Prereq–5930) Analysis of economic, legal, political, ethical, and social factors that influence the practice and profession of CRNAs.

NURS 5941. Nurse Anesthesia Practicum A. (5 cr; S-N or Aud. Prereq–5930) First of a series of three clinical courses that focus on developing proficiency in nurse anesthesia practice. Emphasizes incorporating current research and demonstrating increasing autonomy in decision making and case management.


NURS 5955. Research Dissemination. (2 cr; Stdnt Opt. Prereq–Doctoral student or #) Knowledge dissemination skills for advancement of health/nursing science/practice. Emphasizes interpretation/diffusion of research findings to health professionals and lay audiences in various venues and communication modalities.

NURS 8100. The Discipline of Nursing. (3 cr; Stdnt Opt. Prereq–Grad nurs major or #) 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 cr; Stdnt Opt. Prereq–8100 or equiv, knowledge of phi of sci) Paradoxes 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 cr; S-N or Aud. 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 8131. Integrated Seminar in Nursing Informatics. (3 cr; A-F or Aud. Prereq–Doctoral student, #) Problem-focused topics related to nursing and health informatics, theory, measurement, and ethical/ policy issues. Interdisciplinary, cross-institutional relationships. Interpersonal dynamics that support trust-bonding exchanges.

NURS 8136. Clinical Decision Support: Theory and Application. (3 cr; A-F only. Prereq–5115 or [HINF 5430, HINF 5431] or #) 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 8140. Moral and Ethical Positions in Nursing. (3 cr; Stdnt Opt. Prereq–Grad nurs major, #) Prevailing and emerging views of health from differing belief systems and theories of inquiry. Philosophical, theoretical, and methodological implications for development of a nursing paradigm based on evolving perspectives of humanness.

NURS 8141. Interventions and Outcomes Research. (3 cr; A-F or Aud. Prereq–8123, 8112 or #) Use of advanced experimental design and multivariate statistical approaches to evaluate theory-based interventions with longitudinal outcomes in context.


NURS 8151. Theory Development in Nursing. (3 cr; S-N or Aud. Prereq–8100 or equiv or #) Strategies for theory development; synthesis of theoretical formulations in nursing using selected inductive and deductive theory development strategies.

NURS 8170. Research in Nursing. (3 cr; Stdnt Opt. Prereq–8170 or equiv or #) Research process/methods appropriate for problems relevant to nursing. Critique of research studies, proposal development.

NURS 8171. Qualitative Research Design and Methods. (3-4 cr [max 4 cr]; Stdnt Opt. Prereq–8170 or #) Overview and comparative analysis of selected qualitative research methods and analytic strategies. Focuses on developing rigorous qualitative designs that contribute to development of nursing and health care knowledge for diverse populations.


NURS 8173. Principles and Methods of Implementing Research. (3 cr; Stdnt Opt. +SAPH 8173, Prereq–8141 or other 8xxx grad research methods course, 2 grad stat courses) Integrates scientific, statistical, and practical aspects of research. Inter-relationships among design, sample selections, subject access, human subjects requires, instrument selection and evaluation, data management, analyses plans, grant writing, and research career issues. Field experiences required.


NURS 8176. Methods for the Study of Family Health Phenomena. (3 cr; Stdnt Opt. Prereq–One graduate-level research course, #) 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 cr; S-N or Aud. Prereq–[8181 or &8181], PhD nursing student, #, adviser consent) 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 cr; Stdnt Opt. Prereq–8124, 8100 or equiv or #) Conceptual and methodological approaches in study of family health phenomena from a health-related perspective. Research designs formulated to study questions in this area.

NURS 8180. Doctoral Proseminar I: Scholarly Development. (1 cr; S-N or Aud. Prereq–Doctoral nursing student) Transition to doctoral study. Begins socialization process to role of nursing scholar/scientist. Career trajectories of nursing scholars who have pursued various roles.

Course Descriptions

NURS 8182. Policy Implications of Nursing Research. (1 cr; S-N only. Prereq-Nursing doctoral student or #) 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. (3-4 cr [max 4 cr]. Stndt Opt, Prereq-#171 or grad course in qualitative research methods) 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 cr; A-F or Aud. Prereq-Advanced statistics course, #) 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. (1-6 cr [max 6 cr]; Stndt Opt. Prereq-#) Seminar and/or individual study of research design, methodologies, or instruments.

NURS 8194. Problems in Nursing - Plan B. (1-6 cr [max 6 cr]; S-N or Aud. Prereq-[#180 or #181], #170 or #171, #) Using a scholarly process to address a specific issue relevant to science/practice of nursing.

NURS 8240. Advanced Practice Nursing; Roles and Issues. (2 cr; Stndt Opt. Prereq-Admission to advanced practice area of study or #) 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 practice nursing.

NURS 8241. Health Care Leadership for a Changing World. (2 cr [max 3 cr]. Stndt Opt. Prereq-AHC grad student or #) 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 cr; Stndt Opt. Prereq-Grad nurs student or #) 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 care services.


NURS 8311. Specialized Focus in Research-based Clinical Reasoning and Management in Acute Care. (3-4 cr; Stndt Opt. Prereq-[#300, #522, #8100, #8140, #8240, #8303, #8305, #8309, advanced pharmacology, (pathophysiology or immunobiology)) 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. (3-4 cr [max 4 cr]; Aud. Prereq-#222, #8000, #8100, #8140, #8170, #) 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. (4-5 cr [max 5 cr]; A-F or Aud. Prereq-[#222, #5200, #8100, #8140, #8170, #) 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 cr; A-F or Aud. Prereq-#222, #5200, #8100, #8140, #8170, #8314, #8315) Clinical nurse specialist roles of case management, teaching, consultation, and collaboration. Students use theory/research to advance nursing care to adults within context of selected specialty area.

NURS 8320. Multidisciplinary Seminar on Social Perspectives of Aging. (3 cr; Stndt Opt) 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. (3-6 cr [max 6 cr]; A-F or Aud. Prereq-[#321, #) 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 Clinical Nurse Specialists. (5-6 cr [max 6 cr]; A-F or Aud. Prereq-#322, #8xxx advanced gerontological nurs course, grad nurs major, #) 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. (A For Clinical Nurse Specialists. (6 cr; A-F or Aud. Prereq-Grad nurs major, #) Synthesis and application of theory and research to effectively implement as an advanced gerontological nurse. Comprehend and apply to clinical practice 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 cr; No grade. Prereq-Master's student, adviser and DGS consent) Synthesis of advanced practice nursing theory/research in implementing/evaluating advanced practice 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 8340. Advanced Practice Psychiatric/Mental Health Nursing with Individuals and Their Families. (7 cr; Stndt Opt. Prereq-#200, #523, #525, #8100, #8121, #8140, #8170) 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 cr; Stndt Opt. Prereq-#340, #8340, &#8240, &#8242) 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. (1-6 cr [max 6 cr]; Stndt Opt. Prereq-Grad nurs major, #) Independent study or faculty seminar on special clinical topic when interest exists.

NURS 8361. Special Topics in Nursing. (1-4 cr [max 4 cr]; Stndt Opt. Prereq-Grad nurs major, #) Students select and study a topic of interest.

NURS 8402. Primary Care: Assessment and Management of Health for Advanced Practice Nurses. (2-4 cr [max 4 cr]; A-F or Aud. Prereq-#300, #522, #524, #8422) 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 cr; A-F or Aud. Prereq-#300, #522, #524, #8402, #8601) Comprehensive advanced nursing assessment for acute/chronic health conditions of primary care population across life span. Synthesis/application of nursing theory/research in implementing/evaluating safe/effective nursing interventions to promote health and prevent illness.


NURS 8406. Health Care of Children for the Family Nurse Practitioner. (3 cr; A-F or Aud. Prereq-#) 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 8420. Childbearing-Childrearing Family Nursing. (4 cr; Stdnt Opt. Prereq—8100, 8150, grad or equiv or nursing major or #) Maintenance, promotion, and restoration of health for clients in the childbearing-childrearing family. Theories and concepts related to parents, children, and families. Practicum includes conferences, written assignments, and use of grounded theory methods of investigation.

NURS 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

NURS 8450. Primary Care: Health Assessment and Care of Well Children. (3 cr; Stdnt Opt. Prereq—5200, 5222, &8451) 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. (2-3 cr [max 3 cr]; A-F or Aud. Prereq—5200, 5222, &8451, #) Focus on age-specific, family-centered nursing assessments/interventions to promote wellness of children, infants through adolescence. Emphasizes synthesizing/evaluating interventions for children/families. Practicum includes exposure to models of primary prevention.

NURS 8452. Primary Care: Common Acute Health Conditions Affecting Children. (2 cr; Stdnt Opt. Prereq—8501, 8541, &8451, #) 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. (5 cr; Stdnt Opt. Prereq—8411, 8442, &8452, #) 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 diagnosis, nursing interventions, planning, and follow-up evaluation of outcomes.


NURS 8455. Health Care for Children and Youth with Special Health-Care Needs. (2 cr; Stdnt Opt. Prereq—8454) Primary care of children and youth with special healthcare needs, emphasizing growth and development, pediatric psychology, specific conditions, and holistic, family-centered, community-based, culturally competent, and coordinated approach to assessment and intervention.


NURS 8459. Advanced Nursing Care of Children With Acute Illness for Pediatric Clinical Nurse Specialists. (2 cr; Stdnt Opt. Prereq—Nursing grad student admitted to pediatric clinical nurse specialist area of study or #) 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 8502. Reproductive Health Care for Women at Risk. (2-6 cr [max 6 cr]; Stdnt Opt. Prereq—8503 or 8520) 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 8504. Nurse Midwifery and Women’s Health Care Nurse Practitioner Primary Care Practicum. (2-3 cr or S-N or Aud. Prereq—5200, 5222, 8402) 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 adult populations. Focuses on women.


NURS 8602. Public Health Nursing Intervention Practicum. (5 cr; S-N or Aud. Prereq—2422, 8601) Applying principles, theory, and research about epidemiology/public health/public health nursing interventions to population-focused systems. Collaborating with community-based preceptors to achieve public health objectives.

NURS 8603. Public Health Nursing Leadership Practicum. (5 cr; S-N or Aud. Prereq—8100, 8170, 8211, 8212, 8215, 8600) 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. (1-6 cr [max 12 cr]; No grade. 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)

NURS 8701. Nursing and Health-Care Systems Administration I. (4 cr; A-F or Aud. Prereq—#) 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 cr; A-F or Aud. Prereq—8701, #) 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. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

NURS 8800. Methods for the Study of Family Health Phenomena. (2 cr; Stdnt Opt. Prereq—8814, 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. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)
Nutrition (NUTR)
Department of Food Science and Nutrition
College of Food, Agricultural and Natural Resource Sciences

NUTR 5621L. Macronutrient Metabolism. (4 cr, Sdnt Opt. Prereq-BIOC 3021, PHLS 3051, FSCN 4612)

Nutritional, biochemical, and physiological aspects of vitamins/minerals in human/experimental-animal models.

NUTR 5623W. Regulation of Energy Balance. (2 cr, Sdnt Opt. Prereq-5621 or FSCN 4612)
Regulation of energy balance in humans, including regulation of food intake and energy expenditure.


NUTR 5833. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

NUTR 6444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

NUTR 8610. Nutrition Graduate Seminar. (1 cr; S-N or Aud. Prereq-Nutr grad student, #)
Presentation of thesis (M.S. or Ph.D.) or plan B project work in public seminar.

Recent links in energy balance and body composition in animals and humans.

NUTR 8615. Advances in Nutrition: Exercise Metabolism. (2 cr, Sdnt Opt. Prereq-Grad student in nutr or related field)
Review of research on effects of diet on exercise metabolism.

NUTR 8616. Advances in Nutrition: Free Radicals, Trace Elements, and Other Micronutrients. (2 cr, Sdnt Opt. Prereq-Grad student in nutr or related field)
Free radical chemistry, cellular biology, and micronutrient nutrition considered in roles of pro-oxidants and antioxidants in human diseases and aging. Current understanding of biological action of free radicals and role of micronutrients in antioxidant protection in human health and animals.

NUTR 8617. Chemical Carcinogenesis and Chemoprevention. (3 cr; A-F or Aud. PUBH 8162. Prereq-[BIOC 3001, BIOC 3021, BIOC 4331 or equiv]. (Chem 2302 or equiv])
Fundamental background in chemical carcinogenesis, carcinogen activation, modification, carcinogen-DNA adduct formation, cellular oncogenesis, cancer chemoprevention, nutrition/cancer. Topics integrated/interrelated.

NUTR 8618. Neuroregulation of Energy Metabolism. (2 cr; A-F or Aud. Prereq-[FSCN 5621, FSCN 5623 or #)

NUTR 8620. Advances in Nutrition. (2-3 cr [max 6 cr]; Sdnt Opt. Prereq-#)
Recent research or special topics (e.g., obesity, vitamin biocchemistry, nutrition education).

NUTR 8621. Presentation Skills. (1 cr; S-N or Aud, Prereq-#)
Orientation to nutrition graduate program. Presenting scientific seminars, using electronic presentation programs/techniques.

NUTR 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

NUTR 8695. Independent Study: Nutrition. (1-10 cr [max 30 cr]; Sdnt Opt. Prereq-#)
Written report for master’s plan B project.

NUTR 8777. Thesis Credits: Master’s. (1-10 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

NUTR 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

NUTR 8900. Advances in Nutrition: Advanced Lifestyle Nutrition. (2 cr, Sdnt Opt. Prereq-#; PUBH 8900; Nutr grad major or Pub hlt nutr or EpH MPH or EpH Food sci grad major)
Evaluation and discussion of research and research issues in nutrition during various stages of the life cycle. Methodological issues of applied human nutrition investigation, current status of knowledge, and implication of research results to public health policies, programs, and future research.

Occupational Therapy (OT)
Department of Physical Medicine and Rehabilitation
Medical School
OT 5121. Issues in Mental Health. (1 cr; S-N or Aud. Prereq-One course gen psych, one course abnorm psych)
Psychiatric/neuropsychological assessment/treatment. Issues related to medical/community 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 cr; A-F or Aud. Prereq-OT student or #)
Relates neuroanatomical/neurophysiological principles to neurological conditions commonly seen in occupational/physical therapy practice.

OT 5161. Theory of Physical Medicine and Rehabilitation Applied to Medical Sciences. (2 cr; A-F or Aud. Prereq-OT student or #)
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 cr; A-F or Aud. Prereq-Registered occupational therapy student or #)
Neuroanatomic structures as functional systems, basic neurophysiologic concepts. Emphasizes applications for understanding/treating physical dysfunctions.

OT 5300. Concepts of Occupational Therapy Practice. (4 cr; A-F or Aud. Prereq-enrolled OT student or #)
Critical thinking, ethics, professional resources/organizations, patient-therapist relationship. Level 1 fieldwork experience.

OT 5313. Therapeutic Occupation. (4 cr; A-F or Aud. Prereq-enrolled OT student or #)
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 cr; A-F or Aud. Prereq-5359 or #)
Assessment concepts/techniques. Application to patient populations with both mental health/physical disabilities. Treatment planning/documentation.

OT 5342. Compensatory Rehabilitation: Evaluation and Intervention II. (4 cr; A-F or Aud. Prereq-5350, 5315 or #)
Assessment of daily living performance areas; adaptation techniques to compensate for performance deficits. Level 1 fieldwork experience.

OT 5344. Neurorehabilitation: Evaluation and Intervention III. (4 cr; A-F or Aud. Prereq-5342 or #)
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 cr; A-F or Aud. Prereq-5313 or #)
Application of group/team dynamics in various professional settings.

OT 5370. Theory of Occupation. (1 cr; A-F or Aud. Prereq-enrolled OT student or #)
Occupational therapy frames of reference, role of activity, and historical development of profession.

OT 5375. Community Resources and Health-Care Issues. (2 cr; A-F or Aud. Prereq-[5300, 5342] or #)
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 cr; A-F or Aud. Prereq-5313 or #)
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 the therapeutic interventions. Student teaching unit, community based activity.

OT 5380. Management of Occupational Therapy Services. (3 cr; A-F or Aud. Prereq-[5360, 5375, 5376] or #)
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 cr; A-F or Aud. Prereq-[5357, 5376] or #)
The well elderly, school therapy, work-related injuries/industrial rehabilitation. Fieldwork.
OT 5392. Research in Occupational Therapy. (3 cr; A-F or Aud. Prereq-5313 or #) Analysis of scientific literature, development of research proposals.

OT 5395. Functional Anatomy and Kinesiology. (4 cr; A-F or Aud. Prereq-enrolled OT student or #) Gross human anatomy emphasizing skeletal, muscular, circulatory, and peripheral nervous systems of the extremities and trunk. Includes cadaver lab prosections. Analyzing functional human movement from a biomechanical perspective.

OT 5394. Orthotics. (3 cr; A-F or Aud. Prereq-5341 or #) Analysis and construction of orthotic devices.

OT 5396. Independent Study in Occupational Therapy. (1-4 cr; max 16 cr), Stdnt Opt. Prereq-Enrolled OT student or #)

OT 8300. Research Seminar in Occupational Therapy. (1 cr; S-N or Aud. Prereq-5392 or #) 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. (1-6 cr; max 6 cr; S-N or Aud. Prereq-5392, Plan B OT student or #) Individual, concentrated study of a problem in occupational therapy. Completion of Plan B project.

OT 8320. Fieldwork Education in Occupational Therapy I. (1-6 cr; max 6 cr), S-N or Aud. Prereq-Occupational therapy student or #) 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. (1-6 cr; max 6 cr), S-N or Aud. Prereq-Occupational therapy student or #) 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. (1-6 cr; max 6 cr), S-N or Aud. Prereq-Occupational therapy student or #) Optional fieldwork experience involving supervised practice in clinic or community agency with specialty focus. Sample topics: hand therapy, school therapy, clinical research. Students apply critical thinking through supervised application of theory/skills.

OT 8335. FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGSC consent)

OT 8777. Thesis Credits: Master’s. (1-18 cr; max 50 cr; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Operations and Management Sciences (OMS)

Department of Operations and Management

Curtis L. Carlson School of Management

OMS 8651. Experimental Design. (3 cr; max 4 cr; A-F or Aud. Prereq-MBA 6120 or equiv or business admin PhD student or #; offered all yrs) 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.

OMS 8652. Regression Analysis. (3 cr; max 4 cr; A-F or Aud. Prereq-MBA 6120 or equiv, business admin PhD student or #; offered all yrs) Regression and correlation models, inferences in simple and multiple regression, multicollinearity, indicator variables, variable selection techniques, treatment of assumption violations, application to management problems, basic concepts of experimental design.

OMS 8661. Linear Programming. (3 cr; max 4 cr; A-F or Aud. Prereq-Business admin PhD student or #) Revised simplex, primal-dual, and large-scale methods, including decomposition and partitioning and methods for bounded variables.

OMS 8671. Simulation Analysis. (3 cr; max 4 cr; A-F or Aud. Prereq-credit will not be granted if credit has been received for: SCIC 8031) Business admin PhD student or #; offered all yrs) A treatment of underlying probabilistic and statistical aspects of computer simulation. Random number generators, variate and process generation, statistical analysis of simulation output, ranking and selection of simulation models, and variance reduction techniques.

OMS 8672. Stochastic Modeling and Analysis. (3 cr; max 4 cr; A-F or Aud. Prereq-Business admin PhD student or #; offered all yrs) Probabilistic modeling of dynamic processes, including Markov chains; Poisson, renewal, continuous-time Markov processes, and queuing models. Statistical estimation of selected models; applications to managerial problems, such as brand shift, industrial migration, manufacturing, and computer/communications networks.

OMS 8681. Queuing Theory: A Computational Approach. (3 cr; max 4 cr; A-F or Aud. Prereq-6872, business admin PhD student or #) Theory of Stochastic Service Systems (theory of queues) from an algorithmic point of view. Prepares students to model and analyze complex stochastic service systems via classical methods and algorithmic methods and approximations.

OMS 8711. Research in Operations Strategy. (3 cr; max 4 cr; A-F or Aud. Prereq-Business admin PhD student or #; offered all yrs) Operations performance, competitive advantage, focused factory, product, and process innovation; and operations strategy implementation. Research results and methods.

OMS 8721. Management of Technological Operations. (3 cr; max 4 cr; A-F or Aud. Prereq-Business admin PhD student or #; offered all yrs) 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.

OMS 8735. Operations Forecasting and Inventory Research. (3 cr; max 4 cr; A-F or Aud. Prereq-Business admin PhD student or #; offered all yrs) 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.

OMS 8745. Research on Quality Management. (3 cr; max 4 cr; A-F or Aud. Prereq-Business admin PhD student or #; offered all yrs) Research literature, methods, and results. Research on quality strategies, economics of quality, statistical process control, vendor management, off-line quality, and quality practice.

OMS 8800. Research Topics in Operations and Management Science. (2-4 cr; max 16 cr; A-F or Aud. Prereq-Business admin Ph.D. student or #) Topics selected from new areas of research. Research methods, issues in operations/management science.

OMS 8892. Readings in Operations and Management Science. (1-6 cr; max 16 cr; Stdnt Opt. Prereq-Business admin PhD student or #) Readings useful to student’s individual program and objectives that are not available in regular courses.

OMS 8894. Graduate Research in Operations and Management Science. (1-8 cr; max 16 cr; Stdnt Opt. Prereq-Business admin PhD student or #) Individual research on an approved topic appropriate to student’s program and objectives.

Oral Biology (OBIO)

Department of Oral Sciences

School of Dentistry

OBIO 5001. Methods in Research and Writing. (2 cr, Stdnt Opt) Skills necessary to begin a research project, including literature review, hypothesis formation, research design, and writing. Each student develops a research protocol.


OBIO 8022. Oral Neuroscience. (2 cr, Stdnt Opt. Prereq-Dental specialist or oral research trainee or #) 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 8024. Genetics and Human Disease. (1 cr; Stdnt Opt. Prereq-Dental specialist or oral research trainee or #) 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 cr; A-F or Aud. Prereq-Dental specialist or oral research trainee or #) 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.

For definitions of course numbers, symbols, and abbreviations, see page 214. 355
Course Descriptions


**OBIO 8027. Structural and Biological Aspects of Dental Biomaterials.** (1 cr; Stdnt Opl. Prereq–Dental specialist or oral research trainee or #) Relates composition/structure of dental biomaterials to their behavior in a biological environment. Causes/mechanism of such effects. Materials that have beneficial effects. Dental implantology, guided tissue regeneration.

**OBIO 8028. Molecular Basis of Cellular and Microbial Adhesion.** (2 cr; A-F or Aud. Prereq–Dental specialist or oral research trainee or #) 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 cr [max 10 cr]; S-N or Aud. Prereq–Dental specialist or oral research trainee or #) Faculty and student discussion of current topics in oral biology.

**OBIO 8093. Tutorial in Oral Biology.** (1-2 cr [max 2 cr]; S-N only, Prereq–#) Semester-long apprenticeship with faculty members to familiarize students with faculty research interests. Individual study of selected topics.

**OBIO 8094. Directed Research.** (1-10 cr [max 10 cr]; S-N or Aud. Prereq–#) Directed readings and preparation of reports on selected topics.

**OBIO 8333. FTE: Master’s.** (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

**OBIO 8371. Mucosal Immunobiology.** (3 cr; A-F or Aud. CMB 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.

**OBIO 8444. FTE: Doctoral.** (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

**OBIO 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for t/s/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)

**OBIO 8777. Thesis Credits: Master’s.** (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**OBIO 8888. Thesis Credit: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

**Otolaryngology (OTOL) Department of Otolaryngology Medical School**

**OTOL 5101. Introduction to the Basic Sciences in Otolaryngology I: Ear.** (2 cr; A-F or Aud. Prereq–OTOL 5100 major or #) 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. N-S grading option for nonmajors only.

**OTOL 5102. Introduction to the Basic Sciences in Otolaryngology II: Head and Neck.** (2 cr; A-F or Aud. Prereq–OTOL 5100 major or #) 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.** (1-12 cr [max 24 cr]; A-F or Aud. Prereq–#) Directed readings and preparation of reports on selected topics.

**OTOL 8230. Clinical Oto-rhino-laryngology.** (4 cr; A-F or Aud. Prereq–Grad otol major) Diagnostic and management instruction and experience in all phases of clinical otorhinolaryngology. Both inpatient and outpatient services are provided at Fairview-University Medical Center, St. Paul Ramsey Medical Center, Veterans Administration Medical Center, and Hennepin County Medical Center. Clinical practice and weekly special group conferences.

**OTOL 8231. Surgery of the Ear, Nose, and Throat.** (3 cr; A-F or Aud. Prereq–Grad otol major) Surgical training and experience with broad scope of surgical problems encountered in otorhinolaryngology provided at Fairview-University Medical Center, St. Paul Ramsey Medical Center, Veterans Administration Medical Center, and Hennepin County Medical Center. Clinical practice and weekly special group conferences.

**OTOL 8232. Maxillofacial Surgery.** (1 cr; A-F or Aud. Prereq–Grad otol major) 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 cr; A-F or Aud. Prereq–Grad otol major) Otolaryngologic cosmetic surgery emphasizing rhinoplasty and otoplasty.

**OTOL 8234. Anatomy of the Head and Neck and Temporal Bone Dissection.** (2 cr; Stdnt Opl. Prereq–Grad otol major or #) 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 cr [max 12 cr]; A-F or Aud. Prereq–Grad otol major) Principles and procedures in roentgenology for otolaryngologic and head and neck problems.

**OTOL 8236. Pharmacology in Otolaryngology.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Grad otol major) Principles of pharmacology as they relate to otolaryngology.

**OTOL 8237. Endoscopy.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Grad otol major) Didactic and practical instruction in laryngoscopy, esophagoscopy, bronchoscopy, and mediastinoscopy. General management principles emphasized.

**OTOL 8238. Pathology of the Ear, Nose, and Throat.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Grad otol major) Gross pathology and histopathology of diseases of the ear, nose, throat, and related regions.

**OTOL 8239. Otoneurology.** (1-2 cr [max 12 cr]; Stdnt Opl. Prereq–Grad otol major or #) Instruction and experience in diagnosis and management of otoneurologic problems, including training in electronystagmographic analysis of vestibular function.

**OTOL 8240. Allergy.** (1 cr [max 12 cr]; A-F or Aud. Prereq–Grad otol major) Concepts and management of otolaryngologic allergy.

**OTOL 8241. Cancer of the Head and Neck.** (1-2 cr [max 12 cr]; A-F or Aud. Prereq–Grad otol major) Clinical head and neck oncology; etiology, treatment (both surgical and nonsurgical), and other principles of management.

**OTOL 8242. Audiology and Speech Pathology.** (2 cr; Stdnt Opl. Prereq–Grad otol major or #) 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 cr; Stdnt Opl. Prereq–Grad otol major or #) Statistical methods, experimental design, and execution of otolaryngologic research. Ethics of research with human and animal subjects.

**OTOL 8244. Seminar: Current Literature.** (1 cr; Stdnt Opl. Prereq–Grad otol major or #) Presentation and discussion of selected articles. Required for all otolaryngology graduate students.

**OTOL 8245. Anatomy and Physiology of Hearing and Balance.** (3 cr; Stdnt Opl. Prereq–Grad otol major or #) 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 8246. Directed Readings in Auditory Physiology.** (1-2 cr [max 2 cr]; Stdnt Opl. Prereq–Grad otol major or #) 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 cr; Stdnt Opl. Prereq–#) Review of current research papers concerning cochlear anatomy and pathology.

**OTOL 8250. Advanced Biochemistry of the Auditory System.** (1 cr; Stdnt Opl. Prereq–MdBc 6100, MdBc 6101 or equiv or #) Review of recent progress in biochemical aspects of auditory end organs.

**OTOL 8262. Advanced Clinical Audiology.** (2 cr; Stdnt Opl. Prereq–Grad otol major, 8242 or #) 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 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

OTOL 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

OTOL 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

OTOL 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required (Plan A only))

OTOL 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

Pharmaceutics (PHM)

Department of Pharmaceutics

College of Pharmacy


PHM 8100. Seminar: Pharmaceutics. (1 cr [max 4 cr]; S-N or Aud. Prereq—Grad Phm major)

PHM 8110. Readings in Pharmaceutics. (1 cr [max 4 cr]; S-N or Aud. Prereq—Grad Phm major) Current literature.

PHM 8120. Readings in Central Nervous System (CNS) Drug Delivery. (1 cr [max 4 cr]; S-N only. Prereq—#) 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 cr [max 12 cr]; S-N or Aud. +PHAR 6223, Prereq—Grad Phm major) Current concepts and literature review.

PHM 8295. Research Problems in Pharmaceutics. (1 cr [max 20 cr]; S-N or Aud. Prereq—#) Experimental investigation of problems in pharmaceutics.

PHM 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

PHM 8411. Stabilization of Pharmaceuticals. (3 cr; Stdtnt Opt. 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 Pharmaceutokinetics. (4 cr; A-F or Aud) Topics in kinetics of drug absorption, distribution, metabolism, and excretion.

PHM 8431. Controlled Release: Materials, Mechanisms, and Models. (3 cr; A-F or Aud. +SMEN 8431. Prereq—Differential equations course including partial differential equations or #) Physical, chemical, physiological, and mathematical principles underlying design of delivery systems for drugs. Small molecules, proteins, genes. Emphasizes temporal controlled release. Concepts may be applicable to controlled release of other chemical agents.

PHM 8441. Solubility and Solid-State Properties of Drugs. (3 cr; A-F or Aud. Prereq—Physical chem survey course or #) Physical/physicochemical properties of drugs in solid state as related to drug delivery.

PHM 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

PHM 8481. Advanced Neuropharmaceutics. (4 cr; A-F or Aud. +CMR 8481, SNC 8481. Prereq—#) 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. (1-6 cr [max 12 cr]; No grade. 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)

PHM 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required (Plan A only))

PHM 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

PHM 8900. Spec Topics in Pharmaceutics. (1-4 cr; A-F or Aud)

Pharmacology (PHCL)

Department of Pharmacology

Medical School

PHCL 5101. Pharmacology for Pharmacy Students. (3 cr; A-F or Aud. Prereq—2nd yr pharmacy student or #) Action/fate of drugs. Lectures, lab.

PHCL 5102. Pharmacology for Pharmacy Students. (2 cr; A-F or Aud, Prereq—5101 or #) Action/fate of drugs.

PHCL 5103. Pharmacology for Dental Students. (3 cr; Stdtnt Opt. Prereq—enrolled dental student or #) Pharmacological principles/actions of drugs.

PHCL 5109. Problems in Pharmacology. (1-18 cr [max 18 cr]; Stdtnt Opt. Prereq—Upper div or grad student or #) Research projects and special problems by arrangement.

PHCL 5110. Introduction to Pharmacology. (3 cr; A-F or Aud. Prereq—Grad student or #) Basic principles of Pharmacology. Focuses on molecular mechanisms of drug action.

PHCL 5111. Pharmacogenomics. (3 cr; A-F or Aud. Prereq—Grad student or #) Human genetic variation, its implications. Functional genomics, pharmacogenomics, toxicogenomics, proteomics. Interactive, discussion-based course.

PHCL 5112. A Graduate Student Toolkit: Scientific Speaking, Grant Writing, and Responsible Conduct of Research. (2 cr; A-F only. Prereq—#) Presentation skills, scientific writing, responsible conduct of research. Practical workshops in each area. Preparing for preliminary exams.

PHCL 5210. Pharmacology. (1 cr; A-F or Aud. Prereq—Grad student or #) Principles of pharmacology. Meets with 6110.

PHCL 5211. Pharmacology. (2 cr; A-F or Aud. Prereq—5210 or #) Continuation of 5210. Meets with 6111. Lectures on the major classes of drugs.

PHCL 5212. Pharmacology. (3 cr; A-F or Aud. Prereq—5211 or #) Continuation of 5211. Meets with 6112

PHCL 5462. Neuroscience Principles of Drug Abuse. (2 cr; Stdtnt Opt. +NSC 5462. Prereq—#) 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.


PHCL 8110. Advanced Pharmacology. (4 cr; A-F or Aud. Prereq—5110 or #) Contemporary research concepts, experimental approaches in investigative pharmacology. Mechanisms of action of drugs on systems (whole animal), organ, and cellular levels.

PHCL 8200. Seminar: Selected Topics in Pharmacology. (1 cr [max 8 cr]; Stdtnt Opt. Prereq—6112 or #) Student-presented seminars.

PHCL 8207. Seminar: Psychopharmacology. (1 cr; Stdtnt Opt. +NSC 8207, PSY 8070. Prereq—#) 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 cr; A-F or Aud. Prereq—5121, 6112, Psy 5021, Psy 5061) or #) Methodologies to study relationships between drugs and biochemical, behavioral, and neurophysiological consequences. Functional biogenic amine, peptidergic, other pathways. How manipulations alter neuronal function or behavior. Feedback mechanisms, induction, inhibition. Reinforcement of, tolerance to, or dependence on drugs of abuse; stimulants, hallucinogens, depressants, opiates. Student presentations. Offered alternate years.

PHCL 8209. Substance Abuse at the bedside. (1 cr; Stdtnt Opt. Prereq—Grad student in any basic science program) Clinical management of addictive diseases. Students discuss how observed clinical interactions can influence a basic science project in which they are involved.


For definitions of course numbers, symbols, and abbreviations, see page 214.

PHIL 5202. Symbolic Logic II. (4 cr; Stdt Opt. Prereq–5201 or #) Study of propositional and predicate predicate modal logics; problems of interpreting modal languages.

PHIL 5221. Modal Logic. (3 cr; Stdt Opt. Prereq–5201 or #) Axiomatic and semantic treatment of propositional and predicate modal logics; problems of interpreting modal languages.

PHIL 5222. Philosophy of Mathematics. (3 cr; Stdt Opt. Prereq–College level logic or mathematics course or #) Major philosophical questions arising in connection with mathematics. What is mathematics about? How do we know the mathematics we do? What is the relation between mathematics and the natural sciences? Selected readings of leading contributors such as Frege, Dedekind, Russell, Hilbert, Brouwer, Godel, Quine.

PHIL 5223. Education and Social Change. (4 cr; A-F or Aud. =PHIL 4258) Connections between education, social change, theories of democratic/popular education, their application through in-depth practicum in community education setting.

PHIL 5234. Ethics and Education. (3 cr; Stdt Opt. =PHIL 4234. Prereq–6 cr in [philosophy or education] or #) What constitutes good education in terms of educational outcomes and of processes that promote learning. Connections between concepts of good education and of good society.

PHIL 5235. Biomedical Ethics. (3 cr; Stdt Opt. Prereq–Grad or #) A survey of major topics and issues in biomedical ethics including patients’ rights and duties, informed consent, confidentiality, ethical issues in medical research, the initiation and termination of medical treatment, euthanasia, abortion, and the allocation of medical resources.


PHIL 5415. Philosophy of Law. (5 cr; Stdt Opt. Prereq–1003 or 1004 or 3302 or social science major or #) Analytical accounts of law and legal obligation.

PHIL 5510. Philosophy of the Individual Arts. (3 cr; Stdt Opt. =PHIL 4510. Prereq–3502) Aesthetics problems that arise in studying or practicing an art.

PHIL 5601. History of the Philosophy of Science. (3 cr; Stdt Opt. Prereq–#) History of logical thought: origins 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 cr; Stdt Opt. Prereq–#) Contemporary issues concerning representation and explanation of scientific facts.

PHIL 5603. Scientific Inquiry. (5 cr; Stdt Opt. Prereq–#) Philosophical theories of methods for evaluating scientific hypotheses, of role of experimentation in science, and of how hypotheses come to be accepted within a scientific community.

PHIL 5605. Space and Time. (3 cr; Stdt Opt. =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 cr; Stdt Opt) 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 5611. Philosophy of the Social Sciences. (3 cr; Stdt Opt. =PHIL 4611. Prereq–[9 cr of [philosophy or social science], grad student] or #) Criteria for describing/explaining human actions. Problems of objectivity, reduction, freedom.


PHIL 5760. Selected Topics in Philosophy. (5 cr; Stdt Opt. Prereq–3xxx–5xxx course in phil or #) Philosophical problems of contemporary interest. Topics specified in Class Schedule.

PHIL 5993. Directed Studies. (1-3 cr; max 6 cr); Stdt Opt. Prereq–#, %, @ Guided individual reading or study.

PHIL 8010. Workshop in History of Philosophy. (1 cr; max 4 cr); Stdt Opt. Prereq–&4xxx hist of phil course, #) Topics vary by offering.

PHIL 8080. Seminar: History of Ancient and Medieval Philosophy. (5 cr; max 6 cr); Stdt Opt. Prereq–#) Topics vary by offering.


PHIL 8090. Seminar: History of Modern Philosophy. (3 cr; max 6 cr); Stdt Opt. Prereq–#) Topics vary by offering.

PHIL 8100. Workshop in Epistemology and Metaphysics. (1 cr; max 4 cr); Stdt Opt. Prereq–&4xxx [epistemology or metaphysics] course, #) Topics vary by offering.

PHIL 8110. Seminar: Metaphysics. (3 cr; max 6 cr); Stdt Opt. Prereq–4101 or #) Topics vary by offering.

PHIL 8131. Epistemology Survey. (3 cr; Stdnt Opt.)
Survey, against background of traditional issues, of
temporary developments in theory of knowledge.

PHIL 8180. Seminar: Philosophy of Language. (3 cr [max 6 cr]; Stdnt Opt. Prereq-4231 or #)
Topics vary by offering.

PHIL 8182. Formal Semantics of Natural Language. (3 cr; A-F or Aud. -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 cr [max 4 cr]; Stdnt Opt. Prereq-\&4xxx logic or 4xxx phil of math, #)
Topics vary by offering.

PHIL 8210. Seminar: Logical Theory. (3 cr [max 6 cr]; Stdnt Opt. Prereq-[5201, 5205] or #)
Topics vary by offering.

PHIL 8220. Seminar: Philosophy of
Mathematics. (3 cr [max 6 cr]; Stdnt Opt. Prereq-5202 or [4xxx math course or #]
Topics such as significance of limitative metatheorems
(Gooden, 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 cr [max 4 cr]; Stdnt Opt. Prereq-
\&4xxx moral phil or 4xxx pol phil #)
Topics vary by offering.

PHIL 8310. Seminar: Moral Philosophy. (3 cr [max 9 cr]; Stdnt Opt. Prereq-4310 or 4320 or
4330 or #)
Concepts/problems relating to ethical discourse.

PHIL 8320. Seminar on Medical Ethics. (3 cr [max 6 cr]; Stdnt Opt. Prereq-[4xxx or 5xxx]
ethics course #)
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 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

PHIL 8410. Seminar: Philosophy of Law. (3 cr [max 6 cr]; Stdnt Opt. Prereq-5415 or #)
Primarily for law students and advanced political
science, history, or sociology majors or minors.

PHIL 8420. Seminar: Political Philosophy. (3 cr [max 6 cr]; Stdnt Opt. Prereq-4521 or 4414 or #)
Topics vary by offering.

PHIL 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

PHIL 8500. Workshop in Aesthetics. (1 cr [max 4 cr]; Stdnt Opt. Prereq-\&4xxx aesthetics course, #)
Topics vary by offering.

PHIL 8510. Seminar: Aesthetics Studies. (3 cr [max 6 cr]; Stdnt Opt)
Topics vary by offering.

PHIL 8550. Seminar: Philosophy of Religion. (3 cr [max 6 cr]; Stdnt Opt. Prereq-4521 or #)
Topics vary by offering.

PHIL 8600. Workshop in the Philosophy of
Science. (1 cr [max 4 cr]; Stdnt Opt. Prereq-
\&4xxx phil of sci course, #)
Topics vary by offering.

PHIL 8606. Seminar: Philosophy of Medicine
and the Biomedical Sciences. (3 cr; Stdnt Opt)
Aims and goals of medicine; concepts of health,
ilness, and disease; nature of reasoning in clinical
medicine; theoretical evolution in medicine; and role
of values in practice of medicine and healthcare.

PHIL 8610. Seminar: History of Modern
Physical Sciences. (3 cr [max 6 cr]; Stdnt Opt. Prereq-#)
Topics specified in [Class Schedule].

PHIL 8620. Seminar: Philosophy of the
Biological Sciences. (3 cr [max 6 cr]; Stdnt Opt)
Topics vary by offering.

PHIL 8640. Seminar: Philosophy of the
Cognitive Sciences. (3 cr [max 6 cr]; Stdnt Opt. Prereq-#)
Philosophical framework for analyzing cognitive
sciences. Recent developments in metaphysics/
esthlmophile. Nature of scientific theories,
methodologies of cognitive sciences, relations among
cognitive sciences. Relation of cognitive science to
esthlmophile and to various philosophical problems.
Topics vary by offering.

PHIL 8660. Seminar: Social and Cultural
Studies of Science. (3 cr [max 6 cr]; Stdnt Opt.+
SST 8260)
Review of recent work; analysis of theoretical and
methodological differences among practitioners;
selected responses from historians and philosophers of
science.

PHIL 8664. Doctoral Pre-Thesis Credits.
(1-6 cr [max 12 cr]; No grade. 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
1st/2nd registrations, up to 60 combined cr)

PHIL 8670. Seminar: Philosophy of Science. (3 cr [max 6 cr]; Stdnt Opt. Prereq-#)
Topics vary by offering.

PHIL 8710. Seminar: Feminist Philosophy. (3 cr [max 6 cr]; Stdnt Opt. Prereq-6622 or 5622 or
WoSt 4122 or WoSt 5122 or #)
Topics vary by offering.

PHIL 8777. Thesis Credits: Master’s. (1-18 cr
[max 50 cr]; No grade. Prereq-Max 18 cr per
semester or summer; 10 cr total required [Plan A only])

PHIL 8888. Thesis Credit: Doctoral. (1-24 cr
[max 100 cr]; No grade. Prereq-Max 18 cr per
semester or summer; 24 cr required)

PHIL 8993. Directed Study. (1-3 cr [max 6 cr]; Stdnt Opt. Prereq-#)

PHIL 8994. Directed Research. (1-3 cr [max 6 cr]; Stdnt Opt. Prereq-#)

(1-15 cr [max 15 cr]; Stdnt Opt. Prereq-enrolled in
PMed residency training program)

PMED 8212. Electromyography. (1-15 cr [max
15 cr]; Stdnt Opt. Prereq. Prereq-enrolled in PMed
residency training program)

PMED 8214. Readings in Electromyography.
(1-3 cr [max 3 cr]; Stdnt Opt. Prereq-enrolled in
PMed residency training program)

PMED 8220. Seminar: Physical Medicine and
Rehabilitation. (1-15 cr [max 15 cr]; Stdnt Opt.
Prereq-enrolled in PMed residency training program)

Physical Therapy (PT)
Department of Physical Medicine and
Rehabilitation
Medical School
PT 8131. Research Seminar I. (1 cr; A-F or Aud.
Prereq-Grad PT major)
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 in Physical Therapy
II. (3 cr; A-F or Aud. Prereq-8131, Grad PT major)
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 8193. Research Problems in Physical
Therapy. (1-7 cr [max 7 cr]; A-F or Aud. Prereq-
Grad PT major)
Process of developing/completing a scholarly research
project or literature review related to rehabilitation
science. Type of research experience is determined by
adviser.

PT 8533. FTE: Master’s. (1 cr; No grade. Prereq-
Master s student, adviser and DGS consent)

PT 8777. Thesis Credits: Master’s. (1-18 cr
[max 50 cr]; No grade. Prereq-Max 18 cr per
semester or summer; 10 cr total required [Plan A only])

Physics (PHYS)
School of Physics and Astronomy
Institute of Technology
PHYS 5001. Quantum Mechanics I. (4 cr; Stdnt
Opt. Prereq-4101 or equiv or #)
Schrödinger equation: bound state and scattering
problems in one dimension. Spherically symmetric
problems in three dimensions, angular momentum,
and the hydrogen atom. Approximation methods for
stationary states. Time-dependent perturbation theory.
Operators and state vectors: general formalism of
quantum theory.

PHYS 5002. Quantum Mechanics II. (4 cr; Stdnt
Opt. Prereq-5001 or equiv)
Symmetry in quantum mechanics, space-time
symmetries and the rotation group, Clebsch-Gordan
coefficients and the Wigner-Eckart theorem. Scattering
theory. Method of second quantization with elementary
applications. Relativistic wave equations including
Dirac equation.

Prereq-4001, 4002 or #)
Classical mechanics: Lagrangian/Hamiltonian
mechanics, orbital dynamics, rigid body motion,
special relativity.
Course Descriptions

PHYS 5012. Classical Physics II. (4 cr; Stdnt Opt. Prereq-5011 or #)
Classical electromagnetism: electrostatics, magnetostatics, Maxwell’s equations, electromagnetic waves, radiation, interaction of charged particles with matter.


PHYS 5041. Mathematical Methods for Physics. (4 cr; Stdnt Opt. Prereq-5021 or grad student)
Survey of mathematical techniques needed in analysis of physical problems. Emphasizes analytical methods.

PHYS 5042. Analytical and Numerical Methods of Physics II. (4 cr; Stdnt Opt. 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 cr; Stdnt Opt. 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. (1-3 cr [max 5 cr]; Stdnt Opt)
Pedagogies for introductory physics classes. Topics from educational research/practice as applied to classroom.

PHYS 5081. Introduction to Biopolymer Physics. (3 cr; Stdnt Opt. +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 5201. Thermal and Statistical Physics. (3 cr; A-F or Aud. Prereq-[[4101, 4201] or equinv] previous exposure to thermodynamics, introductory quantum physics)

PHYS 5401. Physiological Physics. (4 cr; Stdnt Opt. Prereq-1301 or 1401)
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 cr; Stdnt Opt. Prereq-1302 or 1402)
Signal analysis, medical imaging, medical x-rays, tomography, radiation therapy, nuclear medicine, MRI, and similar topics.

PHYS 5701. Solid-State Physics for Engineers and Scientists. (4 cr; Stdnt Opt. Prereq-Grad or advanced undergrad in physics or engineering or the sciences)
Crystal structure and binding; diffraction; phonons; thermal and dielectric properties of insulators; free electron model; band structure; semiconductors.

PHYS 5702. Solid State Physics for Engineers and Scientists. (4 cr; Stdnt Opt. Prereq-5701 or #)
Diamagnetism and paramagnetism; ferromagnetism and antiferromagnetism; optical phenomena; lasers; superconductivity; surface properties; ferroelectricity.

PHYS 5950. Colloquium Seminar. (1 cr; S-N or Aud. Prereq-[Grad student or advanced undergrad in physics, %])
Colloquium of School of Physics and Astronomy.

PHYS 5980. Introduction to Research Seminar. (1 cr, max 3 cr; S-N or Aud. Prereq-Grad or upper div phys major)
Introduction to the research activities of the School of Physics and Astronomy.

PHYS 5993. Directed Studies. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq-grad, %)
Independent, directed study in physics in areas arranged by the student and a faculty member.

PHYS 5994. Directed Research. (1-5 cr [max 15 cr]; Stdnt Opt. Prereq-Jr, %)
Problems, experimental or theoretical, of special interest to students. Written report.

PHYS 8001. Advanced Quantum Mechanics. (3 cr; Stdnt Opt. Prereq-5002 or #)
Topics in non-relativistic quantum mechanics; second quantization. Introduction to Diagrammatic and Green’s function techniques and to relativistic wave equations. Application of relativistic perturbation theory to particle interactions with electromagnetic field. Invariant interactions of elementary particles.

PHYS 8011. Quantum Field Theory I. (5 cr; Stdnt Opt. Prereq-8001 or #)

PHYS 8012. Quantum Field Theory II. (5 cr; Stdnt Opt. Prereq-8011 or #)
Aspects of general theory of quantized fields, including space-time and discrete transformation properties, the CPT theorem, and the spin-statistics connection. Introduction to functional and path-integral methods. Renormalization group and asymptotic freedom. Semi-classical methods and instantons in gauge theories.

PHYS 8013. Special Topics in Quantum Field Theory. (3 cr; Stdnt Opt. Prereq-8012 or #)
Includes non-perturbative methods in quantum field theory, supersymmetry, two-dimensional quantum field theories and their applications, lattice simulations of quantum fields, topological quantum field theories, quantum field theory methods applied to condensed matter physics, and string theory.

PHYS 8100. Seminar: Problems of Physics Teaching and Higher Education. (1 cr [max 3 cr]; Stdnt Opt)
Lectures and informal discussions of courses and curricula, techniques and materials important in undergraduate physics instruction; relation to general problems of higher education.

PHYS 8161. Atomic and Molecular Structure. (3 cr; A-F only. Prereq-8011 or #)
Aspects of general theory of quantized fields, including the CPT theorem, and the spin-statistics connection. Emphasizes interpretation of quantum numbers and selection rules in terms of symmetry. Experimental data summarized and compared with theoretical predictions.

PHYS 8200. Seminar: Cosmology and High Energy Astrophysics. (1 cr [max 6 cr]; S-N or Aud. Prereq-#)
Current topics in cosmology and high energy astrophysics.

PHYS 8301. Symmetry and Its Application to Physical Problems. (3 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq-[[5201 or Chen 4707], 5011 or #)

PHYS 8312. Biological Physics of Macroscopic Systems. (3 cr; Stdnt Opt. Prereq-[[5201 or CHEN 4707], 5011 or #)
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 cr; no grade. Prereq-Master’s student, adviser and DGS consent)

PHYS 8500. Plan B Project. (4 cr; Stdnt Opt. Prereq-#; may be taken once to satisfy Plan B master’s project requirement; no cr toward PhD)
Project topic arranged between student and instructor. Written report required.

PHYS 8501. General Relativity and Cosmology I. (5 cr; Stdnt Opt. Prereq-8501 or #)
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-Nordstrom, and Kerr solutions.

PHYS 8502. General Relativity and Cosmology II. (3 cr; Stdnt Opt. Prereq-8501 or #)

PHYS 8600. Seminar: Space Physics. (1 cr [max 6 cr]; S-N or Aud)
Current topics in space physics and plasma physics.

PHYS 8601. Plasma Physics I. (3 cr; Stdnt Opt. Prereq-8601, 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 cr; Stdnt Opt. 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 Ray and Space Physics. (3 cr; Stdnt Opt. Prereq-5012 or #)
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 cr; max 9 cr; Stdnt Opt. Prereq–8602 or 8611 or #)
Topics in plasma waves and instabilities, solar physics, cosmic ray physics, astrophysical physics or planetary physics.

PHYS 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

PHYS 8700. Seminar: Condensed Matter Physics. (1 cr [max 6 cr]; S-N or Aud. Prereq–#)
Current research.

PHYS 8702. Statistical Mechanics and Transport Theory II. (3 cr; Stdnt Opt. Prereq–8701 or #)
Equilibrium properties of macroscopic classical and quantum systems. Phase transitions and Renormalization Group. Transport theory. Applications to soft condensed matter systems.

PHYS 8711. Solid-State Physics I. (3 cr; Stdnt Opt. Prereq–4211, 5002 or #)

PHYS 8712. Solid-State Physics II. (3 cr; Stdnt Opt. Prereq–8711 or #)

PHYS 8750. Advanced Topics in Condensed Matter Physics. (3 cr [max 9 cr]; Stdnt Opt. Prereq–8712 or #)
Sample research topics: magnetism, superconductivity, low temperature physics, superfluid helium.

PHYS 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only] only)

PHYS 8800. Seminar: Nuclear Physics. (1 cr [max 6 cr]; S-N or Aud)
Current research topics.

PHYS 8801. Nuclear Physics I. (3 cr; Stdnt Opt. Prereq–5001 or concurrent reg in 5001)
Properties of nuclei based on hadronic and quark-gluon degrees of freedom. Relativistic field theory at finite temperature and density applied to many-body problems, especially nuclear matter and quark-gluon plasma. Applications to lepton and hadron scattering, nuclear-nucleus collisions, astrophysics and cosmology.

PHYS 8802. Nuclear Physics II. (3 cr; Stdnt Opt. Prereq–8801 or #)
Properties of nuclei based on hadronic and quark-gluon degrees of freedom. Relativistic field theory at finite temperature and density applied to many-body problems, especially nuclear matter and quark-gluon plasma. Applications to lepton and hadron scattering, nuclear-nucleus collisions, astrophysics and cosmology.

PHYS 8850. Advanced Topics in Nuclear Physics. (3 cr [max 9 cr]; Stdnt Opt. Prereq–8802 or #)
Research topics.

PHYS 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

PHYS 8900. Seminar: Elementary Particle Physics. (1 cr [max 6 cr]; S-N or Aud)
Elementary particle physics, high energy physics, particle astrophysics and cosmology.

PHYS 8901. Elementary Particle Physics I. (3 cr; Stdnt Opt. Prereq–8001 or #)

PHYS 8902. Elementary Particle Physics II. (3 cr; Stdnt Opt. Prereq–8901 or #)

PHYS 8911. Introduction to Supersymmetry. (3 cr; A-F only. Prereq–8011 or #)

PHYS 8950. Advanced Topics in Elementary Particle Physics. (3 cr [max 9 cr]; Stdnt Opt. Prereq–8902 or #)
Research topics.

PHYS 8994. Research in Physics. (1-12 cr [max 24 cr]; Stdnt Opt. Prereq–#)
Research under faculty direction.

Physiology (PHSL)

Department of Physiology

Medical School

PHSL 5061. Principles of Physiology for Biomedical Engineering. (4 cr; Stdnt Opt. Prereq–Biomedical engineering grad, one yr college chem and physics and math through integral calculus)
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. (1-5 cr [max 20 cr]; Stdnt Opt. Prereq–#)
Independent lab research project in physiology, supervised by physiology faculty.

PHSL 5095. Problems in Physiology. (1-5 cr [max 20 cr]; Stdnt Opt. Prereq–#)
Individualized study in physiology. Students address selected problem through library or lab research, supervised by physiology faculty.

PHSL 5101. Human Physiology. (5 cr; Stdnt Opt. Prereq–Grad student)

PHSL 5115. Advanced Clinical Physiology I for Nurse Anesthetists. (3 cr; Stdnt Opt. Prereq–#)
Cellular mechanisms underlying systems physiology. Cellular physiology, physiology of excitable tissues, renal physiology, cardiovascular physiology.

PHSL 5116. Advanced Clinical Physiology II for Nurse Anesthetists. (3 cr; A-F or Aud. Prereq–#)
Respiratory physiology, acid-base physiology, gastrointestinal physiology, metabolism, endocrinology, physiology of pregnancy and labor.

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 5315. Human Power, Sports Performance, and Disease Treatment. (2 cr; Stdnt Opt. Prereq–Major in [physiology or medicine or physical therapy or kinesiology or coaching/elite athletic training] or)

PHSL 5350. Humans in Extreme Environments. (2 cr; Stdnt Opt. Prereq–[3061 or equiv.]
Physiological systems, human factors, psychological reactions. Countermeasures to enhance performance and prevent negative health consequences. Readings, required paper, final exam.

PHSL 5355. Directed Study: Humans in Extreme Environments. (1-5 cr [max 25 cr]; Stdnt Opt. Prereq–[3061 or equiv.]
Individualized study on topics related to human physiology in extreme environments. Library or lab research.

PHSL 5356. Research: Humans in Extreme Environments. (1-5 cr [max 25 cr]; Stdnt Opt. Prereq–[3061 or equiv.]
Independent lab research on physiology in extreme environments.

PHSL 5444. Muscle. (3 cr; Stdnt Opt. +BIOC 5444. Prereq–3061 or 3071 or 5061 or BioC 3021 or BioC 4331 or #)

PHSL 5510. Advanced Cardiac Physiology and Anatomy. (2-3 cr; Stdnt Opt. Prereq–)
Fundamental concepts and advanced topics related to clinical/biomedical cardiology. Lectures, laboratories, workshops, anatomical dissections. Intense, one week course.

PHSL 5511. Advanced Neurornuscular Junction Physiology. (2-3 cr; Stdnt Opt. Prereq–)
Fundamental concepts and advanced topics related to clinical/biomedical aspects of neuromuscular junction physiology. Lectures, laboratories, workshops, anatomical dissections. Intense, one week course.

Fundamental concepts and advanced topics related to mechanical aspects of pulmonary function (e.g., elastic recoil, airway resistance). Lectures, laboratories, demonstrations. Intense, one week course.

Topics in pharmacokinetics. Non-compartmental calculations of clearance and volume of distribution. Compartmental modeling and noncompartmental approaches. Physiologically-based pharmacokinetic modeling. Course is designed around the pharmacokinetic program PKQuest.
### Course Descriptions

**PHSL 5540. Advanced Exercise Medicine: Physiology and Bioenergetics.** (1-2 cr; [max 2 cr]; Stdnt Opt. 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 5701. Physiology Laboratory.** (1-2 cr [max 2 cr]; A-F or Aud. Prereq-#) Experiments in physiology. Emphasizes quantitative aspects, including analysis of organ systems.

**PHSL 8216. Selected Topics in Autonomic and Neuroendocrine Regulation.** (1 cr; S-N or Aud. +NSC 8216) Advanced seminar.

**PHSL 8222. Central Regulation of Autonomic Function.** (3 cr; A-F or Aud. +NSC 8222. 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 8294. Research in Physiology.** (1-18 cr [max 18 cr]; Stdnt Opt. Prereq-Grad cellular and integrative Physl major, #) Directed laboratory research.

**PHSL 8310. Advanced Topics in Cellular Physiology.** (1 cr [max 4 cr]; Stdnt Opt. Prereq-#) Discussion of primary research publications. Topics vary by semester.

**PHSL 8333. FTE: Master’s.** (1 cr; No grade. Prereq-Master’s student, adviser and DGs consent) Preparation of research proposals.

**PHSL 8444. FTE: Doctoral.** (1 cr; No grade. Prereq-Doctoral student, adviser and DGs consent) Grant writing process. Strategies and ethical standards for research proposal preparation/review. Students prepare an original proposal and critique work of others.

**PHSL 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; No grade. 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)

**PHSL 8777. Thesis Credits: Master’s.** (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required (Plan A only))

**PHSL 8888. Thesis Credit: Doctoral.** (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

**PHSL 8900. Seminar.** (1-2 cr [max 4 cr]; S-N or Aud) Current scientific research.

**PHSL 9011. Preparation of Research Proposals.** (1 cr; S-N only. Prereq-Plant biological sciences PhD student) Directed laboratory research.

**PLPA 5102. Epidemiology and Genetics of Plant Disease.** (3 cr; Stdnt Opt. Prereq-[5201 or equiv], GCD 3022) Concepts/methodology in study of plant disease agents, integrated control procedures. Disease management. Fiscal responsibility/management. Strengths/weaknesses of techniques/analyses. Questions molecular tools are used to answer.

**PLPA 5301. Plant Genetics.** (3 cr; Stdnt Opt. Prereq-BIOL 3407 or BIOL 4509 or BIOL 5403) 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.

**PLPA 5412. Plant Physiology.** (3 cr; Stdnt Opt. Prereq-Biol 202 or Biol 3002 or Biol 3007, Biol/BioC 3021 or BioC 4331) Physiological and biochemical bases of plant systems with emphasis on higher plants.

**PLPA 5416. Plant Morphology, Development, and Evolution.** (4 cr; Stdnt Opt. Prereq-Biol 202 or Biol 3002 or Biol 3007) Evolutionary history of land plants. Morphological changes in vegetative and reproductive structures. Morphology of green algal ancestors, nonvascular land plants, and spore bearing and seed bearing vascular plants are analyzed in an evolutionary framework.

**PLPA 5514. Plant Molecular Genetics and Development.** (3 cr; Stdnt Opt. Prereq-BIOC 3021 or BIOC 4005 or BIOC 4352 or equiv) 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.

**PLPA 5516. Plant Cell Biology.** (3 cr; Stdnt Opt. +PBIO 4516W. Prereq-[Biol 202 or Biol 3007 or Biol 3022, [Biol 3021 or BioC 3021 or BIOL 4005 or BIOC 4352 or equiv) 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.

**PLA 5606. Special Topics.** (1-3 cr [max 18 cr]; Stdnt Opt. Prereq-Plant biology course)

### Plant Pathology (PLPA)

**College of Food, Agricultural and Natural Resource Sciences

PLPA 5003. Diseases of Forest and Shade Trees.** (3 cr; Stdnt Opt) 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.** (1-4 cr [max 4 cr]; Stdnt Opt) See Class Schedule or department for current offerings.

**PLPA 5102. Epidemiology and Genetics of Host-Parasite Interactions.** (3 cr; A-F or Aud. Prereq-[5201 or equiv], GCD 3022) Concepts/methodology in study of plant disease epidemics, host plant resistance, and host-parasite genetics. Disease assessment, epidemic progress models, environmental influences, crop loss assessment, disease forecasting, ecology of host-parasite. Environmentally sound management strategies. Use of resistance for disease control.


PLPA 5202. Field Plant Pathology. (2 cr; Sdtnt Opt) 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 5300. Current Topics in Molecular Plant Pathology. (1 cr max 2 cr; S-N only. Prereq-[BioC 4125; course in [plant pathology or microbiology]], course in genetics, [lab in [molecular biology, Biotechnology] or equivalent]) or #) Interactive class. Students read, discuss, and critique publications in molecular plant pathology. Each week, students focus on one article and examine it from different dimensions (underlying principles, experimental strategies, data analysis, impact on the broader discipline).

PLPA 5301. Plant Genomics. (5 cr; Sdtnt. Opt. +PBIO 5301. Prereq-Intro course in genetics or #) 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, gene knock-out systems, genome databases, sequence comparison/clustering algorithms, visualization tools.

PLPA 5302. Genomics of Plant-Associated Microbes. (3 cr; A-F or Aud. Prereq-[BioC 4125, course in [plant pathology or microbiology]], course in genetics, [lab in [molecular biology, biotechnology] or equivalent]) or #) Genomics research for plant-associated microbes. Journal articles, discussions, case studies. Identification/characterization of genes in plant-microbe interactions. Analysis of plant pathogens, research methodologies. Linkage gene/physical mapping, sequencing, gene silencing, knock-out, ESTs, microarrays, bioinformatics. Online training modules, field trips, guest lectures, individual/group projects.

PLPA 5999. Special Workshop in Plant Pathology. (1-4 cr max 4 cr; Sdtnt Opt) Workshops on a variety of topics in plant pathology offered at locations other than the Twin Cities campus. See Class Schedule or department for current offerings.

PLPA 8005. Supervised Classroom or Extension Teaching Experience. (2 cr; S-N or Aud. +AGRE 8005, BBE 8005, HORT 8005, SOIL 8005. Prereq-#) 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. (1-8 cr max 8 cr; Sdtnt Opt) Special assign in lab and field problems in pathological research.


PLPA 8200. Seminar. (1 cr; A-F or Aud) Critical review and presentation of current problems and progress in plant pathology.

PLPA 8302. Genomics of Plant-Associated Microbes. (3 cr; A-F or Aud. Prereq-[BioC 4125, course in [plant pathology or microbiology]], course in genetics, [lab in [molecular biology, biotechnology] or equivalent]) or #) Identification/characterization of genes in plant-microbe interactions. Analysis of plant pathogens, research methodologies. Linkage gene/physical mapping, sequencing, gene silencing, knock-out, ESTs, microarrays, bioinformatics. Online training modules, field trips, guest lectures, individual/group projects.

PLPA 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)
Course Descriptions

POL 5280. Topics in Political Theory. (3-4 cr; Stdnt Opt. 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 cr; Stdnt Opt. +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 5309. Justice in America. (3 cr; Stdnt Opt. 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. How social influences matter. How American Civil Liberties Foundation responds to court decisions. What impact decisions have. Why people comply with them.

POL 5310. Topics in American Politics. (3 cr; Stdnt Opt. Prereq—grad student or #) See Class Schedule for description.


POL 5322. Rethinking the Welfare State. (3-4 cr; Stdnt Opt. 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 5331. Thinking Strategically in Domestic Politics. (3-4 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq—grad student) Topics of current analytical or policy importance. Topics vary, see Class Schedule.

POL 5885. International Conflict and Security. (3 cr; Stdnt Opt. POL 4885W. Prereq—grad student or #) 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 cr; A-F or Aud. Prereq—4887; grad student) Applications of game theory to international politics. Conflict/cooperation, global environmental commons, deterrence/reputation.

POL 5889. Governments and Global Trade and Money. (3 cr; Stdnt Opt. POL 4889. Prereq—5835 or grad student or #) Politics of international trade and monetary affairs, including north-south and east-west relations.

POL 5970. Individual Reading and Research. (1-4 cr [max 4 cr]; Stdnt Opt. Prereq—& %) Guided individual reading or study.

POL 8060. Research Proseminar in Political Science. (2 cr [max 8 cr]; S-N only. Prereq—Pol sci grad student) Readings, discussion, guest speakers. Topics vary by semester.

POL 8070. Advanced Research and Writing in Political Science. (2 cr [max 4 cr]; S-N only. Prereq—ABD student in pol sci) Complementary guidance at all stages of dissertation research process, from conceptualization of topic to editing of nearly final drafts.

POL 8101. Introduction to Political Science. (3 cr [max 4 cr]; A-F or Aud. Prereq—Grad pol sci major or #) 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 8105. Professional Development II. (1 cr [max 2 cr]; S-N or Aud. Prereq—Pol sci grad student, ABD, %) Research ethics. Skills for teaching undergraduate courses in political science. Completion of dissertation prospecti or early chapter.

POL 8120. Core Course in Political Methodology: Modeling Political Processes. (3 cr; Stdnt Opt. Prereq—Pol sci grad major or #) Methods used and potential for creating models of political processes. Designing political institutions, discerning/facilitating 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) Survey of positive political theory and rational-choice models. Information and transaction costs; institutions; models of elections, voting, coalitions.

POL 8123. Introduction to Quantitative Political Research. (3 cr; A-F or Aud. Prereq—Pol sci grad student or #) Principles of regression analysis, use of regression model in political science.

POL 8124. Game Theory. (3 cr; Stdnt Opt. Prereq—[6122, grad pol sci major or #) Application of cooperative 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 cr; Stdnt Opt. Prereq—Pol sci grad student or #) Time series methods, application in political science.

POL 8126. Qualitative Methods. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) Broad introduction to qualitative methods in social science. Practical, hands-on training through fieldwork projects devised and carried out during the semester. Interviewing, participant observation, narrative interpretation, ethical problems, and issues of gender and race in fieldwork.

POL 8127. Survey Research Methods: Measuring Public Opinion. (3 cr; Stdnt Opt. Prereq—Pol sci grad major) 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 on phenomena.

POL 8131. Advanced Methods and Models. (3 cr; Stdnt Opt. Prereq—Grad pol sci major, 6 cr 81xx seminars or #) 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. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq—Grad pol sci major or #) Seminars on selected topics.

POL 8201. Understanding Political Theory. (3 cr [max 4 cr]; Stdnt Opt. Prereq—Grad pol sci major or %) Key concepts and major approaches.


POL 8225. American Political Thought. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 8225. Democratic Theory. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 8253. Late Modern Political Thought. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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, Toqueville, Mill, Nietzsche, Weber, Freud.

POL 8260. Topics in Political Theory. (3 cr [max 6 cr]; Stdnt Opt. Prereq—Grad pol sci major or #) Readings and research in special topics or problems.

POL 8275. Contemporary Political Thought. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr [max 4 cr]; Stdnt Opt. Prereq—Grad pol sci major or #) 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 Participation. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) Major theoretical perspectives and research on political participation, voting behavior, and public opinion. Voter turnout, importance of party identification, effects of campaigns, long-term change in public opinion, and designing and conducting research.

POL 8303. Political Parties. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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. (1 cr; S-N or Aud. PSY 8211. Prereq—Grad pol sci major or pol psy minor or #) Readings, discussion, and guest speakers. Topics vary by semester.

POL 8308. Proseminar in Political Psychology II. (1 cr; S-N or Aud. PSY 8212. Prereq—Grad pol sci major or pol psy minor or #) Readings, discussion, and guest speakers. Topics vary by semester.
Course Descriptions

POL 8311. Political Psychology and Socialization. (3 cr; A-F or Aud. Prereq—Grad pol sci major or pol psych minor or #) 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr; A-F or Aud) Approaches, findings, and controversies in research on social psychology of prejudice, racial attitudes, and intergroup relations. Focuses on approaches based in social psychology and on related work from political science and sociology.

POL 8321. Urban Politics. (3 cr; A-F or Aud. Prereq—Grad pol sci major or #) 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) Overview of substantive and theoretical debates in American constitutional law; role of law and constitutionalism in shaping American political institutions and American politics.

POL 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

POL 8335. Public Policy. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr [max 9 cr]; Stdnt Opt. Prereq—Grad pol sci major or #) Readings/research in special topics or problems.

POL 8401. International Relations. (3 cr [max 4 cr]; Stdnt Opt. Prereq—Grad pol sci major or #) Basic theoretical approaches to study of international politics. Surveys representative work/central issues of scholarship.


POL 8403. International Norms and Institutions. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 social norms.

POL 8404. International Hierarchy. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr; A-F or Aud. Prereq—Grad pol sci major or #) 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) Relationship between workings of the international political system and that of international markets for currency and capital.

POL 8407. Morality in World Politics. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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, gene implications of technology, case study on war (Gulf War).

POL 8408. International Relations of the Environment. (3 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr; Stdnt Opt. Prereq—Grad pol sci major or #) U.S. policy toward foreign states and peoples: heritage, motivations, policy processes, what the public generally knows and wants, specific policies. Rise of interstate issues and decline of enemy-focused internationalism; implications for process and content of U.S. foreign policy.

POL 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

POL 8460. Topics in International Relations. (3 cr [max 6 cr]; Stdnt Opt. Prereq—Grad pol sci major or #) Readings and research in advanced topics or problems. Recent topics: global environmental issues, morality in world politics, and norms and institutions in world politics.

POL 8601. Introduction to Comparative Politics. (3 cr; Stdnt Opt. Prereq—Grad pol sci major) Main theoretical approaches and issues: comparative method, the state and class; political culture; development, democratization, rational choice, social movements.


POL 8603. European Government and Politics. (3 cr; A-F or Aud. Prereq—Grad pol sci major or #) 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 cr; A-F or Aud. Prereq—Grad pol sci major or #) 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 perspective and working out of possession of and decay, social movements, and prospects for democracy.

POL 8608. Government and Politics of Russia and the Commonwealth of Independent States. (3 cr; A-F or Aud. Prereq—Grad pol sci major or #) 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 8615. The Political Economy of Contemporary Japan. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 8619. Latin American Politics. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) Major bodies of theory of development, democracy and redemocratization, social movements, civil society, the state, and transnational linkages.

POL 8633. Comparative Sociopolitical Change. (3 cr; Stdnt Opt. Prereq—Grad pol sci major or #) 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 cr; Stdnt Opt. Prereq-Grad pol sci major or #) Connections between democracy and markets, emphasizing experiences of countries in North America and Europe.

POL 8641. Comparative Mass Political Behavior. (3 cr; A-F or Aud. Prereq-Grad pol sci major or #) 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 cr; A-F or Aud. Prereq-Pol sci grad student or #) 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 cr [max 9 cr]; Stdnt Opt. Prereq-Grad pol sci major or #) Readings in advanced topics or problems; supervised research and research training.

POL 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required coursework 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)

POL 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

POL 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

PORT 8990. Directed Readings and Research in Political Science. (1-7 cr [max 7 cr]; Stdnt Opt. Prereq-16 cr 8xxx pol sci courses, #, %)

PORT 5910. Topics in Lusophone Cultures and Literatures. (3 cr [max 9 cr]; Stdnt Opt) Cultural manifestations in Lusophone-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 problematic such as post-colonialism or Luso-Brazilian modernities.

PORT 5970. Directed Readings. (3 cr [max 9 cr]; Stdnt Opt. Prereq-MA or PhD candidate, #, %, @) Lusophone studies (Portuguese-speaking Africa, Brazil, Portugal). Areas not covered in other courses. Students submit reading plans for particular topics, figures, periods, or issues.

PORT 5990. Directed Research. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

PORT 8620. Seminar: Lusophone Literatures and Cultures. (3 cr [max 9 cr]; Stdnt Opt) Problems pertaining to Portuguese, Brazilian, and/or Lusophone African cultures and literatures. Topics specified in [Class Schedule].

Preventive Science Minor (PREV)


PREV 8005. Prevention Science Capstone Course. (1 cr Prereq-8001) Topics for preservation research project. Students discuss possible projects with faculty/peers. Students present final proposal for research project.

Psychology (PSY)

Department of Psychology

College of Liberal Arts

PSY 5012. Learning and Cognition in Animals. (4 cr; Stdnt Opt. Prereq-3011 or 4011 or honors or grad student or #) 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 5015. Cognition, Computation, and Brain. (3 cr; Stdnt Opt. Prereq-3051 [except for honors/grad student]) 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 cr; Stdnt Opt. Prereq-Math 1271 or #) 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 cr; Stdnt Opt. +NSC 5031W. Prereq-3031 or 3051 or #) 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 cr; Stdnt Opt. Prereq-[[3031 or 3051], [Math 1272 or equiv]] or #) 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 cr; Stdnt Opt. +NSC 5037. Prereq-3031 or #) 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.

PSY 5038W. Introduction to Neural Networks. (3 cr; Stdnt Opt. Prereq-[[3061 or NSC 3102, [MATH 1282 or 2243]] or #) Parallel distributed processing models in neural/ cognitive science. Linear models, Hebbian brains, self-organization, non-linear networks, optimization, representation of information. Applications to sensory processing, perception, learning, memory.


PSY 5054. Psychology of Language. (3 cr; Stdnt Opt. Prereq-3001W or equiv) or honors or grad student) Theories/experimental evidence in past/present conceptions of psychology of language.

PSY 5061. Neurobiology of Behavior. (3 cr; Stdnt Opt. +PSY 5061. Prereq-[3001W or equiv] or BIOL 1009 or #) Physiological/neuroanatomical mechanisms underlying behavior of animals, including humans. Neural basis of learning/memory, sleep, wakefulness, and attention processes. Effects of drugs on behavior.


PSY 5064. Brain and Emotion. (3 cr; A-F or Aud. Prereq-3031 or 3051 or #) 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.

For definitions of course numbers, symbols, and abbreviations, see page 214.
PSY 5065. Functional Imaging: Hands-on Training. (3 cr; Stdnt Opt. Prereq.-[2801 or 4801 or equiv] or [3061 or NSCI 3101] or #) Basic neuroimaging techniques. Emphasizes functional magnetic resonance imaging (fMRI). Theory/background. Students design/executemRI experiment on Siemens 3 Tesla scanner, incorporating techniques that compensate for distortion and other imaging artifacts.

PSY 5101. Personality Psychology. (3 cr; Stdnt Opt. »PSY 3101. Prereq.-[3001W or equiv]. [honors undergrad or grad student]) Theories and major issues/findings on personality functioning, personality structure, and personality assessment. Historically important and currently influential perspectives.

PSY 5135. Psychology of Individual Differences. (3 cr; Stdnt Opt. »PSY 3155. Prereq.-[3001W or equiv] or [5862 or equiv] or #) 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 cr; Stdnt Opt. Prereq.-3135 or 5135, 5862 or equiv or #) Theory, methods, and applications of research in human abilities. Topics include intelligence, aptitude, achievement, specific abilities, information processing/learning and intelligence, aptitude/trait/difference/interaction, and quantitative measurement issues.


PSY 5138. Psychology of Aging. (3 cr; Stdnt Opt. Prereq.-3001W or equiv) Theories/findings concerning age-related changes in mental health, personality, cognitive functioning, productivity. Review integrated within context of multiple biological, social, and psychological changes that accompany age.

PSY 5202. Attitudes and Social Behavior. (3 cr; Stdnt Opt. Prereq.-3201 or #) Theory/research on social psychology of beliefs/attitudes. Persuasion principles.

PSY 5204. Psychology of Interpersonal Relationships. (3 cr; A-F only. Prereq.-[Honors or grad student], #) Introduction to interpersonal relationship theory/research findings.

PSY 5205. Applied Social Psychology. (3 cr; Stdnt Opt. Prereq.-3201 or grad student or #) 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 cr; A-F only. Prereq.-3201 or grad student or #) Survey of social psychological theory/research pertaining to processes by which people develop beliefs about health/illness. Relationship between these beliefs, adoption of health-related behaviors. Effect of psychological factors on physical health.

PSY 5207. Personality and Social Behavior. (3 cr; A-F or Aud. Prereq.-3101 or 3201 or honors or grad student or #) Conceptual/methodological strategies for scientific study of individual differences and their social worlds. Applications of theory/research to issues of self, identity, and social interaction.

PSY 5301. Vocational and Occupational Health Psychology. (3 cr; Stdnt Opt. Prereq.-3001W or equiv or #) 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 564QH. Abnormal Psychology. (3 cr; Stdnt Opt. »PSY 3604, Prereq-honors or grad student or #) Comprehensive review of psychopathological disorders. Etiology, diagnostic criteria, clinical research findings.

PSY 5666. Clinical Psychopharmacology. (3 cr; Stdnt Opt. Prereq.-[3001W or equiv], [3061 or 5061], [3604 or 5043] or #) How psychopharmacological methods such as autonomic/central nervous system recording are used in studying major psychopathological disorders.

PSY 5701. Organizational Staffing and Decision Making. (3 cr; Stdnt Opt. Prereq.-[2801 or equiv], 3711 or #) Application of psychological research/theory to issues in personnel recruitment/selection and to measurement of job performance. Applying principles of individual differences, psychological measurement to decision making in organizations (recruitment, selection, performance appraisal).

PSY 5703. Psychology of Organizational Training and Development. (3 cr; Stdnt Opt. Prereq.-[2801 or equiv], 3711 or #) Theories, methods, and research pertaining to improving performance of individuals at work through training-need analysis, instructional design, aptitude/trait/difference/interaction, and measurement of training outcomes, training evaluation, knowledge structures.

PSY 5708. Organizational Psychology. (4 cr; Stdnt Opt. »PSY 5702, PSY 5705. Prereq.-[3001W or equiv], [3711] or #) 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 5960. Topics in Psychology. (1-4 cr [max 8 cr]; Stdnt Opt. Prereq.1001, [ jr or sr grad student]) Special course or seminar. Topics listed in psychology office.

PSY 5993. Research Laboratory in Psychology. (3 cr [max 18 cr]; Stdnt Opt. Prereq.-#) Laboratory instruction and seminars in faculty research areas.

PSY 8004. Philosophical Psychology. (3 cr; S-N or Aud. Prereq.-[Logic or phil course], [psy or CDD or phil] Ph.D student or #) Selected philosophical/methodological problems.

PSY 8010. Advanced Topics in Learning. (3 cr [max 12 cr]; S-N or Aud. Prereq.-#) Contemporary topics in learning and behavior theory.

PSY 8020. Seminar in Conditioning and Learning. (3 cr [max 12 cr]; S-N or Aud. Prereq.-5012 or grad psych major or #) Review and discussion of ongoing research and perspectives on future research.


PSY 8036. Topics in Computational Vision. (3 cr [max 12 cr]; Stdnt Opt. Prereq.5031 or 5036 or equiv or #) Recent research in visual psychophysics, visual neuroscience, and computer vision.


PSY 8055. Seminar: Cognitive Neuroscience. (3 cr; Stdnt Opt. Prereq.-5015 or #) Recent advances in analysis of neural bases of cognitive functions.

PSY 8056. Seminar: Psychology of Language. (3 cr; A-F or Aud. Prereq.-Grad psych major or #) Selected topics in psycholinguistics.

PSY 8060. Seminar: Neural Substrates of Mental Processes. (3 cr [max 12 cr]; Stdnt Opt. Prereq.-5012 or 5061 or 5062 or 5064 or NSCI 5661 or 8010 or CPSY 8501 or NSCI 8401 or #) Neurobiological substrates of psychological processes such as memory, attention, and emotion. Neurobiological substrates of mental dysfunction.

PSY 8061. Neuropsychopharmacology. (3 cr; A-F or Aud. Prereq.-5xxx coursework in biological psy or neuroscience or pharmacology or #) Relationships between biochemical/neuropsychological, psychological, and behavioral effects of drugs. Research in neuropsychopharmacology, behavioral pharmacology, and pharmacology of addiction.


PSY 8112. Psychopathology II. (3 cr; A-F or Aud. Prereq.-[3111, psych grad student] or #) Etiological bases of psychopathology. Theory/research. Evaluation of current theoretic models and empirical findings regarding nature/causes of varying behavior disorders.

PSY 8203. Impression Management. (3 cr; Stdnt Opt. Prereq–Grad psych major; 8208 recommended; #) 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 cr; Stdnt Opt) 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 8208. Social Psychology: The Self. (3 cr; A-F or Aud. Prereq–Psych background especially in personality and soc psych) Social psychological theory and research concerning the self and social behavior.  
PSY 8210. Law, Race, and Social Psychology. (3 cr; A-F only. Prereq–2nd or 3rd yr law student or PhD student in social science doctoral program) 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. Proseminar in Political Psychology I. (1 cr; S-N or Aud. #POL 8307, Prereq–Political Psychology grad minor) Readings, discussion, and guest speakers. Topics vary each semester.  
PSY 8212. Proseminar in Political Psychology II. (1 cr; S-N or Aud. #POL 8308, Prereq–Political Psychology grad minor) Readings, discussion, and guest speakers. Topics vary each semester.  
PSY 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)  
PSY 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)  
PSY 8501. Counseling Psychology: History and Theories. (3 cr; Stdnt Opt. Prereq–Counseling psych grad student or #) 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 8503. Interviewing and Intervention. (3 cr; Stdnt Opt. Prereq–8501, 8502 or #) 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. (1-6 cr [max 6 cr]; S-N or Aud. Prereq–Counseling psych grad student, 8501, 8502 or 8503 or equiv, #) Beginning applied experiences in counseling psychology settings.  
PSY 8511. Counseling Psychology Beginning Practicum General: (1-6 cr [max 18 cr]; S-N or Aud._prereq–[8501, 8502, 8503 or equiv]) counseling psych grad student, or #) Beginning applied experiences in counseling psychology settings.  
PSY 8512. Counseling Psychology Beginning Practicum General: (1-6 cr [max 18 cr]; S-N or Aud. Prereq–Counseling psych grad student, 8501, 8502, 8503 or equiv, #) Beginning applied experiences in counseling psychology settings.  
PSY 8514. University Counseling Practicum I. (1-6 cr [max 6 cr]; S-N or Aud. #EPSY 8513) Prereq–Counseling psych grad student, 8501, 8502, 8503 or equiv, #) Integrates science with supervised practice in University Counseling and Consulting Services (UCCS) involving career, academic, and personal counseling clients.  
PSY 8515. University Counseling Practicum II. (1-6 cr [max 6 cr]; S-N or Aud. #EPSY 8514, Prereq–Counseling psych grad student, 8501, 8502, 8503 or equiv, 8514, #) Integrates science with supervised practice in University Counseling and Consulting Services (UCCS) involving career, academic, and personal counseling clients.  
PSY 8541. Multicultural Psychology. (3 cr; Stdnt Opt. Prereq–Psych grad student or #) 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. Ethics in Psychology. (3 cr; S-N or Aud. Prereq–Counseling or clinical psych grad student or #) Ethical principles and codes of conduct for psychologists. Ethical dilemmas faced by researchers, practitioners, and teachers.  
PSY 8544. Vocational and Occupational Health Psychology Research. (3 cr; Stdnt Opt. Prereq–[8501, 8502, 8503 or equiv]) counseling psych grad student, #) 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 cr; Stdnt Opt. Prereq– [8501, 8502, 8503 or equiv]) counseling psych grad student, #) Introduction to methods/content domains. Research design, methodological issues, analogue research, process/outcome research.  
PSY 8554. Career and Occupational Health Psychology Assessment. (3 cr; Stdnt Opt. Prereq–Counseling psych grad student, or #) History of vocational interest inventories/measures related to career development, and of assessments used in occupational health psychology. Scale construction methodology, research applications. Interpretation/use of instruments.  
PSY 8560. Counseling Psychology Advanced Practicum I: General. (1-6 cr [max 6 cr]; S-N or Aud. Prereq–[[[8501, 8502, 8503 or equiv], [8510, 8511] or [8514, 8515 or equiv]]) counseling psych grad student] or #) Applied practice experience in counseling psychology settings and seminars. 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. (1-6 cr [max 6 cr]; S-N or Aud. Prereq–Counseling psych grad student, 8501-8502-8503 or equiv, 8510-8511 or 8514-8515 or equiv, #) Applied practice experience in counseling psychology settings and seminar that may include guest speakers, readings, and student presentations on topics relevant to clients and settings of practice experiences.  
PSY 8565. Counseling Psychology Advanced Practicum I: Vocational Assessment Clinic. (1-6 cr [max 6 cr]; S-N or Aud. Prereq–[[[8501, 8502, 8503 or equiv], [8514, 8515] or equiv], counseling psych grad student] or #) Applied practice experience in vocational assessment clinic of Department of Psychology. Career/vocational testing, assessment, decision making.  
PSY 8566. Counseling Psychology Advanced Practicum II: Vocational Assessment Clinic. (1-6 cr [max 6 cr]; S-N or Aud. Prereq–8501, 8502, 8503 or equiv, 8514, 8515 or equiv, counseling psych grad student, or #) Applied practice experience in Vocational Assessment Clinic of Department of Psychology. Career and vocational testing, assessment, and decision making.  
PSY 8567. Counseling Psychology Advanced Practicum III: Vocational Assessment Clinic. (1-6 cr [max 6 cr]; S-N or Aud. Prereq–Counseling psych grad student, 8501, 8502, 8503 or equiv, 8514, 8515 or equiv, #) Applied practice experience in Vocational Assessment Clinic of Department of Psychology. Career and vocational testing, assessment, and decision making.  
PSY 8570. Counseling Psychology Internship I. (1-12 cr [max 36 cr]; S-N or Aud. Prereq–Counseling psych PhD candidate, #) First part of counseling psychology internship.  
PSY 8571. Counseling Psychology Internship II. (1-12 cr [max 36 cr]; S-N or Aud. Prereq–Counseling psych PhD candidate, #) Second part of counseling psychology internship.  
PSY 8572. Counseling Psychology Internship III. (1-12 cr [max 36 cr]; S-N or Aud. Prereq–Counseling psych PhD candidate, #) Third part of counseling psychology internship.  

PSY 8881. Seminar: Quantitative and Psychometric Methods. (3cr [max 15cr]; Stdnt Opt) Reviews individual research on current topics in psychological measurement.

PSY 8882. Seminar: Quantitative and Psychometric Methods. (3cr [max 15cr]; Stdnt Opt) Reviews, individual research on current topics in psychological measurement.

PSY 8888. Thesis Credit: Doctoral. (1-24cr [max 100cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

PSY 8935. Readings in Behavioral Genetics and Individual Differences Psychology. (1cr [10cr]; S-N or Aud. Prereq—5135, 5137 or #)

Each week participants read and discuss one or two primary research articles.

PSY 8937. Seminar in Human Behavioral Genetics. (3cr [max 6cr]; Stdnt Opt. Prereq—5137 or #)

Advanced topics vary with each offering. Sample topics: gene identification in complex human traits, behavioral genetics of alcoholism, twin-family methodology.

PSY 8960. Graduate Seminar in Psychology. (1-4cr [max 36cr]; Stdnt Opt. Prereq—Psycho graduate student or #)

Graduate seminar in subject of current interest in psychology.

PSY 8993. Directed Studies: Special Areas of Psychology and Related Sciences. (1-6cr [max 36cr]; Stdnt Opt. Prereq—#)

Special area of psychology or a related science.

Public Affairs (PA)

Hubert H. Humphrey Institute of Public Affairs

PA 5001. Intellectual Foundations of Public Action. (1.5cr; A-F or Aud. Prereq—Major in publ action or [sci, tech, and environ policy])

Evolution of intellectual approaches that underlie public planning, management, and policy analysis as strategies for public action. How public decision making is shaped by knowledge and values; role of rationality. Conceptual approaches to public action along descriptive/normative lines and structure/process lines.

PA 5002. Introduction to Policy Analysis. (1.5cr; A-F or Aud. Prereq—Major in public policy or #)

Process of public policy analysis in problem structuring to communication of findings. Commonly used analytical methods. Alternative models of analytical problem resolution.

PA 5003. Introduction to Financial Analysis and Management. (1.5cr; A-F or Aud. Prereq—Public policy major or pubic affairs major or grad nonprofit mgmt cert or #)


PA 5004. Introduction to Planning. (3cr; A-F or Aud. Prereq—Major in urban/regional planning or #)

Historical, institutional development of urban planning as a profession. Intellectual foundations, planning theory. Roles of urban planners in U.S. international settings. Scope, legitimacy, limitations of planning and of planning process. Issues in planning ethics and in planning in settings of diverse populations/stakeholders.

PA 5011. Leadership and Management. (3cr; A-F or Aud. Prereq—Major in public policy or #)

Challenges facing higher-level managers in public/nonprofit organizations in a mixed economy and 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. (3cr; A-F or Aud. Prereq—Major in public policy or [sci, tech, and environ policy] or #)

Stages of policy making from agenda setting to implementation. Role/behavior of political institutions (courts, legislatures, executives, bureaucracies) and citizens, social movements, and interest groups. Concepts of political philosophy. Theories of the state. Team taught, interdisciplinary course. Small discussion sections.

PA 5013. Law and Urban Land Use. (1.5cr; A-F or Aud. Prereq—Major in urban/regional planning or #)

Role of law in regulating/shaping urban development, land use, environmental quality, and local/regional governmental services. Interface between public/private sector.

PA 5021. Economics For Policy Analysis and Planning I. (3cr; A-F or Aud. Prereq—[Econ 1101 or equiv], Major in public policy or [sci, tech, and environ policy]) or #)

Introduction to tools useful for public policy: intermediate microeconomics, macroeconomics, concepts of international trade.

PA 5022. Economics For Policy Analysis and Planning II. (1.5-3cr [max 4.5cr]; A-F or Aud. Prereq—[5021 or equiv], public policy major or #)

Application of economic reasoning to various public policy issues. Cost-benefit analysis, nonmarket valuation, and tax analysis.

PA 5031. Empirical Analysis I. (4cr; A-F or Aud. Prereq—Major in publ policy or [sci, tech, and environ policy] or urban/regional planning or #)


PA 5032. Intermediate Regression Analysis. (2cr; A-F or Aud. Prereq—[5031 or equiv], major in [public policy or [sci, tech, and environ policy]]) or #)

Bivariate/multivariate models of regression analysis, assumptions behind them. Problems using these models when such assumptions are not met.

PA 5033. Multivariate Techniques. (2cr; A-F or Aud. Prereq—[5031 or equiv], major in [public policy or [sci, tech, and environ policy]] or #; [5032 or equiv] recommended)

Public affairs topics using maximum-likelihood estimation approaches.

PA 5035. Survey Research and Data Collection. (1.5cr; A-F or Aud. Prereq—[5031 or equiv], major in [publ policy or [sci, tech, and environ policy] or urban/regional planning]) or #)

Introduction to survey research methods. Emphasizes applications to policy and applied research. Research design choices (e.g., descriptive, experimental, case studies), sampling, variable specification, measurement. Conducting interviews, mailed questionnaires. Qualitative techniques.
PA 5036. Regional Economic Analysis. (1.5 cr; A-F only. Prereq—Major in public policy or science, tech, env policy or urban/regional planning or #) Economic data analysis techniques for practitioners in planning and economic development working at local/regional levels. Data mining, econometric base model, base multipliers, location quotient analysis, minimum requirements method, economic impact analysis. Individual/group projects.

PA 5037. Regional Demographic Analysis. (1.5 cr; A-F only. Prereq—Major in public policy; or science, tech, and env policy; or urban and regional planning; or instructor consent) Demographic data analysis, population projection techniques for practitioners in planning, social service delivery, and community development at local/regional levels. Population extrapolation using curve fitting methods, demographic indicators, cohort-component method of population projection, estimation of fertility/migration rates, life tables. Individual/group projects.

PA 5080. Capstone Preparation Workshop. (1 cr; S-N only. Prereq—PS 5808) Project management, qualitative research, and critical framework needed to successfully complete Capstone course. Students complete draft of client project group norms and client contract.

PA 5101. Management and Governance of Nonprofit Organizations. (5 cr; Stdnt Opt; Prereq—SO 5011 or 5941 or grad nonprofit mgmt cert or #) 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 5102. Organization Performance and Change. (3 cr; Stdnt Opt; Prereq—SO 5011 or 5941 or grad nonprofit mgmt cert or #) Models of change/leadership. How leaders can promote personal, organizational, and societal change. Case studies, action research. Framework for leadership development and stewardship.

PA 5104. Strategic Human Resource Management. (3 cr; A-F or Aud; Prereq—SO 5011 or 5941 or grad nonprofit mgmt cert or #) 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 5113. State and Local Public Finance. (3 cr; Stdnt Opt; Prereq—Grad or #) Theory/practice of financing. Providing public services at state/local level of government. Emphasizes integrating theoretical materials to specific policy areas, and documenting wide range of institutional arrangements across/within the 50 states.

PA 5122. Law and Public Affairs. (3 cr; Stdnt Opt; Prereq—Grad or #) Overview of evaluation of American legal system. Role of courts, legislatures, and political actors in changing law. How law is used to change public policy.

PA 5123. Introduction to Philanthropy: Theory and Practice. (3 cr; Stdnt Opt; Prereq—SO 5011 or 5941 or grad nonprofit mgmt cert or #) Brief history of philanthropy in the United States. Foundations/other sources of funding for nonprofit activity. Philosophies of fundraising/grantmaking. Types of foundations/agencies that fund. Practical approaches to getting/managing money.

PA 5132. Mediation Training. (3 cr; Stdnt Opt; Prereq—Grad or #) Creating an arena for mediation. Skills/expectations needed to mediate disputes between individuals, among groups: balanced (peer or colleague), imbalanced (power differentials). Role playing, group debriefing, critique, case.

PA 5190. Topics in Public and Nonprofit Leadership and Management. (1-3 cr [max 9 cr]; Stdnt Opt; Prereq—SO 5011 or 5941 or grad nonprofit mgmt cert or #) Selected topics.

PA 5203W. Geographical Perspectives on Planning. (4 cr; Stdnt Opt. = GEOG 5203W, 5603W, 5603W; GEOG 5203W, Prereq—Grad student or #) Includes additional weekly seminar-style meeting and bibliography project on topic selected in consultation with instructor.

PA 5204. Urban Spatial and Social Dynamics. (3 cr; Stdnt Opt; Prereq—Grad student or #) Behavioral theories of internal spatial arrangement, functioning, and characteristics of cities at macro level and how they combine to produce a system of cities. Factors influencing urban spatial structure over time. Urban form, land use/rent. Spatial expression of economic, social, and political forces.

PA 5211. Land Use Planning. (3 cr; Stdnt Opt; Prereq—Grad student or #) Physical/spatial basis for land use planning at community/regional level. Role of public sector in guiding private development. Land use regulations, comprehensive planning, growth management, innovative land use planning/policies.

PA 5212. Managing Urban Growth and Change. (3 cr; Stdnt Opt; Prereq—Grad student or #) Theory/practice of planning, promoting, and controlling economic growth/change in urban areas. Economic development tools available to state/local policymakers, historic context of their use in the United States, legal, social, and economic implementation constraints. Interactions among economic, social, and demographic trends.

PA 5221. Private Sector Development. (3 cr; Stdnt Opt; Prereq—Grad or #) Roles of various participants in land development. Investment objectives, effects of regulations. Overview of development process from private/public perspective.


PA 5232. Transportation Policy, Planning, and Deployment. (4 cr; Stdnt Opt; Prereq—Grad or Sr student or #) Development of transportation policy, making of transportation plans, development of transportation technologies. Lectures, interactive case studies, role playing.

PA 5234. Transportation Planning. (3 cr; A-F or Aud; Prereq—Grad student or #) Theory/practice of transportation management for public/nonprofit organizations/networks. Strategic planning process, management systems; stakeholder analyses. Tools/techniques such as purpose expansions, SWOT analyses, causal mapping, portfolio analyses, and logic models.

PA 5235. Planning and Participation Processes. (5 cr; A-F only; Prereq—Grad student or #) Theory/practice of design, implementation, and evaluation of planning/participation processes in an increasingly diverse society. Types of planning. Stakeholders, including typically under-represented groups. Costs/benefits of participation. Participant roles. Planning/participation tools/techniques.

PA 5246. Housing Policy. (3 cr; A-F or Aud; = DPHA 5465; Prereq—Grad or #) Institutional/environmental setting for housing policy in the United States. Competing views of solving housing problems through public intervention in the market. Federal/local public sector responses to housing problems.


PA 5290. Topics in Planning. (1-3 cr [max 9 cr]; Stdnt Opt; Prereq—Grad student or #) Selected topics.


PA 5311. Program Evaluation. (3 cr; Stdnt Opt; Prereq—Grad student or #) Institutional/organizational systems. Case study 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. (1-4 cr [max 9 cr]; Stdnt Opt; Prereq—Grad student or #) Topics in advanced policy analysis methods.
PA 5405. Implementation of Social Policy. (3 cr; A-F or Aud)
Theory, tools, and practice of the implementation of social policy in the United States.

PA 5412. Aging and Disability Policy. (3 cr; Stdt Opt. Prereq-Grad or #)
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 5414. Child Labor and Education. (3 cr; Stdt Opt. Prereq-Grad student or #)
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 cr; Stdt Opt. Prereq-Grad or #)
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 5431. Public Policies on Work and Pay. (3 cr; Stdt Opt. Prereq-[PA 5031 or equiv], grad student] or #)
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 cr; Stdt Opt. Prereq-Grad or #)

PA 5442. Policy Design for Education and Human Development. (3 cr; Stdt Opt. Prereq-Grad or #)
Designing effective educational policies. Using interdisciplinary approaches to identify/understand core variables (economic, psychological, etc.) Work on policy design.

PA 5451. Immigrant Health Issues. (3-4 cr [max 4 cr]; A-F only. +PB 6281. Prereq-Grad student or #)
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 to promote immigrant health. Community visits required. Online course.

PA 5452. Immigration and Public Policy. (3 cr; Stdt Opt. Prereq-Grad student or #)
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. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Jr or sr grad student or #)
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. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Grad student or #)
Selected topics.

PA 5501. Economic Development. (3 cr; Stdt Opt. Prereq-Grad or #)

PA 5511. Community Economic Development. (3 cr; Stdt Opt. Prereq-Grad or #)
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 cr, Stdt Opt. Prereq- [5501 or 55501 or 58204 or 58204 recommended])
Techniques/approaches of development planning and policy analysis at national, regional, and project levels. Direct/indirect effects of external shocks and government interventions on national/regional economies. Macroeconomic modeling, input-output analysis, social accounting matrices/multipliers, project appraisal/evaluation techniques.

PA 5522. International Development Policy, Families, and Health. (3 cr; Stdt Opt. Prereq-Grad student or #)

PA 5590. Topics in Economic and Community Development. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Grad student or #)
Selected topics.

PA 5601. Survey of Women, Law, and Public Policy in the United States. (3 cr; Stdt Opt. Prereq-Grad or #)

PA 5611. Feminist Economics. (2 cr; Stdt Opt. Prereq-[5501, grad student] or #)

PA 5621. Board Service in Women and Public Policy. (1 cr; S-N only. Prereq-#)
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. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Grad student or #)
Selected topics.

PA 5701. Science and State. (3 cr; Stdt Opt. Prereq-Grad or #)

PA 5711. Science and Technology Policy. (5 cr; Stdt Opt. Prereq-Grad student or #)
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 ST&I implications.

PA 5721. Energy and Environmental Policy. (3 cr; Stdt Opt. Prereq-Grad or #)
Impact of energy production/consumption choices on environmental quality at national, regional, and other economic/social goals. Emphasizes public policy choices for energy/environment, linkages between them.

PA 5722. Environmental and Resource Economics Policy. (3 cr; Stdt Opt. Prereq-[Intermediate microeconomics, intermediate policy analysis, grad student] or #)

PA 5790. Topics in Science, Technology, and Environmental Policy. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Grad or #)
Selected topics.

PA 5801. Global Public Policy. (3 cr; Stdt Opt. Prereq-Grad student or #)
Creation of rules, norms, and institutions to regulate global activities. Activity making, from exclusive domain of state to including various nonstate actors. How global policy making regulates interstate, national, and transnational activities. Creation/enforcement of international law, international security, political economy, and other topics.

PA 5890. Topics in Foreign Policy and International Affairs. (1-3 cr [max 9 cr]; Stdt Opt. Prereq-Grad student or #)
Selected topics.

PA 5902. Computer Applications in Public Affairs. (3-5 cr [max 6 cr]; S-N or Aud.)
Introduction to computer systems/appliances in public affairs practice.

PA 5910. Developing Your Public Service Career. (1 cr; S-N or Aud. Prereq-Major in [public affairs or public policy or urban/regional planning or [science, technology/environmental policy]) or #)
Students investigate/analyze interests, skills, and abilities and combine them in a career plan. Students develop tools to demonstrate their abilities, document their experiences/knowledge, and explore public service career options.

PA 5912. Politics of Public Affairs and Civic Engagement. (3 cr; A-F only. Prereq-Grad student or #)
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 cr [max 12 cr]; Stdt Opt. Prereq-Grad student or #)
Topics on public policy or planning skills. Topics specified in Class Schedule.

PA 5931. Role of the Media in Public Affairs. (3 cr; Stdt Opt. Prereq-Grad or #)
Historical/contemporary role of news media in defining/shaping public opinion/policy, primarily in the United States. Emphasizes critical research, professional skills in three forms of journalism: hard news coverage, investigative reporting, documentaries. Field experience, practice in governmental public relations.

PA 5941. Leadership for the Common Good. (4 cr; Stdt Opt. Prereq-Major in public affairs or #)
Personal, team, organizational, visionary, ethical, and political aspects of leadership. Emphasizes building/experiencing a learning community.

PA 5952. Global Commons Seminar II. (2 cr; A-F only. Prereq-HH International fellow)
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 5990. Topics: Public Affairs--General
Topics. (1-3 cr [max 9 cr]; Stdt Opt. Prereq--Grad student or #)
General topics in public policy.

PA 8001. Transforming Public Policy. (4 cr; A-F or Aud. Prereq--5041 or #)
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 8002. Synthesis Workshop. (4 cr; A-F or Aud. Prereq--[6001, grad PA major or #]
Project external client on issue agreed upon by student, client, and instructor. Students apply interdisciplinary methods, approaches, and perspectives studied in core courses to the issue. Written report includes analysis of issue and policy recommendations. Oral presentation of major findings. Concentration/topic vary term-to-term.

PA 8082. Working Group. (3 cr; A-F or Aud. Prereq--Grad major in [public policy or [urban and regional planning] or [science, technology, and environment policy]], completion of core courses or #)
Project external client on issue agreed upon by student, client, and instructor. Students apply interdisciplinary methods, approaches, and perspectives studied in core courses to the issue. Written report includes analysis of issue and policy recommendations. Oral presentation of major findings. Concentration/topic vary term-to-term.

PA 8141. Doctoral Seminar in Observational Research. (2 cr [max 20 cr]; S-N or Aud. Prereq--8140; recommended)
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.

PA 8140. Validity Concepts in Epidemiologic Research. (2 cr; S-N only)
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.

PA 8160. Advanced Toxicology. (3 cr; S-N or Aud. Prereq--5032, 5033, 5022 or equiv)
Use of social science research methods in analyzing and developing public policies.

PA 8390. Advanced Topics in Advanced Policy Analysis Methods. (1-3 cr [max 6 cr]; Stdt Opt)
Selected topics.

PA 8390. Advanced Topics in Public Policy. (1-3 cr [max 6 cr]; Stdt Opt)
Selected topics.

PA 8590. Advanced Topics in Economic and Community Development. (1-3 cr [max 6 cr]; Stdt Opt)
Selected topics.

PA 8686. Feminist Organizations. (3 cr; A-F or Aud)
Uses social movement literature and histories of U.S. second-wave feminism to study feminist organizations. Recurring issues and conflicts within organizations and movements examined through comparative studies of feminism in Latin America, Eastern Europe, Britain, and Italy. Methods and sources for studying feminism.

PA 8687. Women and Electoral Politics. (3 cr; A-F or Aud)
Political science and women’s studies literature on American women and electoral politics.

PA 8690. Advanced Topics in Women and Public Policy. (1-3 cr [max 6 cr]; Stdt Opt)
Selected topics.

PA 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq--Max 18 cr per semester or summer; 10 cr total required [Plan A only])

PA 8790. Advanced Topics in Science, Technology, and Environmental Policy. (1-3 cr [max 6 cr]; Stdt Opt)
Selected topics.

PA 8811. Strategic Issues in International Economic Policy. (3 cr; Stdt Opt)
Compares/contrasts experiences of industrial/developing countries in trade, investment, exchange rates, and immigration.

PA 8821. National Security Policy. (3 cr; Stdt Opt)
Introduction to national security policy. Defense policy, military strategy, and weapons procurement. While emphasis is on the United States, other countries also discussed.

PA 8890. Advanced Topics in Foreign Policy and International Affairs. (1-3 cr [max 6 cr]; Stdt Opt)
Selected topics.

PA 8991. Independent Study. (1-3 cr [max 6 cr]; Stdt Opt. Prereq--#)

Public Health (PUBH)

School of Public Health

PUBH 8100. Topics: Environmental Health. (1-4 cr [max 20 cr]; Stdt Opt)
New course offerings or topics of interest in environmental health.

PUBH 8120. Occupational Health and Safety Research Seminar. (1 cr [max 12 cr]; S-N or Aud. Prereq--6120, 6330 or 6341, 6450, environmental health major, [OPRTP specialty or equiv] or #)
Facilitates student research training in occupational injury prevention. Roundtable discussions, interdisciplinary involvement.

PUBH 8140. Validity Concepts in Epidemiologic Research. (2 cr; S-N only)
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. (3 cr; Stdt Opt. Prereq--6160, one course in biochem, one course in molecular biol) or #
Cellular/molecular mechanisms by which xenobiotics cause toxicity. Investigative approaches to current research problems in toxicology/carcinogenesis. Apoptosis, cell cycle regulation, genetic toxicity, molecular mechanisms of carcinogenesis, genetic basis for susceptibility to environmental toxicants.

PUBH 8161. Current Literature in Toxicology. (1 cr [max 3 cr]; S-N or Aud. Prereq--6104)
Modern methods in toxicology, critical thinking skills. Topics vary each semester. Students read/discuss toxicological literature.

PUBH 8162. Chemical Carcinogenesis and Chemoprevention. (3 cr; A-F or Aud. =NUTR 8617. Prereq--([BioC 3001, BioC 3021, BioC 4331] or equiv), [Chem 2302 or equiv])
Fundamental background in chemical carcinogenesis, carcinogen activation/detoxification, carcinogen-DNA adduct formation, cellular oncogenesis, cancer chemoprevention, nutrition/cancer. Topics integrated/interrelated.

For definitions of course numbers, symbols, and abbreviations, see page 214. 373
Course Descriptions

PUBH 8163. Toxicology. (3 cr; A-F only. Prereq—Enrolled in toxicology concentration of environmental health PhD program) Biographical/physiological principles that govern toxicological methods.

PUBH 8165. Current Topics in Toxicology. (1 cr [max 2 cr]; S-N only. Prereq—[Environmental health PhD, toxicology concentration] student or #) Seminars presented by students/faculty in toxicology grad program.

PUBH 8166. Experiences in Toxicology Research. (3 cr; A-F only. Prereq—Environmental health PhD student in toxicology concentration) Students complete research projects in labs of toxicology program graduate faculty members.

PUBH 8170. Advanced Industrial Hygiene Applications. (2 cr; A-F or Aud. Prereq—5170, eh grad major) Recognition, evaluation, and control of occupational health hazards. Application of concepts to specific industrial hygiene problems related to gases/ vapors, aerosols, and physical agents.

PUBH 8194. Directed Research: Environmental Health. (1-6 cr [max 6 cr], Sdtnt Opt. Prereq—#) Research, with direction from faculty member, in environmental/occupational stresses on human health.

PUBH 8300. Topics: Epidemiology. (1-2 cr [max 20 cr], Sdtnt Opt) New course offerings or topics of interest in epidemiology.

PUBH 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

PUBH 8377. Seminar: Chronic Disease and Behavioral Epidemiology. (1 cr [max 2 cr]; S-N or Aud. Prereq—Epi grad major or #) Readings, presentations, classroom discussions, and exercises in epidemiologic research methods in chronic/behaviorally-based diseases other than infectious/cardiovascular diseases and cancer.

PUBH 8379. Seminar in Epidemiology. (2 cr; S-N or Aud. Prereq—Epi grad major or MPH major or #) Selected current problems.


PUBH 8393. Directed Study: Clinical Research. (1-4 cr [max 20 cr], Sdtnt Opt. Prereq—Clinical research major, #) Directed research or field practice in clinical research.

PUBH 8400. Topics: Biostatistics. (1.5-4 cr [max 20 cr], Sdtnt Opt) Topics of interest.


PUBH 8432. Probability Models for Biostatistics. (3 cr; Sdtnt Opt. Prereq—[7405, 7407, Stat 5102, [advanced biostatistics or statistics] major] or #) Three basic models used for stochastic processes in the biomedical sciences: point processes (emphasizes Poisson processes), Markov processes (emphasizes Markov chains), and Brownian motion. Probability structure and statistical inference studied for each process.

PUBH 8435. Latent Variable Measurement Models and Path Analysis. (3 cr; Sdtnt Opt. Prereq—[7455, Prereq-Biostatistics PhD student or #]) Introduction to use of statistical techniques known collectively as latent variable models. Exploratory/ confirmatory factor analysis, path analysis, structural equation modeling, latent trait models, latent class models. SAS/AMOS software are used.

PUBH 8442. Bayesian Decision Theory and Data Analysis. (3 cr; Sdtnt Opt. Prereq—[7406 or experience with FORTRAN or with [C, S]], Stat 5101, Stat 5311, Stat 5314 grad student in [biostatistics or statistics] or #) Theory/application of Bayesian methods. Bayesian methods compared with traditional, frequentist methods.

PUBH 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

PUBH 8445. Statistics for Human Genetics and Molecular Biology. (3 cr; Sdtnt Opt. Prereq—[[Stat 8101, Stat 8102] or equiv], PhD student or #; some background with molecular biology desirable) Introduction to statistical problems arising in molecular biology. Problems in physical mapping (radiation hybrid mapping, DDP), genetic mapping (pedigree analysis, lod scores, TDT), biopolymer sequence analysis (alignment, motif recognition), and micro array analysis.

PUBH 8452. Advanced Longitudinal Data Analysis. (3 cr; Sdtnt Opt. Prereq—[Stat 5102, Stat 8111, experience with [SAS or S]+, advanced [biostat or stat] student] or #) 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 cr; Sdtnt Opt. Prereq—[Stat 5102 or [Stat 8101, Stat 8102]], some experience with S-plus; Stat 8311 recommended) 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 cr; Sdtnt Opt. Prereq—[[6450, 6451, 6452] or STAT 5503 or equiv], [biostatistics or statistics PhD student] or #) 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 8494. Directed Research: Biostatistics. (1-4 cr [max 4 cr], S-N only. Prereq—#) Research, with direction from a faculty member, in biostatistics.

PUBH 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr], S-N only. Prereq—Doctoral student who has not passed prelim oral; no required consent for lst/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)

PUBH 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr], S-N only. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

PUBH 8800. Topics in Health Services Research and Policy. (1-4 cr [max 20 cr], Sdtnt Opt) Topics and credit vary by instructor.


PUBH 8802. Health Services Policy Analysis: Applications. (2 cr; A-F or Aud. Prereq—Hsrp&a grad major or #) Emphasizes relationships between health services research and policy, and uses case studies to examine how research influences policy and vice versa.

PUBH 8803. Long-Term Care: Principles, Programs, and Policies. (2 cr; Sdtnt Opt. Prereq—Grad-level health-care policy course or #) Long-term care policy for functionally impaired persons, particularly the elderly. Team taught from healthcare and social services perspective; grounded in research literature on evidence of program effects. Innovative programs addressing current fragmentation of services.

PUBH 8805. Sociological Theory in Health Services Research. (3 cr; Sdtnt Opt) Overview of sociological theories in medical sociology, occupations/professions. Emphasizes teaching students how to apply theories to health/social phenomena of their own interest/choice.

PUBH 8806. Sociology of Health Occupations and Organizations. (3 cr; Sdtnt Opt. Prereq—Hsrp&a grad major or #) 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 cr [max 6 cr], Sdtnt Opt. Prereq—[Grad or professional school] student or #) Introduction to philosophy of science, conceptual modeling, experimental design, survey/sample design, issues relevant to health services research.


PUBH 8813. Measurement of Health-Related Social Factors. (3 cr; A-F or Aud. Prereq—Intro course, understanding of simple correlations or #) How social factors such as innovativeness, compliance, religiosity, and stress are measured and tested for reliability and validity. Relationships between theory, concepts, variables, data.
Rec 5161. Recreation Land Policy. (3 cr; A-F or Aud. Prereq-1501 or 5101 or #) Historical development of recreational land policy in the United States and related contemporary issues in policy, management, interpretation, and research.

Rec 5191. Commercial Recreation and Tourism. (3 cr; A-F or Aud. Prereq-3551 or #) Scope and development of profit-oriented recreation agencies, including an emphasis on the tourism industry.

Rec 5211. Introduction to Therapeutic Recreation. (3 cr; A-F or Aud. Prereq-1501 or 5101, rec major or #) Purposeful intervention; roles of specialist/recreation therapists in meeting cognitive, physical, emotional, social needs of people with disabling conditions through recreation services; roles of specialist/recreation therapists changing societal attitudes toward illness and disability and the self-concepts of individuals with impairments.

Rec 5215. Assess and Monitor Patient/Client Functioning in Recreation Therapy. (3 cr; Stdnt Opt. Prereq-TR major or academic health professional or #; majors A-F only) Selecting appropriate techniques/tools, analysis of individual p/c supports/deficits. Monitoring/recordin progress in RT and in collaborative services: standard notes; team meetings; on-line reporting for quality assurance, referral, augmentation/termination of services.

Rec 5217W. Comprehensive Therapeutic Recreation Services Development and Management. (4 cr; Stdnt Opt. Prereq-5211 or #, rec major) Guided development of written plans including development of protocols and critical pathways, intervention programs/activities, individual treatment plans and standards for appropriate placement of individuals in group intervention, and management of patient/client service delivery, record keeping, and administrative responsibilities.

Rec 5231. Therapeutic Recreation and Diagnostic Groups. (3 cr; A-F or Aud. Prereq-5211 or #) Definitions, philosophies, methodologies regarding therapeutic recreation services for persons in diagnostic groups of cognitive, physical, sensory, communication, and psychiatric impairments/disabilities. Lectures, group discussion. Presentations by parents, professionals, and self-advocates. Clinical or community practicum assignment.

Rec 5241. Functional Intervention: Recreation Therapy in Geriatric Care. (5 cr; A-F or Aud. Prereq-3551 or 5111 or #) Role of leisure in maintenance of mental, physical, social-emotional health/functioning. Issues relative to prevention of impairment/disability. Rehabilitation, support of vital life involvement, effect on design/delivery of recreation services.

Rec 5271. Community Leisure Services for Persons with Disabilities. (3 cr; A-F or Aud. Prereq-1501, Rec major or #) Exploration and application of concepts and techniques of normalization and least restrictive environment strategies to leisure service delivery in inclusive community settings for a range of individuals with disabilities.

Rec 5301. Wilderness and Adventure Education. (4 cr; A-F or Aud) Rationale for, methods in applying wilderness/adventure education programs in education, recreation, corporate, human service settings. Emphasizes adventure/wilderness program management.

Rec 5311. Programming Outdoor and Environmental Education. (3 cr; A-F or Aud) Methods, materials, and settings for developing and conducting environmental and outdoor education programs.

For definitions of course numbers, symbols, and abbreviations, see page 214. 375
Course Descriptions

REC 5371. Sport and Society. (3 cr; A-F or Aud. Prereq—[3126, grad student] or #) *Sport, sportifying 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 cr; A-F or Aud. Prereq—Grad student or #) *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. (5 cr; A-F or Aud. Prereq—Kin or rec or postbac or grad student or #) *Theories/techniques in administering/managing sport enterprises. Organizational theory/policy. Practical examples of sport management skills/strategies.*

REC 5511. Women in Sport and Leisure. (3 cr; A-F or Aud. Prereq—Kin or rec or program permission) *Critically examines women’s involvement in/ contributions to sport, physical activity, and leisure.*

REC 5601. Sport Management Ethics and Policy. (3 cr; A-F or Aud. 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 cr; A-F or Aud. Prereq—Kin or rec or grad student or #) *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 cr; A-F only. Prereq—Upper div undergrad or grad student or #) *Youth development programming for out-of-school time. Philosophy/purpose of youth development programs. Principles/procedures for developing out-of-school time programs.*

REC 5801. Legal Aspects of Sport and Recreation. (4 cr; A-F or Aud. Prereq—5551 or 5461 or #) *Legal issues related to recreation, park, and sport programs/facilities with public/private sectors.*

REC 5900. Special Topics: Contemporary Issues in Leisure Services. (1-12 cr [max 12 cr]; Stndt Opt) *Contemporary issues emphasizing administrative and supervisory functions for recreation and allied professionals; individual offerings, to be determined by faculty, focus on specific issues and professional groups.*

REC 5981. Research Methodology in Kinesiology, Recreation, and Sport. (3 cr; A-F or Aud. Prereq— Kin 5981. Prereq—MED or grad student or #) *Defines/reviews various types of research in exercise and sport science, physical education, and recreation studies. Qualitative research, field studies, and introspective research strategies as alternatives to traditional scientific paradigm.*

REC 5992. Readings: Recreation. (1-3 cr [max 9 cr]; Stndt Opt. Prereq—REC major, #) *Independent study under tutorial guidance by faculty member on particular topic(s) not covered in regular coursework.*

REC 5995. Problems in Recreation, Park, and Leisure Studies. (1-12 cr [max 30 cr]; Stndt Opt. Prereq—[MED or grad student] or #) *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.*

REC 8128. Doctoral Sport Management Seminar. (3 cr; A-F only. Prereq—8128. Prereq—PhD student, #) *Analysis of current literature, theoretical constructs, research methodology, and design relative to sport management. Focuses on student-selected topics, research problems.*

REC 8310. Seminar: Leisure Services. (3 cr; A-F or Aud. Prereq—Rec MED or grad student or #) *Critical study and special problems in recreation, park, and leisure services and in therapeutic recreation.*

REC 8320. Seminar: Theoretical Perspectives in Leisure Behavior. (3 cr; A-F or Aud. Prereq—#) *Major theoretical paradigms and empirical findings, where appropriate, from leisure studies in particular and social sciences in general.*

REC 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent) *Critical study and special problems in recreation, park, and leisure services and in therapeutic recreation.*

REC 8590. Seminar: Administrative Problems in Leisure Services and Therapeutic Recreation. (3 cr; A-F or Aud. Prereq—Rec MED or grad student or #) *Administrative and management issues and problems in leisure services and therapeutic recreation.*

REC 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

REC 8980. Graduate Research Seminar in Recreation, Park, and Leisure Studies. (1-3 cr [max 3 cr]; S-N or Aud. Prereq—5981, EPsy 5261 or #) *Analyzing, designing, and reporting on research problems in leisure studies.*

REC 8995. Research Problems in Recreation, Park, and Leisure Studies. (1-4 cr [max 16 cr]; S-N or Aud. Prereq—#) *Individual scholarly research.*

**Rehabilitation Science (RSC)**

**Medical School**

RSC 5135. Advanced Biomechanics I: Kinematics. (3 cr; A-F or Aud. Prereq—#) *How to describe/move movement. Basic/applied biomechanics, pathokinesiology, and rehabilitation literature. Lecture, lab, seminar discussion. Meets with RSC 8135.*

RSC 5294. Independent Study in Rehabilitation Science. (1-3 cr [max 3 cr]; Stndt Opt. Prereq—Rehabilitation science student or program approval) *Independent exploration into topics related to rehabilitation science.*

RSC 5814. Age, Exercise, and Rehabilitation. (2 cr; Stndt Opt. Prereq—Rehabilitation science student or program permission) *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 cr; A-F or Aud. Prereq—[Phys 1031, Phys 1032] or equiv.) # *[rehabilitation science student or program permission]*

Theory/application of kinesiology EMG and other common instruments used to measure human motion.

RSC 5900. Rehabilitation Science Seminar. (1 cr [max 6 cr]; A-F or Aud. Prereq—Rehabilitation science student or program permission) *Critical reading/discussing rehabilitation science literature. Identifying important researchable questions, methods to answer them. Speaking/writing persuasively on scientific topics.*

RSC 8350. Current Literature Seminar. (1 cr; A-F or Aud. Prereq—Grad student in PT or rehabilitation science major or #) *Critical review of literature to evaluate efficacy of selected physical therapy interventions.*

RSC 8353. Advanced Kinesiology. (3 cr; A-F or Aud. Prereq—[Rehabilitation science student or program permission], #) *How to describe/move measurement. Basic/applied biomechanics, pathokinesiology, and rehabilitation literature. Lecture, lab, seminar discussion.*

RSC 8710. Special Topics in Rehabilitation Science. (1 cr [max 3 cr]; A-F or Aud. Prereq—Rehabilitation science student or program permission, #) *Topics vary by semester. Papers required.*

RSC 8818. Teaching Practicum. (1-5 cr [max 5 cr]; A-F or Aud. Prereq—Rehabilitation science student or program permission) *Research practicum on selected topic. Use of systematic literature search. Critical analysis of scientific literature. Specific measurement systems. Data collection/reduction methods of on-going or new research projects. Preparing/defending research reports.*

RSC 8818. Teaching Practicum. (1-5 cr [max 5 cr]; A-F or Aud. Prereq—Rehabilitation science student or program permission) *Research practicum on selected topic. Use of systematic literature search. Critical analysis of scientific literature. Specific measurement systems. Data collection/reduction methods of on-going or new research projects. Preparing/defending research reports.*

RSC 8820. Problems in Human Movement. (4 cr; A-F or Aud. Prereq—Rehabilitation science student or program permission) # *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 cr; No grade. Prereq—Master’s student, adviser and DGS consent) *Critical appraisal of current medical literature. Fundamentals of research design, data analysis, and medical writing.*

RSC 8820. Problems in Human Movement. (4 cr; A-F or Aud. Prereq—Rehabilitation science student or program permission) # *Fundamental principles of neurophysiology, neurology, motor control, and motor learning as a basis for therapeutic intervention in motor dysfunction.*

RSC 8833. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent) *Critical appraisal of current medical literature. Fundamentals of research design, data analysis, and medical writing.*

RSC 8866. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq—Doctoral student who has not passed prelim oral; no required consent for first/second registrations, up to 12 combined cr; % for third/fourth registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)
Russian (RUSS)

College of Liberal Arts

RUSS 5021. Russian Study Tour. (6-18 cr [max 18 cr]; Stdnt Opt. Prereq-3002 or equiv) Study of Russian language & culture in an accredited institution in Russia.

RUSS 5045. Introduction to Literary Analysis. (5 cr; Stdnt Opt. Prereq-3002 or equiv) Reading and analysis of poetry and prose selections to understand rudiments of studying Russian literature. Readings are in Russian.

RUSS 5105. Russian Poetry and Prose. (3 cr; Stdnt Opt. Prereq-3002 or equiv) Appreciation of literary values through stylistic analysis and literary interpretation; analysis of humanistic elements. Readings in Russian.

RUSS 5211. Modern Russian Literature in Translation. (3 cr; Stdnt Opt. +RUSS 3211 Literary, cultural, and political significance of modern Russian literary works.

RUSS 5304. Tolstoy in Translation. (3 cr; Stdnt Opt. +RUSS 3304) Novels, stories, and philosophical writings of Leo Tolstoy.

RUSS 5407. Stories and Plays of Anton Chekhov in Translation. (3 cr; Stdnt Opt. +RUSS 3407) Study of literary devices and themes in selected stories and major plays using the intrinsic approach.

Russian (RUSS)

Department of Classical and Near Eastern Studies


RELS 5535. Death and the Afterlife in the Ancient World. (3 cr; A-F only) 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 5599. Directed Studies. (1-4 cr [max 24 cr]; Stdnt Opt. Prereq-#) Topic or reading not available in standard courses. Independent study with advisor.

For definitions of course numbers, symbols, and abbreviations, see page 214. 377
Course Descriptions

RUSS 5409. 19th-Century Russian Novel. (3 cr; Stdnt Opt. =RUSS 5409)
The Russian realistic novel from origin to decline; social, political, and intellectual circumstances that led to its emergence as the dominant genre of the “age of realism” in Russia.

RUSS 5411. Dostoevsky in Translation. (3 cr; Stdnt Opt. =RUSS 5411)
Novels, stories, and other writings of Fyodor Dostoevsky.

RUSS 5421. Literature: Middle Ages to Dostoevsky in Translation. (3 cr; Stdnt Opt. =RUSS 5421)
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 cr; Stdnt Opt. =RUSS 5422)
Survey of Russian literature from mid-19th century to the present: realism, modernism, feminism and other trends.

RUSS 5601. Methods of Translating Fiction From Russian to English. (3 cr; Stdnt Opt. =RUSS 5601, Prereq=3102 or equiv)
Learning to appreciate various literary styles through experience of translation.

RUSS 5900. Topics in Russian Language, Literature, and Culture. (1-4 cr [max 3 cr]; Stdnt Opt. Prereq=1102 for language topics)
Variable topics in Russian language, literature, and culture.

RUSS 5993. Directed Studies. (1-4 cr [max 16 cr]; Stdnt Opt. Prereq=*, %, @)
Guided individual study.

Sanskrit (SKT)
Department of Classical and Near Eastern Studies
College of Liberal Arts

SKT 5001. Beginning Sanskrit. (4 cr; Stdnt Opt)
Introduction to the classical language of ancient India.

SKT 5002. Beginning Sanskrit. (4 cr; Stdnt Opt. Prereq=5001 or equiv)
Introduction to the classical language of ancient India.

SKT 5201. Intermediate Sanskrit. (3 cr; Stdnt Opt. Prereq=5002 or equiv)
Readings in Sanskrit literature.

SKT 5202. Intermediate Sanskrit. (3 cr; Stdnt Opt)
Readings in Sanskrit literature.

SKT 5710. Topics: Language and Literature. (3 cr, Stdnt Opt)
Selected reading and/or study of linguistic problems in Sanskrit.

SKT 5992. Directed Readings. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq=*, %, @)
Guided individual reading or study.

SKT 5993. Directed Studies. (1-12 cr [max 30 cr]; Stdnt Opt. Prereq=*, %)
Guided individual reading or study.

Scandinavian (SCAN)
Department of German, Scandinavian, and Dutch
College of Liberal Arts

SCAN 5001. Scandinavian Mythology. (3 cr; Stdnt Opt)
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 5002. The Icelandic Saga. (3 cr; Stdnt Opt)
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 5613. Contemporary Scandinavian Literature. (3 cr; Stdnt Opt)
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 5615. Ibsen and the Beginnings of Modern Drama. (3 cr; Stdnt Opt)
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 nonmajors.

SCAN 5616. Strindberg and the Drama in Revolt and Change. (3 cr; Stdnt Opt)
Strindberg as the master of naturalistic drama and the precursor of modernity in European and American theater. Close reading of plays with emphasis on dramatic structure and staging conventions in the context of modern theater. All readings in English for nonmajors.

SCAN 5701. Old Norse Language and Literature. (3 cr; Stdnt Opt)
Acquisition of a reading knowledge of Old Norse; linguistic, philological and literary study of Old Norse language and literature.

SCAN 5710. Old Norse Literature. (3 cr [max 9 cr]; Stdnt Opt. Prereq=5701 or equiv)
Topics may focus on a specific author, group of authors, genre, period, or subject matter. Topics specified in Class Schedule. Readings in English for nonmajors. May meet with 3670.

SCAN 5711. Old Icelandic Drama. (3 cr; Stdnt Opt)
Primary texts read in Old Norse. Critical literature about medieval Icelandic theatre. Topics specified in Class Schedule.

SCAN 5993. Directed Studies. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq=*, %, @)
Guided individual reading and study.

SCAN 8500. Seminar in Medieval Scandinavian Languages and Literature. (3 cr [max 9 cr]; Stdnt Opt)
Sample topics: [Volusunga Saga], studies in Snorri Sturluson’s [Edda], dialogue analysis in the Icelandic saga.

SCAN 8994. Directed Research. (1-3 cr [max 12 cr]; Stdnt Opt. Prereq=; may be taken as tutorial with *, %)

Scientific Computation (SCIC)
Institute of Technology

SCIC 8001. Parallel High-Performance Computing. (3 cr; Stdnt Opt. Prereq-Undergrad degree in field using sci comp or #)
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 cr; Stdnt Opt. Prereq-Undergrad degree in field using sci comp or #)
Basic issues in scientific visualization, visualization software, graphics, representation of scientific data, modeling, hardware for visualization, user interface techniques, output, commonly used algorithms and techniques for visualization, animation, information visualization, higher dimensional data, case studies, and examples of successful visualizations.

SCIC 8021. Advanced Numerical Methods. (3 cr; Stdnt Opt. Prereq-Undergrad degree in field using sci comp or #)

SCIC 8031. Modeling, Optimization, and Statistics. (3 cr; Stdnt Opt. Prereq-Undergrad degree in field using sci comp or IT grad student or #)
Interdisciplinary overview of mathematical modeling, optimization, and statistics techniques for scientific computation. Nonlinear equations and nonlinear optimization, statistics, control theory, modeling, and simulation.

SCIC 8041. Computational Aspects of Finite Element Methods. (3 cr; Stdnt Opt. Prereq-Undergrad 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. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq-Undergrad degree in field using sci comp or #)
Selected topics in interdisciplinary aspects of scientific computing.

SCIC 8199. Supercomputer Research Seminar. (1 cr [max 3 cr]; Stdnt Opt. Prereq-Undergrad degree in field using sci comp or #)
Series of seminars by distinguished lecturers.

SCIC 8333. FTE: Master’s. (1 cr; No grade.
Prereq-Master’s student, adviser and DGS consent)

SCIC 8444. FTE: Doctoral. (1 cr; No grade.
Prereq-Doctoral student, adviser and DGS consent)

SCIC 8594. Scientific Computation Directed Research. (1-4 cr [max 9 cr]; Stdnt Opt. Prereq-Undergrad degree in field using sci comp or #)
Course Descriptions

SW 5319. Adolescents: Norms, Culture, and Health. (2 cr; Stdnt Opt) 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 adolescence.

SW 5481. Child Abuse Prevention I: Research and Theory. (3 cr; Stdnt Opt. Prereq—Bachelor’s degree or #) Foundation of research/theory for level I child abuse prevention studies certificate.

SW 5482. Child Abuse Prevention II: Program Development, Evaluation, and Advocacy. (3 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq—Bachelor’s degree or #) 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 5512. Developing and Managing an Agency Budget. (1 cr; Stdnt Opt. Prereq—MSW student or #) 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 cr; Stdnt Opt. Prereq—MSW student or #) 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 cr; Stdnt Opt. Prereq—MSW student or #) Strategies to minimize risk to agency, its assets, and its resources. Relationship between mission, risk management, and board role. Agency internal systems, controls, and prevention strategies. Liability/insurance. Agency exposure to risk, including volunteer program management.

SW 5519. Mediation and Conflict Resolution. (3 cr; Stdnt Opt. Prereq—5519) Develop mediator skills for making informed decisions regarding the appropriateness of mediation for conflicts that frequently confront social worker practitioners such as divorce, neighborhood disputes, conflicts between parents and adolescents, conflicts between spouses, and conflicts between crime victims and offenders.

SW 5525. Global Perspectives on Social Welfare, Peace, and Justice. (3 cr; Stdnt Opt. Prereq—5525) Role of international social welfare in meeting basic human needs and promoting human rights, social justice, and peace. Theories, models, and social policies in different economic and political systems with emphasis on Third World nations.

SW 5705. Violence in Families. (3 cr; Stdnt Opt. Prereq—5707) Grad student or adult special or #) Prevention/intervention with perpetrators, survivors, and social institutions. Perpetration, effects on victims, social responses to family violence. Child abuse/ neglect of women/vulnerable adults. Roles of gender, race, culture, age, physical ability, and sexual orientation.


SW 5707. Interventions with Battered Women and Their Families. (2 cr; Stdnt Opt. Prereq—5705) Grad or non-degree seeking student or #) Current theories, research, and evaluation of interventions with battered women and their families. Focus on practice, e.g., direct work with social institutions, victim-survivors, and assailants and their families.

SW 5708. Substance Abuse and Social Work. (3 cr; Stdnt Opt. Prereq—Grad or non-degree seeking student or #) Assessment and intervention in situations involving substance abuse with special emphasis on cross cultural practices. Relationships of substance abuse to areas such as child welfare, mental illness, and violence within families are examined.

SW 5709. Applied Psychopharmacology for Human Service Professionals. (2 cr; A-F or Aud) Categories of psychoactive drugs. Medications to treat mental disorders. Legal drugs such as alcohol, nicotine, cocaine, and marijuana. What is occurring physiologically when someone takes a psychoactive drug.

SW 5711. Co-Occurring Addictive and Mental Health Disorders. (2 cr; A-F or Aud. Prereq—Cannot be taken for cr by MSW students) Mentally ill, chemically abusive, or dependent clients. Intervention, advocacy, education, and support for client and those who are part of his or her environment. Social, environmental, and multicultural factors. Meets partial state requirements for becoming licensed as an alcohol/drug counselor.

SW 5810. Seminar: Special Topics. (1-4 cr [max 10 cr]; Stdnt Opt) Topics specified in Class Schedule.

SW 5811. Social Work Ethics. (2 cr; Stdnt Opt. Prereq—8801, grad student or non-degree seeking student or #) Acquire knowledge base and develop skills required to identify ethical issues, resolve ethical dilemmas, and make ethical decisions within the context of the professional practice of social work. Values base and ethical standards of the profession and ethical decision-making models examined in-depth.


SW 5991. Independent Study in Social Work. (1-2 cr [max 4 cr]; Stdnt Opt) Independent study in areas of special interest to students and faculty.

SW 8010. Seminar: Field Practicum I. (1-8 cr [max 6 cr]; S-N or Aud. Prereq—8201) 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. (1-6 cr [max 6 cr]; S-N or Aud. Prereq—8010) 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. (1-8 cr [max 8 cr]; S-N or Aud. Prereq—Adv standing) Integrates classroom learning with direct experience of a social work field internship. Professional support/learning groups discuss issues raised in field placement. 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. (3-4 cr; S-N or Aud. Prereq—8030, MSW adv-standing) Internship within an agency or a specific population. Applied practical experience in specialized concentration area of practice.

SW 8051. Psychopathology and Social Work Practice. (3 cr; A-F only. Prereq—All foundation courses for full program or advanced standing or #) 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 8011. Social Policy and Delivery Systems for Child Welfare and Family Services. (3 cr; A-F only. Prereq—8211, advanced standing or #) Federal, state, and local policies related to contemporary child welfare system and system of social services to families. Current debates about policies, financing, and structure and organization of service delivery; process of influencing policy changes in children and family services.

SW 8013. Health and Mental Health Policy. (3 cr; A-F only. Prereq—8211, advanced standing or #) Factors affecting health and mental health status of variety of populations. Policies on organizational, local, state, and federal levels affecting health status; financing, and delivery of health and mental health services. Ethical issues embedded in policies, issues in need of policy development.

SW 8015. Economic Security of Disadvantaged Populations. (3 cr; A-F only. Prereq—8211, advanced standing or #) Impact of social policy on macro economic trends on economic security of disadvantaged populations. Focuses on antipoverty/welfare programs in the United States, although international perspective is used as well.

SW 8016. Special Topics in Social Policy. (1-9 cr [max 9 cr]; Stdnt Opt)

SW 8202. Social Work Methods: Practice With Families and Groups. (3 cr; A-F or Aud. Prereq–[Foundation curriculum, advanced standing] or [8201, 8202, adv standing] or #) Principles, applied practice of service delivery in human service settings. Social service theories and interventions. Social work assessment, planning, decision making, and evaluation. Social work ethics and values; social work as a profession. Field learning experiences or other coursework. Students design evaluation that incorporates 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 cr; A-F only. Prereq–[8601 or equiv] or #) 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. (1-6 cr; max 12 cr; No grade. Prereq–Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 16% for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr)
SW 8861. Theory and Model Development in Social Work. (3 cr; A-F only. Prereq–Soc wk PhD student or #) 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 cr; A-F only. Prereq–Soc wk PhD student or 2nd-yr MSW student or #) 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 cr; A-F only. Prereq–Soc wk PhD student or #) 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 cr; A-F only. Prereq–8871 or #) Methods/design of quasi-experiments, surveys, descriptive research. Grounded theory. Analysis of quantitative/qualitative data.

SW 8875. Research Practicum. (2 cr [max 6 cr]; S-N or Aud. Prereq–Soc wk PhD student or #) Experience in conduct of research, following completion of 8871 and 8872. Students work under faculty direction.

SW 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Social, Administrative, and Clinical Pharmacy (SACP)

SACP 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, [adviser, DGS] consent)

SACP 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, [adviser, DGS] consent)

SACP 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

SACP 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Plan A)

SACP 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; No grade)

Sociology (SOC)

Department of Sociology
College of Liberal Arts

SOC 5090. Topics in Sociology. (1-3 cr [max 9 cr]; Stdnt Opt. Prereq–Undergrad soc majors/minors must register A-F) Topics specified in [Class Schedule].

SOC 5455. Sociology of Education. (3 cr; Stdnt Opt. EDPA 5041. Prereq–1001 or equiv or #; soc majors/minors must register A-F) Structures/processes within educational institutions. Links between educational organizations and their social contexts, particularly as these relate to educational change.


SOC 8001. Sociology as a Profession. (1 cr [max 3 cr]; S-N or Aud. Prereq–Grad soc major) Sample topics: role of sociology in society, professional organizations, employment opportunities, professional ethics, and writing for publication or grant proposals.


SOC 8090. Topics in Sociology. (1-4 cr [max 12 cr]; Stdnt Opt. Prereq–#) Topics specified in [Class Schedule].

SOC 8091. Independent Study. (1-5 cr [max 20 cr]; Stdnt Opt) Independent study of an established 8xxx course.

SOC 8093. Directed Study. (1-4 cr [max 20 cr]; Stdnt Opt. Prereq–Grad soc major or #) Directed study in sociology.

SOC 8094. Directed Research. (1-4 cr [max 20 cr]; Stdnt Opt) May be used to fulfill sociology graduate requirement for advanced methodological training.

SOC 8101. Sociology of Law. (3 cr; Stdnt Opt) Sociological analysis of law and society. In-depth review of research on why people obey the law, of social forces involved in creation of law (both civil and criminal), procedures of enforcement, and impact of law on social change.

SOC 8111. Criminology. (3 cr; Stdnt Opt) 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. (5 cr; A-F or Aud. Prereq–[Grad student, 4148] or #) Intensive survey of psychopathology. Reference to criminal behavior, criminal justice system.

SOC 8190. Topics in Law, Crime, and Deviance. (3 cr [max 9 cr]; Stdnt Opt. Prereq–Grad student in sociology or #) Advanced topics in law, crime, and deviance. Social underpinnings of legal/illegal behavior and of legal systems.

SOC 8201. Social Stratification and Mobility. (3 cr; Stdnt Opt. Prereq–3811 or equiv or #) 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 cr; Stdnt Opt) Major theoretical debates. Classic and contemporary theoretical approaches to studying U.S. race relations; contemporary and historical experiences of specific racial and ethnic groups.

SOC 8221. Sociology of Gender. (3 cr; Stdnt Opt. NWOST 8202) 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 cr [max 12 cr]; Stdnt Opt) Comparative perspectives on racial inequality; race, class, and gender; qualitative research on gender stratification; stratification in post-communist societies; institutional change and stratification systems; industrialization and stratification. Topics specified in [Class Schedule].

SOC 8311. Political Sociology. (3 cr; Stdnt Opt) Social dimensions of political behavior and social origins of different forms of the state. How various theoretical traditions—Marxist, Weberian, and feminist-address key issues in political sociology, including citizenship, revolution, state formation, origins of democracy, welfare state, and fascism.

SOC 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

SOC 8390. Topics in Political Sociology. (3 cr [max 12 cr]; Stdnt Opt. Prereq–Soc grad student or #) 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 cr; Stdnt Opt) Sociological analysis of work, occupations, and labor markets, including contemporary theory and research. Course emphasis varies with instructor.

SOC 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

SOC 8490. Advanced Topics in Social Organization. (3 cr [max 12 cr]; Stdnt Opt. Prereq–#) 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].
Course Descriptions

SENG 5852. Quality Assurance and Process Improvement. (3 cr; A-F or Aud. Prereq—Grad SENG major) Theory and application of capability maturity model: process assessment, modeling, and improvement techniques. Life cycle issues related to development and maintenance of quality, safety, and security assurance; project management; and automated support environments. Group projects and case studies.

SENG 5861. Introduction to Software Architecture. (3 cr; A-F or Aud. 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 5900. Directed Study. (1-3 cr [max 3 cr]; Stdt Opt) Directed study/research in software engineering. Topics/semesters decided in collaboration with instructor.

SENG 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent) 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. (2-6 cr [max 12 cr]; Stdt Opt) Independent project arranged with faculty.

Soil, Water, and Climate (SOIL) Department of Soil, Water, Climate College of Food, Agricultural and Natural Resource Sciences

SOIL 5005. Lab and Field Techniques in Soil Science. (2 cr; A-F only. SoIL 4005. Prereq—2125) Field/lab experiences for analysis of soils/landscapes. Students describe soils along a hillslope sequence, take soil samples, and perform a suite of chemical, biological, and physical soil analyses. Lab analytical techniques, safety, quality control issues.

SOIL 5111. Practicum Internship in Precision Agriculture. (2-5 cr [max 5 cr]; S-N or Aud) Practical experience in precision agriculture in industry/business. Content and extent of work at the internship site is jointly decided by the instructor, host business representative, and student’s principal adviser.

SOIL 5125. Soil Science for Teachers. (1 cr; Stdt Opt. SoIL 1125, SOIL 2125) Basic physical, chemical, and biological properties of soil. Soil genesis classification and principles of soil fertility. WWW used for lab. Soil survey information used to make a land-use plan. Similar to 2125 with less emphasis on chemistry.

SOIL 5232. Vadose Zone Hydrology. (3 cr; Stdt Opt. Prereq—[Math 1271 or equiv], [Phys 102 or equiv]) Basic soil physical properties/processes governing transport of mass/energy in soils. Emphasizes water/solute transport through unsaturated root/vadose zones, their impact on subsurface hydrology and on water quality. Lectures, hands-on laboratory exercises, discussion of real world problems, problem solving.


SOIL 5460. Special Topics in Land and Atmospheric Science. (1-4 cr [max 6 cr]; Stdt Opt. Prereq—Grad SENG) Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.

SOIL 5515. Soil Genesis and Landscape Relations. (3 cr; A-F or Aud. Prereq—2125 or #) Basic soil morphology and soil profile descriptions; pedogenic processes and models of soil development; soil geomorphology, hydrology, and hillslope processes; digital spatial analysis; soil classification; soil surveys and land use; soil geography.

SOIL 5555. Wetland Soils. (3 cr; A-F or Aud. Prereq—ESPM 5555. Prereq—1125 or 2125 or equiv or #; 4411 recommended) 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.


SOIL 5711. Forest Soils. (2 cr; Stdt Opt. Prereq—2125 or 2123) Factors affecting tree growth, estimation, modification, and management effects on site productivity; regeneration.

SOIL 6005. Supervised Classroom or Extension Teaching Experience. (2 cr; S-N or Aud. AGRO 6005, BBE 6005, HORT 6005, PLPA 6005. Prereq—#) 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. (1-5 cr [max 6 cr]; S-N or Aud) Research or intellectual areas in soil science or climatology not covered in regular courses. Topics vary; contact department for current offerings.


SOIL 8128. Seminar in Soils. (1 cr [max 2 cr]; S-N or Aud) Students present an open seminar on an advanced topic and attend seminars presented by other graduate students.

SOIL 8195. Research Problems in Soils. (1-5 cr [max 10 cr]; Stdt Opt. Prereq—Grad major in soil sci or related field) Directed research on special topics of interest in soil science or climatology supervised by individual or small groups of faculty.


SOIL 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

SOIL 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

SOIL 8510. Advanced Topics in Pedology. (2-4 cr [max 12 cr]; A-F or Aud. Prereq—5515) 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 cr; A-F or Aud. Prereq—CE 8541, CE 8541, 5311 or CE 4541) 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.

SOIL 8550. Teaching Experience. (1 cr [max 6 cr]; S-N or Aud. Prereq—Grad major in soil sci or related field) Provides students with practical experiences in instructional techniques in a university setting.

SOIL 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

SOIL 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

SOIL 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)
Spanish (SPAN)

Department of Spanish and Portuguese Studies
College of Liberal Arts

SPAN 5106. The Literature of the Reconquest and Feudal Spain. (3 cr; Stdnt Opt; Prereq-three 3xxx or 5xxx literature courses in Spanish or Portuguese)

The major literary genres developed in Spain from the Reconquest to 1502, with reference to the crucial transformations of the Middle Ages, including primitive lyric, epic, clerical narrative, storytelling, debates, collegiate chronicles, "exempla," and the Celestina (1499-1502).

SPAN 5107. The Literature of the Spanish Empire and Its Decline. (3 cr; Stdnt Opt; Prereq-three 3xxx or 5xxx literature courses in Spanish or Portuguese)

Major Renaissance and Baroque works of the Spanish Golden Age (16th- and 17th-century poetry, nonfiction prose, novel, drama) examined against the historical background of internal economic decline, national crisis, and ideological apparatus developed by the modern state.

SPAN 5108. Don Quixote. (3 cr; Stdnt Opt; Prereq-three 3xxx or 5xxx literature courses in Spanish or Portuguese)

Analysis of Cervantes' [Don Quixote] in its sociohistorical context, emphasis on the novel's reception from the romantic period to postmodern times.

SPAN 5109. The Crisis of the Old Regime: Spanish Literature of the Enlightenment and Romanticism. (3 cr; Stdnt Opt; Prereq-three 3xxx or 5xxx literature courses in Spanish or #)

Major literary works and intellectual movements and conflicts represented in written culture, of the 18th and early 19th centuries (1680-1845), examined as expressions of the long crisis of Spain's Old Regime and the rise of bourgeois liberalism.

SPAN 5110. Discursive Formations at the Threshold of 20th-Century Spain. (3 cr; Stdnt Opt. Prereq-three 3xxx or 5xxx literature courses in Spanish or #)

Theory and representative examples of the realist/naturalist novel (Galdós, Pardo Bazán) in the context of its antecedents ("costumbrismo"), opposites (the naturalist novel (Galdós, Pardo Bazán) in the context of its antecedents ("costumbrismo"), opposites (the naturalist novel (Galdós, Pardo Bazán) in the context of its antecedents ("costumbrismo"), opposites (the idealist/sentimental novel), and turn-of-the-century transformations of the Middle Ages, including primitive lyric, epic, clerical narrative, storytelling, debates, collegiate chronicles, "exempla," and the Celestina (1499-1502).

SPAN 5111. Contemporary Spanish Literature. (3 cr; Stdnt Opt; Prereq-three 3xxx or 5xxx literature courses in Spanish or #)


SPAN 5221. Spanish Drama of the 17th-Century. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or Portuguese)

Poetics surrounding public theater in 1600s. Analyses of texts in light of current approaches to comedy and related theatrical genres (e.g., autosacramentales).

SPAN 5316. Spanish Picaresque Narratives. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or Portuguese)


SPAN 5325. Caribbean Literature: An Integral Approach. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or #)

Literature of Spanish-speaking Caribbean. Emphasizes historical legacy of slavery, African culture, and independence struggles.

SPAN 5526. Colonial Discourse in Spanish American Writing. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or Portuguese)

Discourse production in Spanish America between 1492 and 1700. Conquest and colonial writing/counterwriting. Historical origin, evolution, and impact of cultural, political, and socioeconomic factors.

SPAN 5527. Nineteenth Century Latin America: Enlightened Thought, Nation Building, Literary, Cultural Discourse. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx literature courses in Spanish or #)


SPAN 5528. Latin American Cultural Integration in the Neocolonial Order. (3 cr; Stdnt Opt. Prereq-three 3xxx or 5xxx literature courses in Spanish or #)


SPAN 5531. Hispanic Literature of the United States. (3 cr; Stdnt Opt. Prereq-three 3xxx or 5xxx literature courses in Spanish or Portuguese)

Interdisciplinary approach providing a framework for deconstructing issues of national identity, marginalization, and gender. U.S. Hispanic theatre/literature and its ethnic diversity, regional variations, cultural links, and scope of its genres.

SPAN 5701. History of Ibero-Romance. (3 cr; Stdnt Opt. Prereq-Thirty 3xxx or 5xxx Spanish linguistics courses or #)

Origins and developments of Ibero-Romance languages; evolution of Spanish, Portuguese, and Catalan.

SPAN 5711. The Structure of Modern Spanish Phonology. (3 cr; Stdnt Opt. Prereq-Thirty 3xxx or 5xxx linguistics courses in Spanish or #)

Formulating and evaluating a phonological description of Spanish. Approaches to problems in Spanish phonology within metrical, autosegmental, and lexical phonological theories.

SPAN 5713. The Structure of Modern Spanish Syntax. (3 cr; Stdnt Opt. Prereq-Thirty 3xxx or 5xxx linguistics courses in Spanish or #)

Study and analysis of the principal constructions found in the syntax of Spanish.

SPAN 5714. Theoretical Foundations of Spanish Pragmatics. (3 cr; Stdnt Opt. Prereq-Thirty 3xxx or 5xxx linguistics courses in Spanish or #)

Linguistic types/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 cr; Stdnt Opt)

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 5716. Structure of Modern Spanish: Pragmatics. (3 cr; Stdnt Opt)


SPAN 5717. Spanish Sociolinguistics. (3 cr; Stdnt Opt. Prereq-Two 3xxx or 5xxx linguistics courses in Spanish or #)

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 cr; Stdnt Opt. Prereq-Two 3xxx or 5xxx linguistics courses in Spanish or #)

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 cr; A-F or Aud. Prereq-[5711, honors] or grad student or #)

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 cr; Max 9 cr; Stdnt Opt. Prereq-Thirty 3xxx or 5xxx literature courses in Spanish or Portuguese)

Crucial moment or characters, works, or events marking beginning of new phase in literary/cultural landscape.

SPAN 5920. Topics in Spanish-American Studies. (3 cr; Max 9 cr; Stdnt Opt. Prereq-Thirty 3xxx or 5xxx literature courses in Spanish or Portuguese)

Problems in Hispanic linguistics; a variety of approaches and methods.

SPAN 5970. Directed Readings. (1-4 cr [max 9 cr]; Stdnt Opt. Prereq-MA or PhD candidate, #, %, @)

Students must submit reading plans for particular topics, figures, periods, or issues. Readings in Spanish and/or Spanish-American subjects.

SPAN 5985. Sociolinguistic Perspectives on Spanish in the United States. (3 cr; Stdnt Opt. Prereq-Thirty 3xxx or 5xxx linguistics courses in Spanish or #)

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. (1-4 cr [max 9 cr]; Stdnt Opt. Prereq-#, %, @)

SPAN 5991. The Acquisition of Spanish as a First and Second Language. (3 cr; Stdnt Opt. Prereq-Three 3xxx or 5xxx linguistics courses in Spanish or #)

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.
Course Descriptions

SPAN 8100. Research in Sociohistorical Approaches to Spanish Literature. (3 cr [max 9 cr]; Stdnt Opt. Prereq—5xxx courses in Spanish 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 cr [max 9 cr]; Stdnt Opt. Prereq—5xxx courses in Spanish 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 8300. The Construction of Spanish Literary History. (3 cr [max 9 cr]; Stdnt Opt. Prereq—Two 5xxx courses in Spanish 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 cr; Stdnt Opt. Prereq—3106, 5107 or 5xxx course in Portuguese) Cultural reappraisal of the late Middle Ages by reference to two Spanish masterpieces: the Archpriest’s [Book of True Love] and Rosas’ [La Celestina] (1499-1502). Emphasizes historical function of varied genres, motifs, and sources adapted by the authors.

SPAN 8333. FTE: Master’s. (1 cr; No grade. Prereq—Master’s student, adviser and DGS consent)

SPAN 8444. FTE: Doctoral. (1 cr; No grade. Prereq—Doctoral student, adviser and DGS consent)

SPAN 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

SPAN 8710. Seminar in Spanish and Portuguese Phonology. (3 cr [max 9 cr]; Stdnt Opt. Prereq—5711, Ling 5302 or #) Critical examination of readings and research on specific topic.

SPAN 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

SPAN 8888. Thesis Credits: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq—Max 18 cr per semester or summer; 24 cr required)

SPAN 8900. Spanish Seminar. (3 cr [max 9 cr]; Stdnt Opt. Prereq—Span 5xxx series required for MA or #) 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 cr [max 9 cr]; Stdnt Opt) Sources and procedures that have given rise to institutionalizations of Spanish-American literary history. Evaluation and review of epistemological principles and assumptions in theory of literary criticism and histories of literature.

SPAN 8960. Workshop: Research in Hispanic Cultural Issues. (3 cr [max 9 cr]; A-F or Aud. Prereq—Reading knowledge of Spanish and Portuguese) 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 cr [max 9 cr]; Stdnt Opt. 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)

Department of Spanish and Portuguese Studies

College of Liberal Arts

SPPT 5930. Selected Topics in Hispanic and Lusophone Cultural Discourse. (3 cr [max 9 cr]; A-F or Aud. Prereq—Reading knowledge of Spanish and Portuguese) Cultural discourses in Spanish- and Portuguese-speaking areas. Historical intersections/divergences. Taught in Spanish or Portuguese, and in English when English-speaking students register. Taught in Spanish or Portuguese.

SPPT 5999. The Teaching of College-Level Spanish: Theory and Practice. (3 cr; Stdnt Opt. Prereq—Grad or #) 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 cr [max 9 cr]; Stdnt Opt. Prereq—Three 5xxx SPAN or PORT courses) Advanced research in methods of analysis of cultural products, including but not limited to literature. Emphasizes historical, ideological, and theoretical frameworks within which representative texts/events may be interpreted.

SPPT 8920. Critical Theory Seminar. (3 cr [max 9 cr]; Stdnt Opt. Prereq—Grad student) Critical theory as it intersects with cultural issues related to Hispanic/Lusophone worlds. Content varies according to faculty expertise, but remains within geopolitical parameters of nations/regions of Spanish/Portuguese-speaking worlds.


Speech-Language-Hearing Sciences (SLHS)

College of Liberal Arts


SLHS 5501. Fluency and Phonological Disorders. (3 cr; Stdnt Opt. Prereq—Grad student or #) Description, nature, and treatment of fluency disorders in children/adults. Involvement in therapeutic/research activities.


SLHS 5603. Language and Cognitive Disorders in Children. (3 cr; Stdnt Opt. Prereq—[3303 or CDIS 3303 or equiv or grad student or #) Language assessment, teaching procedures used with children/adolescents. Procedures apply to children who face language disabilities such as developmental delays, autism, learning disabilities.


SLHS 5606. Introduction to Augmentative and Alternative Communication. (3 cr; Stdnt Opt) Description of the range of augmentative and alternative communication applications for persons with developmental and acquired disabilities.

SLHS 5607. Electronic Communication Aids. (3 cr; Stdnt Opt. Prereq—5606 or #)
FOR DEFINITIONS OF COURSE NUMBERS, SYMBOLS, AND ABBREVIATIONS, SEE PAGE 214.
Statistics (STAT)

School of Statistics
College of Liberal Arts

STAT 5021. Statistical Analysis. (4 cr; Stdnt Opt. + ANSC 2111, ESM 3012, STAT 3011. Prereq: STAT 3011, College algebra or #; Stat course recommended) Intensive introduction to statistical methods for graduate students needing statistics as a research technique.


STAT 5201. Sampling Methodology in Finite Populations. (3 cr; Stdnt Opt. Prereq-3011 or 5021 or 5101 or #) Simple random, systematic, stratified, unequal probability sampling. Ratio, model based estimation. Single stage, multistage, adaptive cluster sampling. Spatial sampling.


STAT 5601. Nonparametric Methods. (3 cr; Stdnt Opt. Prereq-3022 or 4102 or 5021 or 5102 or #) Order statistics. Classical rank-based procedures (e.g., Wilcoxon, Kruskal-Wallis). Goodness of fit. Topics may include smoothing, bootstrap, and generalized linear models.

STAT 5931. Topics in Statistics. (3 cr; Stdnt Opt) Topics vary according to student needs and available staff.

STAT 5932. Topics in Statistics. (3 cr; Stdnt Opt) Topics vary according to students’ needs and available staff.

STAT 5993. Tutorial. (1-6 cr; max 12 cr; Stdnt Opt. Prereq—#) Directed study in areas not covered by regular offerings.


STAT 8052. Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling. (4 cr; A-F or Aud. Prereq-8051 or #) Classical experimental designs, mixed effect models. How to recognize designs. How to design/analyze experiments. ANOVA for factorial designs, contrasts, multiple comparisons, complete/incomplete block designs, unbalanced data, confounding, fractional factorials, response surfaces, nested designs, split-plots, random effects, mixed effects, repeated measures, longitudinal data.


STAT 8055. Applied Project. (2 cr; S-N only. Prereq-[8054, 8051] or #) Collaborative applied statistical practice with a member of University community, including consulting, problem solving, presentation/document of results.


STAT 8121. Theories of Inference. (3 cr; Stdnt Opt. Prereq-8102, 8112, or #) Topics vary according to instructor and student interests. Sample topics: conditional distributions and sufficiency, estimation theory, comparison of statistical inference theories; Neyman-Pearson hypothesis-testing theory and its extensions; confidence regions; invariance; nonparametric, sequential, likelihood, and Bayesian inference.

STAT 8131. Predictive Inference. (3 cr; Stdnt Opt. Prereq-8112 or equiv) Traditional frequentist and nontraditional predictive approaches. Bayesian predictive methods and the purpose for which data are used. Theoretical apparatus discussed using a variety of common statistical paradigms. Model selection, comparisons and allocation, perturbation analysis and control.


STAT 8151. Statistical Decision Theory. (3 cr; S-N or Aud. Prereq-8112, Math 6856) Comparison of inferential methods in statistics (including risk comparison, minimaxity, and admissibility) using Wald’s formulation of decision. Formal and proper Bayes rules compared with frequentist inferences. Topics may vary depending on instructor.

STAT 8171. Sequential Analysis. (3 cr; Stdnt Opt. 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 cr; S-N or Aud. Prereq-8112) Sampling theory; stratified sampling, ratio estimators, cluster sampling, double sampling, superpopulation theory, Bayesian methods, multiple imputation, nonresponse.

STAT 8311. Linear Models. (4 cr; Stdnt Opt. Prereq-Linear algebra, 5102 or 8102 or #) 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 cr; Stdnt Opt. 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 cr; Sldnt Opt. Prereq-8311)
Optimal, Bayes, and nonlinear designs; algorithms for computing designs; sample size; recent developments.

**STAT 8321.** Regression Graphics. (3 cr; Sldnt Opt. Prereq-8311)

**STAT 8333.** FTE: Master’s. (1 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

**STAT 8401.** Topics in Multivariate Methods. (3 cr; Sldnt Opt. Prereq-8311)

**STAT 8411.** Multivariate Analysis. (3 cr; Sldnt Opt. Prereq-8512)
Multivariate normal distribution. Inference on the mean, covariance, and correlation and regression coefficients; related sampling distributions such as Hotelling’s $T^2$-squared and Wishart distributions. Multivariate analysis of variance. Principal components and canonical correlation. Discriminant analysis.

**STAT 8421.** Theory of Categorical Data Analysis. (3 cr; Sldnt Opt. Prereq-8062 or #)

**STAT 8444.** FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

**STAT 8501.** Introduction to Stochastic Processes with Applications. (3 cr; Sldnt Opt. Prereq-8510 or 8101)
Markov chains in discrete and continuous time, renewal processes, Poisson process, Brownian motion, and other stochastic models and countered in applications.

**STAT 8511.** Time Series Analysis. (3 cr; Sldnt Opt. Prereq-8510 or 8111 or #)

**STAT 8666.** Doct Pr-Thesis Cr. (1-6 cr [max 12 cr]; No grade. 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)

**STAT 8701.** Computational Statistical Methods. (3 cr; Sldnt Opt. Prereq-8311, programming exper)
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 cr; Sldnt Opt. Prereq-8701 or #)
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 cr; Sldnt Opt. 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 likelihood and prior densities in Bayesian analysis.

**STAT 8777.** Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**STAT 8801.** Statistical Consulting. (2-3 cr [max 3 cr]; S-N or Aud. Prereq-Grad stat major or #)
Principles of effective consulting/problem-solving, meeting skills, reporting. Aspects of professional practice behavior, ethics, continuing education.

**STAT 8811.** Statistical Consulting Practicum. (3 cr [max 12 cr]; S-N or Aud. Prereq-Statistics grad student or #)
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 cr; S-N only. Prereq-Statistics grad student, %)
Industrial work assignment using advanced statistical techniques. Grade based on final report and presentation covering work assignment.

**STAT 8888.** Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

**STAT 8900.** Student Seminar. (1 cr [max 2 cr]; S-N or Aud. Prereq-Statistics graduate student)
Preparation or presentation of seminar on statistical topics.

**STAT 8913.** Literature Seminar. (1 cr [max 4 cr]; S-N only. Prereq-Statistics grad major or #)
Students will read, present, discuss, and critique current literature/research.

**STAT 8931.** Advanced Topics in Statistics. (3 cr [max 12 cr]; Sldnt Opt)
Topics vary according to student needs and available staff.

**STAT 8932.** Advanced Topics in Statistics. (3 cr [max 12 cr]; Sldnt Opt)
Topics vary according to student needs and available staff.

**STAT 8933.** Advanced Topics in Statistics. (3 cr [max 12 cr]; Sldnt Opt)
Topics vary according to student needs and available staff.

**STAT 8992.** Directed Readings and Research. (1-6 cr [max 12 cr]; Sldnt Opt. Prereq-#)
Directed study in areas not covered by regular offerings.

**Stem Cell Biology (SCB)**
**SCB 5051.** Stem Cell Biology Practical Training Module. (1 cr; S-N only. Prereq-Acceptance into stem cell biology master’s program)

**SCB 5054.** Stem Cell Institute Research Seminar and Journal Club. (1 cr [max 3 cr]; S-N only. Prereq-Acceptance into stem cell biology master’s program or PhD minor program or #)
Students attend weekly Stem Cell Institute research seminars and journal clubs, write brief summaries, participate in journal club, and present original research paper.

**Studies in Cinema and Media Culture (SCMC)**
Department of Cultural Studies and Comparative Literature
College of Liberal Arts
**SCMC 5001.** Critical Debates in the Study of Cinema and Media Culture. (4 cr; Sldnt Opt)
Basic concepts in historical/international debates over production/reception of media culture. Emphasizes cinema. Advanced orientation toward intellectual traditions that inform contemporary scholarship.

**SCMC 5002.** Advanced Film Analysis. (4 cr; A-F only)
Application of textual analysis to the reading of a film. Students work collaboratively to discern and interpret all components, including vocal elements of what the film says and how it says it.

**SCMC 5993.** Directed Study. (1-3 cr [max 6 cr]; Sldnt Opt)
Guided individual reading or study.

**Studies of Science and Technology (SST)**
Institute of Technology
**SST 8000.** Colloquium. (1.5 cr [max 3 cr]; S-N or Aud. Prereq-Grad SST minor)
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 cr; Sldnt Opt. Prereq-HSci 8111 or [Phil 8601 or Phil 8602 or Phil 8605] or #)
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 cr; Sldnt Opt. Prereq-HSci 8111 or [Phil 8601 or Phil 8602 or Phil 8605] or #)
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 cr; Sldnt Opt. Prereq-HSci 8111 or [Phil 8601 or Phil 8602 or Phil 8605] or #)
Students participate in ongoing research in history, philosophy, and social study of biological and biomedical sciences, and prepare and present research papers.
Course Descriptions

SST 8400. Seminar: Science, Technology, and Society. (3 cr; Stdt Opt. Prereq–HSCI 8111 or [Phil 8501 or Phil 8602 or Phil 8605] or #) 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 cr [max 6 cr]; Stdt Opt. Prereq–PHIL 8660) Recent work; theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

SUMERIAN (SUM)

Department of Classical and Near Eastern Studies

College of Liberal Arts


SUM 5012. Elementary Sumerian II. (3 cr; Stdt Opt. Prereq–5011) Reading from classical literary and historical texts.

SURGERY (SURG)

Department of Surgery

Medical School

SURG 8200. Clinical Surgical Problems in Management. (3 cr; A-F or Aud. Prereq–Grad surg major) Diagnostic and management instruction in all phases of clinical surgery, inpatient and outpatient.

SURG 8201. Surgery Roentgenological Pathology Conference. (1 cr; A-F or Aud. Prereq–Grad surg major) 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 cr; A-F or Aud. Prereq–Grad surg major) Graduate students undertake original investigation of problems in either clinical or surgical surgery.

SURG 8203. Surgery Complications and Research Conference. (1 cr; A-F or Aud. Prereq–Grad surg major) Evaluation of surgical patients, including postoperative course. Discussion and critical evaluation of current research problems.

SURG 8207. Transplantation Conference. (1 cr; A-F or Aud. Prereq–Grad surg major) Interdepartmental discussion and evaluation of current clinical and research problems.

SURG 8293. Applied Statistics. (1 cr; S-N or Aud. Prereq–Grad student in [surgery or experimental surgery or health sciences] or) 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 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

SURG 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

SURG 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

SURG 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

SURG 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

Sustainable Agricultural Systems (SAGR)

Department of Agronomy and Plant Genetics

College of Food, Agricultural and Natural Resource Sciences

SAGR 8010. Colloquium in Sustainable Agriculture. (2 cr; A-F or Aud. Prereq–Coursework in biological or social sciences that provides intro to ag practices or issues) 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 8020. Field Experience in Sustainable Agriculture. (1-4 cr [max 3 cr]; S-N or Aud. Prereq–Coursework in biological or social sciences that provides intro to ag practices or issues) 3- to 14-week internship with growers or organizations working with sustainable agriculture issues. Students analyze issues in final written project, oral seminar.

Teaching English as a Second Language (TESL)

Institute of Linguistics, ESL, and Slavic Languages and Literatures

College of Liberal Arts

TESL 5010. Academic Writing in TESOL. (1 cr; S-N or Aud. Prereq–[5721, grad ESL student] or #) Research writing conventions in the profession. University rules on ethical use of human subjects, research paper rhetorical structure, literature sources/searches, literature review coherence, hedging markers, basic research methods, research result reporting. APA-formatted bibliographies, writing strategies.

TESL 5401. Language Analysis for Teachers of English as a Second Language. (4 cr; Stdt Opt. Prereq–LING 5001 or Ling 5001 or #) Overview of the structure of the English language geared to the needs of teachers of English to speakers of other languages. Study the structures of English from the point of view of second-language speakers as well as native speakers. Phonetics, phonology, morphology, and some aspects of the syntax of the English language. Part of a two-course sequence.

TESL 5402. Language Analysis for Teachers of English as a Second Language. (4 cr; Stdt Opt. Prereq–5401, Ling 5001) Overview of the structure of the English language geared to the needs of teachers of English to speakers of other languages. Study the structures of English from the point of view of second-language speakers as well as native speakers. More complex structures of English syntax, as well as English semantics, pragmatics, and discourse structures. Second in a two-course sequence.


TESL 5722. Practicum in Teaching English as a Second Language. (6 cr [max 12 cr]; S-N or Aud. Prereq–[5401 or 5401] or [5402 or 5402] or 5721, ESL major or ESL minor) or #) Observation of, and practice in, teaching English as a second language to adults at college or university level.

TESL 5723. Materials for Teaching English as a Second Language. (3 cr; Stdt Opt. Prereq–5721, 5722) or #) Principles for evaluating/preparing materials for teaching second languages as applied especially to English as a second language.

TESL 5724. Intro to Language Assessment. (3 cr; A-F or Aud) How to engage in meaningful, appropriate, and fair second-language assessment practices; interpret test results; and construct new forms of assessment.


TESL 5900. Topics in Second Language Learning and Teaching. (3 cr [max 12 cr]; Stdt Opt) Topics vary. See Class Schedule.


TESL 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)

TESL 8751. Genre Analysis for Second Language Learning. (3 cr; Stdt Opt. Prereq–5401 or 5402 or 5402 or #) Critical review of literature on genre analysis. Languages for specific purposes. Focuses on English. Registers used in fields such as engineering, nursing, and business. Students gather data, write research reports.

TESL 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])
Theatre Arts (TH)

Department of Theatre Arts and Dance

College of Liberal Arts

TH 5100. Theatre Practicum. (1-4 cr [max 20 cr]; Stdnt Opt. Prereq—, %; 4 cr of 3100 for undergrads)
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 cr; A-F or Aud. Prereq—[3222, 3711 or 3712] 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 cr; A-F or Aud. Prereq—[3222, 3711 or 3712] 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 5179. Text and Performance. (3 cr; A-F or Aud. Prereq—[3222, 3771 or 3712] or grad student) How to read texts toward performance in various dramatic/ nondramatic material. Method of unlocking metaphoric energy of texts. Vocabulary/techniques of analysis that transform text from page to stage.

TH 5181. Blacks in American Theatre. (3 cr; Stdnt Opt. =AFRO 5181) Historical survey of significant events in the development of American Black theatrical tradition; essays, plays, playrights, and theatres from early colonial references to Black Arts Movement.

TH 5182. Contemporary Black Theatre: 1960–Present. (3 cr; Stdnt Opt. =AFRO 5182) Essays, plays, playrights, and theatres that have contributed to contemporary Black theatre. From the beginning of the Black Arts Movement to the present.

TH 5330. Comedy: Advanced Physical Performance Studio. (3 cr; A-F only. Prereq—3331, #) Mechanics of creating physical comedy. Focuses on process using clown, Comedia 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 cr [max 6 cr]; A-F only. Prereq—[3322, 3331, grad student] or #) Specific tragic/poetic training paradigms in physical theater employed by Stanislavski, Grotowski, Brecht, Lecoq, etc. Psychological, emotional, technical, and physical exercises in Greek tragedy, Shakespeare, Melodrama, operatic characterization, Brecht. Original tragic/poetic work.

TH 5355. Puppetry: Techniques and Practice in Contemporary Theatre. (3 cr; Stdnt Opt. Prereq—[3513 or 3511], # or grad student) Fundamentals of puppetry 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 5500. Theatre Design Practicum. (1-3 cr [max 20 cr]; Stdnt Opt. Prereq—3515, #, %) Individual projects in production of approved plays as a designer of scenery/properties, costumes, lighting, or sound. (See 5510 for other creative practicums.)


TH 5515. Design Composition and Collaboration. (3 cr; Stdnt Opt. Prereq—grad or 3515, 3711, #) Classical composition of art and its application to stage design and directing through the collaborative process.

TH 5520. Scene Design. (3 cr [max 9 cr]; Stdnt Opt. Prereq—3515 or grad or #) Conceiving/communicating design ideas in both two-dimensional sketches and three-dimensional models for theatre and allied venues. Drafting.

TH 5530. Costume Design. (3 cr [max 9 cr]; Stdnt Opt. Prereq—3515 or grad or #) Theory and process of costume design for theatrical productions (e.g., dance, opera, film) through hypothetical productions.

TH 5540. Lighting Design for the Theatre. (3 cr [max 9 cr]; Stdnt Opt. Prereq—3515 or grad or #) 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 cr; Stdnt Opt. Prereq—3515 or grad or #) The lighting technician’s skills and crafts: equipment, techniques, control operation, wiring, and maintenance.

TH 5550. Video Project. (3 cr [max 6 cr]; Stdnt Opt. Prereq—4550 or 4560 [preferred], #) Students participate in a video-shoot project serving in various positions, including camera operator, gaffer, grip, audio engineer, and possibly director and director of photography.

TH 5551. Editing and Post Production for Video and Film. (3 cr; Stdnt Opt. Prereq—#) Students manipulate software and other technologies used in post production. Editing, audio, image manipulation.

TH 5553. Video Production Design and Aesthetics. (3 cr; Stdnt Opt. Prereq—4553 or #) Use of technologies in video/film in making a statement or communicating an idea/emotion. Creativity, sensitivity to an audience. Students explore different creative uses of technologies/media.

TH 5554. Multimedia Production for Live Performance. (3 cr; Stdnt Opt. 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 cr; Stdnt Opt. Prereq—4555, #) Miking/recording techniques specific to music/dramatic dialogue. Recording in 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 5558. Audio Systems Analysis and Installation. (3 cr; Stdnt Opt. Prereq—4555 or #) Analyzing, designing, developing specifications, and installing sound systems. Students work from client program lists, with given resources and given spaces, to arrive at best possible audio system. Hands-on experience.

TH 5559. Sound Design for Performance. (3 cr; Stdnt Opt. Prereq—4555 or #) Audio technology/psychology, their impact on audience in a performance. Communication, design process, psychoacoustics, script analysis.


TH 5580. Costume Technology. (3 cr [max 15 cr]; Stdnt Opt. Prereq—3515 or grad or #) Fabric enhancement techniques, masks, wig-making, millinery, makeup prosthetics, pattern drafting, and draping. Topics specified in Class Schedule.

TH 5590. Theatre Technology Practicum. (1-3 cr [max 15 cr]; Stdnt Opt. Prereq—3515, #, %; 4 cr max for undergrads) Individual creative project in technology/craft area of theatre. Practical work in costume, lighting, makeup, props, scenery, sound, or theatre management.


TH 5713. Theory and Practice of Performance. (3 cr; A-F or Aud. Prereq—[3171, 3712, 4177 or 4178], 5711 or grad student) Traditions of thinking about theatre, from ancient Greece to present, in practical applications. Focuses on epistemological significance of performance in current critical practices of postmodernism, psychoanalysis, and phenomenology.

TH 5714. The Drama of Myth. (3 cr; Stdnt Opt. Prereq—[1322, 3711, 3712] or #) Role of myth in performance. Students choose a myth and study its iconography, tracing its journey in painting, sculpture, music, and other texts that accumulated around it throughout history. Course culminates in creation of a non-traditional performance score that embodies/reveals energies of contemporary culture within ancient metaphor of a chosen myth.

TH 5715. Actor-Director Collaboration. (3 cr; Stdnt Opt. Prereq—[3222, 3711, 3712] or #) Applying advanced acting and directing technique to an artistic, collaborative process that promotes flexibility and creativity. Actors and directors are exposed to a challenging range of roles, styles, and scenes.


Course Descriptions

TH 5725. The Alchemy of an Object. (3 cr; Stdnt Opt. Prereq-[[322, 3171, 3172] or #] and grad student)
Stage object as vehicle for investigating role of drama in culture from Middle Ages to present. Object as first connection that dramatic text makes with material world. Object as culturally inscribed link between language of drama and world of action in a historically given moment. Object as metaphor of cultural praxis.

TH 5753. Text Analysis for Drama. (5 cr; Stdnt Opt. Prereq-5711 or grad)
Tools for intensive textual analysis for advanced directors/designers. Traditional, Aristotelian analysis and contemporary approaches covered through theories/writings of Bertolt Brecht and Howard Barker.

TH 5760. Advanced Stage Management. (2-3 cr [max 3 cr]; Stdnt Opt. Prereq-5716 or 5761. #; 4 cr max for undergrads)
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. (2-4 cr [max 8 cr]; Stdnt Opt. Prereq-5718) Students apply non-profit arts management theories/techniques through 5718. Marketing/audience development, fundraising and grant writing strategies, and financial management of a nonprofit arts organization.

TH 5950. Topics in Theatre. (1-4 cr [max 20 cr]; Stdnt Opt)
Topics specified in Class Schedule.

TH 5993. Directed Study. (1-5 cr [max 20 cr]; Stdnt Opt. Prereq-6 Th cr, #, %, G) Guided individual reading or study.

TH 6100. Theatre Practicum. (1-4 cr [max 20 cr]; Stdnt Opt. Prereq-#, %) Individual creative projects in production of approved plays as an actor, director, dramaturg, or playwright (see 5800 for design practicums).

TH 6102. Theatre Historiography. (3 cr; Stdnt Opt) Current trends in historiography; research strategies and methods.

TH 6111. History and Theory of Western Theatre: Ancient World and Early Medieval. (3 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6112. History and Theory of Western Theatre: Medieval Through Renaissance. (3 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6113. History and Theory of Western Theatre: National Theatres to the French Revolution. (3 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6114. History and Theory of Western Theatre: Enlightenment Through Naturalism. (3 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6115. History and Theory of Western Theatre: 20th Century Through World War II. (3 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 6116. History and Theory of Western Theatre: 20th Century From 1945 to the Present. (3 cr; Stdnt Opt) History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 8120. Seminar. (3 cr [max 12 cr]; Stdnt Opt) Selected research in various theatre fields and periods. Sample topics: Border Crossings--Theatre History and Representation; The Theatre and Drama of the Third Reich, 1927-1944.

TH 8333. FTE: Master's. (1 cr; No grade. Prereq- Master's student, adviser and DGS consent)

TH 8444. FTE: Doctoral. (1 cr; No grade. Prereq- Doctoral student, adviser and DGS consent)

TH 8500. Theatre Design Practicum. (1-3 cr [max 20 cr]; Stdnt Opt. Prereq-#. %) 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 8590. Theatre Technology Practicum. (1-3 cr [max 20 cr]; Stdnt Opt. Prereq-#. %) Individual creative projects in the technology or craft of costume, lighting, makeup, props, scenery, sound, or theatre management.

TH 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq-Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 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)

TH 8711. Theory and Practice of the Modern Stage Director. (3 cr; Stdnt Opt) Survey of principal stage directors (e.g., Saxe-Meiningen, Meyerhold, Brecht, Streihler, Mchnichke, Brook) and their theories and practices from 1871 to today using books, journals, firsthand accounts, and videotapes.

TH 8750. MFA Directing Practicum. (2-3 cr [max 10 cr]; A-F or Aud. Prereq-MFA directing specialization) 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. (1-18 cr [max 50 cr]; No grade. Prereq-#; % for 3rd/4th registrations, up to 12 combined cr; 10 cr total required [Plan A only])

TH 8888. Thesis Credit: Doctoral. (1-24 cr per semester or summer; 10 cr total required [Plan A only])

TH 8994. Directed Research. (1-5 cr [max 5 cr]; Stdnt Opt. Prereq-#, %)

TRAD 8320. Radiation Therapy Treatment Planning Problems. (1 cr; Stdnt Opt)

TRAD 8325. Radiation Therapy Pediatrics Oncology. (1 cr; Stdnt Opt)

TRAD 8350. Research: Radiation Therapy. (1-15 cr [max 15 cr]; Stdnt Opt)

TRAD 8450. Research: Radiation Biology. (1-15 cr [max 15 cr]; Stdnt Opt)

TRAD 8550. Research: Radiological Physics. (1-15 cr [max 15 cr]; Stdnt Opt)

Therapeutic Radiology (TRAD)
Department of Therapeutic Radiology

Medical School

TRAD 8204. Tumor Clinic Conference. (0 cr; Stdnt Opt)

TRAD 8240. Radiation Therapy Conference. (0 cr; Stdnt Opt)

TRAD 8310. Fundamentals of Radiation Therapy. (1 cr; Stdnt Opt)

TRAD 8315. Radiation Therapy Pathology. (1 cr; Stdnt Opt)

Toxicology (TXCL)

College of Veterinary Medicine

TXCL 5000. Directed Research in Toxicology. (1-4 cr [max 16 cr]; A-F or Aud. Prereq-#) Special project that addresses specific issue in toxicology. Under guidance of faculty member.

TXCL 5011. Principles of Toxicology. (2 cr; A-F or Aud. Prereq-Grad student 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 5195. Veterinary Toxicology. (3 cr; A-F or Aud. +CVM 6195. Prereq-Grad student or #) 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 cr; A-F or Aud. +CVM 6545. Prereq-Grad student or #) 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 cr; A-F or Aud. Prereq-5011 or BioC 4331. PubH 5104 or #) Absorption, distribution, metabolism, and excretion of xenobiotics; toxicokinetics; mechanisms of toxicity or specific classes of chemical agents.

TXCL 8013. Advanced Toxicology II. (5 cr; A-F or Aud. Prereq-8012, BioC 4333. Phil 5062 or #) 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 cr [max 2 cr]; A-F or Aud. Prereq-8013 or #) Evaluating toxicology research issues and literature.

TXCL 8333. FTE: Master's. (1 cr; No grade. Prereq-Master's student, adviser and DGS consent)

TXCL 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

TXCL 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

TXCL 8777. Thesis Credits: Master's. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])
Veterinary Medicine, Graduate (VMED)

TXCL 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq- Max 18 cr per semester or summer; 24 cr required)

Translation and Interpreting (TRIN)
Institute of Linguistics, ESL, and Slavic Languages and Literatures

College of Continuing Education
TRIN 5900. Topics in Translation and Interpreting. (1-4 cr [max 16 cr]; Stdnt Opt) Topics specified in Class Schedule.
TRIN 5993. Directed Study. (1-3 cr [max 3 cr]; Stdnt Opt) Directed study in translation/interpretation.

Urban Studies (URBS)
Department of Geography

College of Liberal Arts
URBS 501. The City and the Metropolis: An Exploration. (3 cr; A-F only, Prereq-Grad student or [Adv URBS undergrad, #]) 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 cr; A-F only) 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.

Veterinary and Biomedical Sciences (VBS)
College of Veterinary Medicine
VBS 8700. Seminar: Veterinary Pathobiology. (1 cr [max 5 cr]; Stdnt Opt)

Veterinary Medicine, Graduate (VMED)
College of Veterinary Medicine
VMED 5080. Problems in Veterinary Epidemiology and Public Health. (1-3 cr [max 3 cr]; A-F or Aud) Individual study on problem of interest to epidemiology or public health student.

VMED 5082. Diagnostic Epidemiology of Infectious Diseases. (2 cr; A-F only, Prereq-Statistics course or #) 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 cr [max 3 cr]; S-N or Aud, Prereq-Veterinary Medicine grad student) 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 5093. Directed Studies in Population Medicine. (1-4 cr [max 8 cr]; A-F or Aud, Prereq-Grad student, #) Directed studies arranged between student and instructor.


VMED 5190. Seminar and Presentation Development. (2 cr; S-N only, Prereq-Grad student) 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. (2 cr; A-F or Aud, Prereq-Earned DVM, #) Economic decision making principles applied to commercial dairy farms in North America. Economic techniques, decision making under financially constrained conditions. Financial evaluation of a dairy operation. Modules assigned, written work submitted via the Internet, discussions at online course site.

VMED 5210. Advanced Large Animal Physiology I. (1-3 cr [max 6 cr]; Stdnt Opt) Review of large animal physiology at level needed for specialty board certification or beginning research. Students present topics in physiology and supplement reading with clinical case material or journal articles.

VMED 5211. Advanced Large Animal Physiology II. (1-3 cr [max 3 cr]; A-F or Aud, Prereq-#) 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 5212. Large Animal Diagnostic Ultrasonography. (1 cr; A-F or Aud, Prereq-#) Fundamentals of diagnostic ultrasonography in large animal patient. Ultrasonography of the equine limbs/joints, large animal abdomen/thorax. Lectures, lab.

VMED 5213. Comparative Clinical Veterinary Dermatologic Pathology. (1 cr [max 2 cr]; S-N only, Prereq-DVM degree or foreign equiv) Microscopic pathology of basic dermatologic reactions and of variable disease states.

VMED 5240. Advanced Small Animal Pathobiology I. (1 cr; A-F only, Prereq-CVM grad student, [DVM or foreign equiv] degree) Overview of safety hazards, Forensic pathology, pathophysiology, and medicine of disciplines relevant to companion animals. Pathogenesis/treatment of diseases. Developing hypotheses that could be translated into clinical research.

VMED 5241. Advanced Small Animal Pathobiology II. (1 cr; A-F only, Prereq-CVM grad student, [DVM or foreign equiv] degree) Overview of safety hazards, Forensic pathology, pathophysiology, and medicine of disciplines. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research.

VMED 5242. Advanced Small Animal Pathobiology III. (1 cr; A-F only, Prereq-CVM grad student, [DVM or foreign equiv] degree) Overview of biology, physiology, pathophysiology, and medicine. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research.

VMED 5243. Advanced Small Animal Pathobiology IV. (1 cr; A-F only, Prereq-CVM grad student, [DVM or foreign equiv] degree) Overview of biology, physiology, pathophysiology, and medicine. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research.

VMED 5274. Diseases of the Urinary System. (1 cr; A-F or Aud, Prereq-#) Expands on disorders of small animal urinary system. Introduction to core and to additional disorders.


VMED 5293. Directed Studies in Comparative Medicine and Pathobiology. (1-4 cr [max 8 cr]; A-F or Aud, Prereq-Grad student, #) Directed studies arranged between student and instructor.

VMED 5295. Problems in Large Animal Clinical Medicine/Surgery and Theriogenology. (1 cr [max 3 cr]; A-F or Aud, Prereq-VMED grad student, possess DVM) Hospital cases using standardized format, audiovisual aids. Review literature pertinent to case. One or two cases presented by enrolled participants per month.

VMED 5310. Topics in Veterinary Clinical Pathology. (1 cr [max 2 cr]; S-N only, Prereq-Grad student in CVM) Modified rounds format. Cases from VMU used to explore cytology with associated chemistry/hematology data. Attendees/clinicians can request lab topics for discussion. Past topics have included lab measurement of chemical analytes, test sensitivity or specificity (e.g., ethylene glycol test, FELV test), lab testing for infectious agents.

VMED 5319. Veterinary Gross Pathology. (1 cr [max 3 cr]; S-N only, Prereq-Grad student in CMB or [VMED, [DVM degree or foreign equiv], @]) 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 in course.

VMED 5320. Advanced Veterinary Systemic Pathology I. (3 cr; A-F only, Prereq-Grad student in VMED or [CMB, [DVM degree or foreign equiv]] or #) 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 5321. Advanced Veterinary Systemic Pathology II. (3 cr; A-F only, Prereq-Grad student in VMED or [CMB, [DVM degree or foreign equiv]] or #) 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 cr [max 2 cr]; Stdnt Opt. Prereq-Grad student in VMED or [CMB, [DVM degree or foreign equiv]] or #) 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.
Course Descriptions

VMED 5380. Veterinary Diagnostic and Comparative Pathology. (2 cr; max 4 cr). A-F or Aud. Prereq--[VMED, VMD, or equiv degree] from a foreign institution, [resident or grad student] in [veterinary anatomic or clinical pathology]. #) Diagnostic skills in gross/microscopic pathology. Students participate in necropsy services of veterinary diagnostic lab, examine carcasses from variety of animals. Case write-ups, interpretation of gross/microscopic lesions done under supervision of faculty pathologist. Students assist in supervision of veterinary students on senior necropsy rotation.

VMED 5395. Problems in Veterinary and Comparative Pathology. (3 cr; A-F only. Prereq--Grad student in CVM, [DVM degree or foreign equiv]) Case material in Veterinary Diagnostic Lab. Students investigate pathogenesis/epidemiology of selected disease condition or case-related problem agreed upon with faculty pathologist.


VMED 5420. Molecular Epidemiology of Infectious Disease. (3 cr; A-F only. Prereq--Basic course in microbiology) 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 5493. Directed Studies in Infectious Disease. (1-4 cr; max 8 cr). A-F or Aud. Prereq--Grad student, #) Directed studies arranged between student and instructor.

VMED 5496. Training in Swine Production and Management. (4 cr; S-N only. Prereq--VMED grad student or #) Production module introduces techniques/protocols for swine production system operation. Research module covers applied research trials for viral/bacterial pathogens in pigs.

VMED 5596. Swine Diseases and Diagnostics. (2-3 cr; Sdn Opt) Review of recent advances in swine diseases; farm visits for on-farm disease diagnostics and control programs.

VMED 5610. Companion Animal Oncology. (2 cr; S-N or Aud, Prereq--VMED grad student, #) Principles of veterinary oncology. Biologic behaviors, treatments, and prognosis of neoplastic disorders.

VMED 5621. Principles of Veterinary Anesthesiology. (2 cr; A-F only. Prereq--VMed grad student, [DVM degree or foreign equiv], instr consent) In-depth training in principles of veterinary anesthesiology. Lectures, anesthesia labs, presentations by students.

VMED 5670. Bovine Surgery Practicum. (2 cr; S-N only. Prereq--[VMed grad student, [DVM or equiv foreign degree]] or #) Intensive training in ruminant surgery. Evaluation of food animal surgery principles, hands-on laboratory components.

VMED 5691. Independent Research in Veterinary Anesthesiology. (1-6 cr; max 6 cr). A-F or Aud. Prereq--[Vet Med major or prevet or vet grad student] #) Independent research supervised by faculty member.


VMED 8090. Epidemiology of Zoonoses and Diseases Common to Animals and Humans. (3 cr; A-F or Aud. Prereq--Epidemiology and infectious disease course or #) Major human zoonotic diseases, methods of transmission, diagnosis, control, and prevention.

VMED 8134. Ethical Conduct of Animal Research. (3 cr; A-F or Aud. +ANSC 8134, CMB 5910) Directed research.

VMED 8195. Pre-Harvest Food Safety and Public Health Aspects of Food Animal Production. (1-3 cr; max 3 cr). Sdn Opt) Includes presentations and discussions on on-farm HACCP principles and prudent use of antibiotics.

VMED 8201. Advanced Small Animal Veterinary Medicine. (1-3 cr; max 6 cr). A-F or Aud. Prereq--#) Discussions of diseases of organs or systems in animals, including degenerative, psychological, analonomic, nutritional, neoplastic, immune, inflammatory, toxic, and traumatic disorders.

VMED 8202. Internal Medicine in Small Companion Animals. (1-3 cr; max 3 cr). A-F or Aud. Prereq--#) Lectures, assigned readings, and discussions on internal medical problems of dogs and cats.

VMED 8203. Advanced Diagnosis and Therapeutics of Animal Medicine. (1-2 cr; max 2 cr). A-F or Aud. Prereq--#) Detailed examination, treatment, and discussion of naturally occurring disease in patients admitted to Veterinary Medical Center.

VMED 8210. Seminar: Veterinary Medicine. (1 cr; Sdn Opt. Prereq--#) Participation and presentations of regularly scheduled seminars about internal medicine.


VMED 8250. Problems in Acid-base, Electrolyte, and Fluid Metabolism. (2-4 cr; max 4 cr). A-F or Aud. Prereq--#) Clinical problems and physiology of acid-base, electrolyte, and fluid disorders of dogs and cats.

VMED 8297. Journal Club: Large Animal Internal Medicine. (1 cr; max 3 cr). A-F or Aud. Prereq--#) Students/faculty keep abreast of current literature in large animal internal medicine. Students critically evaluate the literature.


VMED 8296. Advanced Large Animal Veterinary Medicine. (1-3 cr; max 6 cr). A-F or Aud. Prereq--DVM student, vet med grad student, #) Discussions of diseases of organs or systems in animals in a clinical setting.

VMED 8333. FTE: Master’s. (1 cr; No grade. Prereq--Master’s student, adviser and DGS consent)

VMED 8360. Evidence-based Medicine. (2 cr; A-F or Aud. Prereq--#) Use of medicine literature in clinical problem solving.

VMED 8393. Medical Conference. (1-3 cr; max 6 cr). A-F or Aud. Medical, surgical, or obstetrical cases supported by anatomic, bacteriologic, pathologic, physiologic, pharmacologic, and radiologic evaluations whenever applicable.

VMED 8394. Research in Veterinary Medicine. (1-3 cr; max 3 cr). Sdn Opt. Prereq--#) Research problems relating to any aspect of internal medicine or to the various systems in animals.

VMED 8396. Diagnostic and Therapeutic Techniques of Animal Diseases. (1-3 cr; max 6 cr). Sdn Opt. Prereq--DVM student, vet med student, #) Detailed examination, discussions, and treatments of cases of animal diseases in a clinical setting.

VMED 8444. FTE: Doctoral. (1 cr; No grade. Prereq--Doctoral student, adviser and DGS consent)


VMED 8494. Research in Infectious Diseases. (1-3 cr; max 3 cr). Sdn Opt) Directed research.

VMED 8495. Problems in Infectious Diseases. (1-3 cr; max 3 cr). Sdn Opt) In-depth discussion on specific problems for various infectious diseases of farm animals.

VMED 8520. Advanced Immunology. (2 cr; Sdn Opt) Lectures and case presentations.

VMED 8530. Advanced Swine Diseases. (2 cr; Sdn Opt) Lectures and discussion on advances.

VMED 8592. Infectious Disease Journals: Critical Thinking. (1 cr; Sdn Opt) Reading and critical discussion of journal articles.
VMED 8593. Advanced Veterinary Virology and Serology. (1.5 cr [max 3 cr]; Stdnt Opt) Discussion and laboratory practice.

VMED 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

VMED 8681. Advanced Small Animal Surgery. (1-3 cr [max 3 cr]; Stdnt Opt) Advanced techniques and procedures.

VMED 8682. Advanced Large Animal Surgery. (1-3 cr [max 6 cr]; A-F or Aud. Prereq–DVM or equiv degree, #) Surgery of various systems in large animals, with preoperative and postoperative evaluation and management.

VMED 8683. Surgery of the Gastrointestinal System. (2-4 cr [max 4 cr]; A-F or Aud) Advanced techniques and problems.

VMED 8684. Surgical Physiology. (1-3 cr [max 3 cr]; Stdnt Opt) Discussions on pathophysiology of surgical diseases in dogs and cats.

VMED 8685. Neurosurgery. (2-5 cr [max 3 cr]; A-F or Aud) Advanced neurosurgical diseases of small animals amenable to surgical treatment.

VMED 8686. Thoracic and Cardiovascular Surgery. (2-4 cr [max 4 cr]; A-F or Aud) Advanced thoracic and cardiovascular diseases of small animals amenable to surgical treatment.

VMED 8688. New Techniques in Large Animal Surgery. (1-6 cr [max 6 cr]; A-F or Aud. Prereq–DVM or equiv degree, #) Students conduct medical and surgical procedures involved in management of avian trauma and critical care patients.

VMED 8791. Research in Veterinary Anesthesia. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–8781 or equiv, SACS 5380 or equiv) Research methodology; controlled prospective and retrospective research studies. Collection and analysis of scientific data.

VMED 8792. Seminar: Veterinary Radiology. (1 cr [max 6 cr]; Stdnt Opt) Current topics in veterinary imaging, veterinary radiation therapy, or specific applications.

VMED 8793. Seminar: Veterinary Anesthesiology. (1-2 cr [max 2 cr]; A-F or Aud. Prereq–[CVM 6321, CVM 6322] or equiv, DVM degree) Discussion and presentations; for veterinary anesthesiology and surgery residents and graduate students.

VMED 8794. Research in Veterinary Radiology. (1-3 cr [max 3 cr]; Stdnt Opt) Research into an application, development of an application, or prospective/retrospective study of any aspect of veterinary imaging or veterinary radiotherapy.

VMED 8795. Problems in Veterinary Radiology. (1-3 cr [max 6 cr]; Stdnt Opt) Discussion of problems associated with veterinary imaging or radiation therapy.


VMED 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

VMED 8880. Advanced Avian Critical Care: Principles and Procedures. (2 cr; A-F or Aud. Prereq–Course each in vet pathology, physiology, pharmacology, anatomy, small animal anesthesiology and critical care) Procedures and protocols for managing avian medical emergencies such as starvation, toxicities, respiratory failure, and massive trauma.

VMED 8881. Seminar: Advanced Veterinary Anesthesiology. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–[CVM 6321, CVM 6322] or equiv, grad student) Active interaction around topics of advanced anesthesiology in veterinary species.

VMED 8882. Seminar: Veterinary Critical Care/Emergency Medicine. (1 cr; A-F or Aud. Prereq–DVM or equiv degree) Current topics.

VMED 8889. Research in Avian Clinical Problems and Procedures. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–DVM, #) Students conduct medical and surgical procedures involved in management of avian trauma and critical care patients.

VMED 8888. Thesis Credit: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser and DGS consent)


VMED 8690. Seminar: Large Animal Surgery. (1-3 cr [max 6 cr]; A-F or Aud. Prereq–DVM or equiv degree, #) Discussion of current literature and surgery board preparation.

VMED 8691. Research in Large Animal Surgery. (1-6 cr [max 6 cr]; A-F or Aud, Prereq–DVM or equiv degree, #) Independent research projects.

VMED 8692. Seminar: Small Animal Surgery. (1 cr; A-F or Aud) Advanced techniques and problems.


VMED 8694. Research in Small Animal Surgery. (1-3 cr [max 3 cr]; S-N or Aud) Directed studies in water resources science.

VMED 8695. Problems in Large Animal Surgery. (1-3 cr [max 6 cr]; A-F or Aud. Prereq–DVM or equiv degree, #) New techniques and procedures in large animal orthopedic surgery.

VMED 8696. Research in Critical Care/Emergency Medicine. (1-3 cr [max 3 cr]; Stdnt Opt. Prereq–DVM or equiv degree) 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. (1-18 cr [max 50 cr]; No grade. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

For definitions of course numbers, symbols, and abbreviations, see page 214.
Work and Human Resource Education (WHRE)

WHRE 5001. Survey: Human Resource Development and Adult Education. (3 cr; Stdnt Opt)
Overview of fields of human resource development and adult education. Includes societal context, theories, processes, definitions, philosophies, goals, sponsoring agencies, professional roles, participants, and resources. Focus on the unique characteristics and ways the fields overlap and enhance one another.

WHRE 5002. Thinking, Learning, and Teaching in Work and Human Resource Education. (3 cr; A-F or Aud)
Nature of thinking/learning in everyday life contexts of work and human resource education. Theory/practice relevant to stimulating/supporting thinking/learning in/for these contexts.

WHRE 5011W. Technology and Public Ethics. (3 cr; A-F or Aud)

WHRE 5021. Learning Through Service. (3 cr; Stdnt Opt)
Service as philosophy and as method of learning. Theory/practice of service in school-based, work-based, and community-based organizations.

WHRE 5031. Information Resources in Education. (3 cr; S-N or Aud)
Sources of knowledge and search strategies for accessing library, electronic, institutional, and informal resources of interest to educators.

WHRE 5101. Introduction to Leadership and Administration of WHRE. (3 cr; Stdnt Opt)
Finance, public relations, communications, legal aspects, leadership, personnel policies, management, program planning/development, evaluation. Inter-institutional collaboration of work and human resource education programs in school-based settings.

WHRE 5102. Leadership in WHRE. (2 cr; Stdnt Opt)
Leadership, leadership roles/responsibilities. Application to work and human resource education.

WHRE 5121. Principles of Supervisory Management. (3 cr; Stdnt Opt)
Introduction to the principles of supervision in education, business, industry, government, and service organizations.

WHRE 5131. Planning WHRE. (3 cr; Stdnt Opt)

WHRE 5141. Evaluation of WHRE. (3 cr; Stdnt Opt)
Designing/conducting project, program, and systems evaluations in work and human resource education contexts/settings.

WHRE 5201. Family and Work Relationships. (3 cr; A-F or Aud)
Examination of the interactions of work and family to prepare professionals to improve work and family relationships.

WHRE 5301. Philosophy and Practice of Career and Technical Education. (2 cr; A-F or Aud)

WHRE 5331. Coordination Techniques for Work and Human Resource Education. (3 cr; Stdnt Opt)

WHRE 5341. Global Program Delivery Techniques and Technology of Extension. (2 cr; A-F or Aud; =AFEE 5341)
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.

WHRE 5351. Methods for Change in Developing Countries. (5 cr; A-F or Aud; =AFEE 5351)
Sociological and cultural parameters as they pertain to promoting 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.

WHRE 5401. Distance Learning in Adult Education and Training. (3 cr; A-F or Aud)
Distance learning, concepts, theory, history, present practice, delivery systems, course design, major issues, future directions.

WHRE 5501. Organizational Learning. (3 cr; A-F or Aud)

WHRE 5511. Education for Work. (3 cr; Stdnt Opt)
Examination of contextual bases underlying education for work; implications for practice.

WHRE 5521. Work-Based Learning Policies. (2 cr; Stdnt Opt)
Aims/purposes of federal, state, and local policies, related to work-based learning.

WHRE 5522. Work-Based Learning Practices. (3 cr; Stdnt Opt)

WHRE 5601. Student and Trainee Assessment. (2 cr; A-F or Aud; =HRD 5601, Prereq–BI 5601)
Developing learning progress reporting systems and tests of knowledge, affect, and processes for programs focused on instruction of skills associated with business/industry. Evaluating instructional effectiveness. Applying tests and other evaluation instruments to assess/report learning in business/industry and career/technical education fields. Students develop each type of test and an overall evaluation plan for a course.

WHRE 5612. Managing and Consulting in Human Resource Development and Adult Education. (3 cr; Stdnt Opt; Prereq–5001)
The theory of managing and consulting in human resource development and adult education. Includes a personal assessment of role requirements and experimentation with management and consultation processes and techniques.

WHRE 5628. Multimedia Presentations in Business. (3 cr; Stdnt Opt. Prereq–5001 or equiv)
Designing, creating, and presenting information using multimedia resources in business settings.

WHRE 5629. Course Development for Business and Industry. (2 cr; A-F or Aud; =HRD 5629)
Designing instructional programs/courses that help learners develop desired competencies. Designing instruction for performance based training and vocational/technical education. Developing course syllabus components that clarify course expectations. Developing academic/community-based elements that supplement course goals. Reflect on and compare performance-based instruction with other curriculum models for the field.

WHRE 5661. Instructional Methods for Business and Industry. (2 cr; Stdnt Opt. Prereq–HRD 5661 or BIE 5661)
Theory/practice in instructional methods for career/technical education 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.

WHRE 5696. Teaching Internship: Introduction. (1 cr; S-N only; =CI 5924, Prereq–Admission to initial licensure program)
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.

WHRE 5697. Teaching Internship: School and Classroom Settings. (2 cr; Stdnt Opt. Prereq–5696 for initial licensure program)
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.

WHRE 5698. Teaching Internship. (3-6 cr; max 8 cr; Stdnt Opt. Prereq–Admission to initial licensure program)
Teaching experience in a school system that provides programs for grades 5-12.

WHRE 5699. Teaching Internship: Extended. (1 cr; Stdnt Opt. =CI 5927, Prereq–5698)
Extended student teaching experience in a school system that provides programs for grades 5-12.

WHRE 5771. Teaching Entrepreneurship: Small Business Management. (3 cr; Stdnt Opt)
Methods, organization, curriculum development and modification, and implementation of educational programs for entrepreneurs.

WHRE 5801. Educating Special Populations in Work and Human Resource Education Settings. (3 cr; Stdnt Opt)
Identifying/accommodating in work and human resource education settings educational traits of students with disabilities and disadvantage conditions.

Interagency planning issues/practices relating to special populations for educational, business, and human service organization personnel, family members, and advocates.

WHRE 5803. Developmental Writing and the College Student: Theory and Practice. (3 cr; Stdnt Opt. Prereq–Bachelor’s degree)
WHRE 8804. Research in Postsecondary Developmental Education. (3 cr; Stdnt Opt. Prereq–Bachelor’s degree, courses in [intro psychology, basic statistics]) 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.


WHRE 8823. Program Planning and Improvement for Special Populations in Work and Human Resource Education. (2 cr; Stdnt Opt) Concepts, issues, and practices related to the design, implementation, and evaluation of efforts focused on developing new programs or modifying existing programs, in work and human resource education settings, for individuals with special learning needs.


WHRE 8990. Special Topics in Work and Human Resource Education. (1-4 cr [max 4 cr]; Stdnt Opt) Topics vary.

Whre 5993. Directed Study in WHRE. (1-4 cr [max 4 cr]; Stdnt Opt) Self-directed study, with faculty advice, in areas not covered by regular courses.

WHRE 8001. Advanced Theory in Human Resource Development and Adult Education. (3 cr; A-F or Aud. Prereq–5001 or AdvEd 5001) Theoretical understanding of individuals and organizations as adaptive entities; roles of human resource development and adult education in mediating complex demands.

WHRE 8100. Work and Human Resource Education Colloquium. (1-3 cr [max 12 cr]; Stdnt Opt) Selected topics of significance to work and human resource education professionals. Topics based on interest and demand.


WHRE 8143. Contemporary Workforce and Workplace Issues. (3 cr; A-F or Aud) Workforce preparation/retraining. Impact of cultural, political, and economic changes.

WHRE 8333. FTE: Master’s. (1 cr; No grade. Prereq–Master’s student, adviser consent, DGS consent)

WHRE 8444. FTE: Doctoral. (1 cr; No grade. Prereq–Doctoral student, adviser and DGS consent)

WHRE 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. Prereq–Doctoral student who has not passed prelim oral; no required credit for 1st/2nd registrations, up to 12 combined cr; 4% 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)

WHRE 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade)

WHRE 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq–Max 18 cr per semester or summer; 24 cr required)

WHRE 8896. Internship. (1-10 cr [max 10 cr]; S-N or Aud) Student applies for position in professional practice; individual arrangements describe specific responsibilities during internship. Ed.D. program requirement.


WHRE 8915. Ethics and Responsible Research. (I cr; A-F or Aud) Introduction to ethical/legal issues involved in practicing responsible educational research. Key issues, formal/informal codes of conduct, ethical reasoning.

WHRE 8990. Research Seminar. (1 cr [max 6 cr]; S-N or Aud. Prereq–8911, 8912 or 8913 or 8914) or %) Developing, reporting, and evaluating research. Participants make and react to presentations. (Two credits counted in doctoral program.)

Writing Studies (WRIT)

Writing Studies (WRIT)


WHRE 5915. Ethics and Responsible Research. (I cr; A-F or Aud) Introduction to ethical/legal issues involved in practicing responsible educational research. Key issues, formal/informal codes of conduct, ethical reasoning.


WHRE 8915. Ethics and Responsible Research. (I cr; A-F or Aud) Introduction to ethical/legal issues involved in practicing responsible educational research. Key issues, formal/informal codes of conduct, ethical reasoning.

Writing Studies (WRIT)

WRIT 5052. Graduate Research Presentations and Conference Writing for Non-Native Speakers of English. (3 cr; A-F or Aud. Prereq–Grad student, non-native speaker of English or #) 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 5111. Information Design: Theory and Practice I. (3 cr; A-F or Aud. Prereq–Grad student or #) Audience analysis, media selection, message design through various theoretical perspectives, including cognitive/schema, social construction, feminist, intercultural theories. Usability testing, contextual inquiry as means to study effectiveness of messages.

WRIT 5112. Information Design: Theory and Practice II. (3 cr; A-F or Aud. Prereq–Grad student or #) 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. (3-6 cr [max 6 cr]; S-N or Aud. Prereq–STC grad or #) 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. (1-3 cr [max 3 cr]; A-F or Aud. Prereq–[[STC or RSTC] [major or grad student]], #) Topics specified in Class Schedule.

WRIT 5291. Independent Study. (1-3 cr [max 3 cr], Stdnt Opt. Prereq–#, %) Supervised reading/research on advanced projects not covered in regularly scheduled offerings.


WRIT 5531. Introduction to Writing Instruction: Composition Pedagogy. (3 cr; A-F or Aud. Prereq–Grad student) Pedagogical philosophy/methodology in composition, primarily first-year writing. Introduction to theories underlying teaching/tutoring with technology.

WRIT 5532. Scientific and Technical Communication Course Development and Pedagogy II. (1 cr; A-F or Aud. Prereq–5531 or #) Mentor with faculty, usually concurrently with student’s first teaching assignment. Student shares observations, solves teaching problems in seminar setting. Issues facing new teachers. Developing a philosophy of teaching. Focuses on evaluating work in classroom.

WRIT 5534. Designing Technical Training for Intercultural Audiences. (3 cr; A-F or Aud) 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.

For definitions of course numbers, symbols, and abbreviations, see page 214.
WRIT 5664. Science Writing for Popular Audiences. (3 cr; A-F or Aud. Prereq-Rhet 5362 or #) How science is “translated” for popular audiences. Rhetorical theory used to critique popularized articles. Developing a heuristic for writing articles. Controversial issues surrounding movement from science as “science” to science as “popular.”

WRIT 5777. Major Figures in Rhetorical Tradition: Classical Period. (3 cr; A-F only) Classical theories of rhetoric. Epistemological status of rhetoric. Ethical implications of persuasion. Emphasizes “Aristotle’s Rhetoric” as founding document. Other figures (e.g., Plato, Isocrates, Cicero, Quintilian).


WRIT 5779. Rhetoric of Science. (3 cr; A-F only) Relationship between rhetorical theory/science. Readings typically include works by rhetoricians, sociologists, historians, and philosophers on role that rhetoric/language play in establishing scientific claims.

WRIT 8011. Research Methods in Rhetoric and Scientific Communication. (3 cr; A-F or Aud. Prereq-STC/RSTC grad or #) Quantitative/qualitative research methods. Theoretical perspectives that demonstrate/test analytical approaches to scientific/technological rhetoric.

WRIT 8012. Applied Research Methods in Scientific and Technical Communication. (3 cr; max 6 cr); A-F or Aud. Prereq-[5011, grad student] or #) 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 cr; No grade. Prereq-Master’s student, adviser and DGS consent)

WRIT 8444. FTE: Doctoral. (1 cr; No grade. Prereq-Doctoral student, adviser and DGS consent)

WRIT 8505. Professional Practice. (5 cr; A-F or Aud. Prereq-STC/RSTC grad student, %, #) 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. Topics in Rhetorical Theory, History, and Criticism. (3 cr [max 12 cr]; A-F or Aud. Prereq-5775 or equiv) Rhetorical theory in context of culture influenced by science/technology. Topics vary. See Class Schedule.


WRIT 8540. Topics in Scientific and Technical Communication Pedagogy. (5 cr [max 12 cr]; A-F or Aud) Doctoral seminar on theories of pedagogy/research studies that inform technical/scientific classroom/workplace. Topics vary. See Class Schedule.

WRIT 8666. Doctoral Pre-Thesis Credits. (1-6 cr [max 12 cr]; No grade. 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)

WRIT 8775. Classical Rhetorical Theory. (3 cr [max 12 cr]; A-F or Aud) Aristotle’s “Rhetoric” in context of its times and of Aristotle’s other works, especially “The Ethics” and “The Politics.”

WRIT 8777. Thesis Credits: Master’s. (1-18 cr [max 50 cr]; No grade. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

WRIT 8792. Directed Readings. (1-4 cr [max 12 cr]; S-N only. Prereq-#) Supervised research project.

WRIT 8888. Thesis Credit: Doctoral. (1-24 cr [max 100 cr]; No grade. Prereq-Max 18 cr per semester or summer; 24 cr required)

Youth Development and Research (YOST)

School of Social Work

College of Education and Human Development

YOST 5031. International Youthwork. (5 cr; Stndt Opt. \*YOST 5032. Prereq-2xxx or #) Lives of young people living outside the United States and of immigrants/refugees now resident in this country. Working with and with behalf of such groups. Socio-political analysis of globalization. Its impact on young people, youthwork, and youth policy worldwide.

YOST 5032. Adolescent and Youth Development for Youthworkers. (4 cr; Stndt Opt. \*YOST 5032. Prereq-[1001 or 2001 or 2002W or 2101], [any Psych or CPsy course]) Application of theory/research about children/adolescents. How findings/theories facilitate understanding of behavior.

YOST 5101. Youth Work Practice I: Internship. (3 cr; Stndt Opt. Prereq-5101, 5032 or equiv, &5111, #) First course of a sequential internship that includes 15 hours per week working with youth in a community youth-serving organization. Development and enhance competence and identity as a youth worker, and reflect on and integrate knowledge about youth with ongoing experience in youth work.

YOST 5102. Youth Work Practice II: Internship. (1 cr; Stndt Opt. Prereq-5101, 5032 or equiv, &5101, #) Second course of a sequential internship that includes 15 hours per week of work with youth in a community youth-serving organization. Develop and enhance competence and identity as a youth worker, and reflect on and integrate knowledge about youth with ongoing experience in youth work.

YOST 5111. Youth Work Methods I: Seminar. (1 cr; Stndt Opt. Prereq-5101, 5032 or equiv, &5101, #) Weekly discussion seminar taken concurrently with 5101 to integrate theory and praxis with youth work experience. Written and experiential assignments to increase knowledge, competency, and skills related to working with youth.

YOST 5112. Youth Work Methods II: Seminar. (1 cr; Stndt Opt. Prereq-5111, &5102, #) Weekly discussion seminar taken concurrently with 5102 to integrate theory and praxis with youth work experience. Written and experiential assignments to increase knowledge, competency, and skills related to working with youth.

YOST 5234. Youth Agencies, Organizations, and Youth Service System. (5 cr; Stndt Opt. \*YOST 5234. Prereq-[Two soc/anth courses, work experience in [youth agency or org]] or #) Communities/governmental responses to young people as potential problems through agencies/programs and other organizational forms. Purpose, structure, activities of such forms. How forms are/are not integrated into youth service systems.

YOST 5235. Community Building, Civic Engagement, and Civic Youthwork. (4 cr; Stndt Opt. \*YOST 5235. Prereq-2001, one basic course in Pol, one basic course in Soc or #) Reciprocities between youth development and community development brought about by young people’s civic engagement. Individual, social, and political change by/for young people and their community.

YOST 5240. Special Topics in Youth Studies. (2 cr [max 10 cr]; Stndt Opt. \*YOST 5240. Prereq-Two soc/anth courses, exper working with youth or #) In-depth investigation of one area of youth studies. Teaching procedure and approach determined by specific topic and student needs. Topic announced in advance.

YOST 5241. Experiential Learning. (4 cr; Stndt Opt. \*YOST 2241. Prereq-[1001, 2001 or 2002W or 2101] or #) History/theory of experiential learning, its application in youthwork. Observation, reflection, program design, and evaluation skills grounded in experiential learning theory. 15 hours of field observation required.

YOST 5291. Independent Study in Youth Studies. (1-8 cr [max 8 cr]; Stndt Opt) Independent research and/or research under faculty supervision.
YOST 5301. Communicating With Adolescents About Sexuality. (3 cr; Stdnt Opt. Prereq–Upper div AdPy course, exper working with youth or #)
How to communicate sensitively/effectively with adolescents and their concerned persons about sexuality in everyday life. Healthy sexual development (physical, emotional, ethical), sexual diversities. Gender/body image, disease, sexual violence, intimacy, sex in cyberspace.

YOST 5313. Direct Work with Adolescents. (2 cr; Stdnt Opt. Prereq–Two social sci courses, exper working with youth or #)
Designed to give an understanding of direct work with troubled and at-risk adolescents in a wide range of settings where youth workers or social workers are typically involved. Emphasis on young people in groups in the “lifespace” in everyday life, rather than in one-to-one office-based interactions.

YOST 5314. Theatre Activities in Youthwork and Education. (2 cr; Stdnt Opt. =YOST 4314. Prereq–1001 or 2101)

YOST 5315. Youthwork in Schools. (4 cr; Stdnt Opt. =YOST 4315. Prereq–Introductory course in education or #)
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 5319. Understanding Youth Subcultures. (3 cr; Stdnt Opt. =YOST 4319. Prereq–2001 or one course each in [Anth, Soc] or #)
Young people's participation in and understanding of subcultures, life-styles, and event cultures. Place of these in young people's identity, friendship, and life chances.

YOST 5321. Work With Youth: Individual. (2 cr; Stdnt Opt. =YOST 4321. Prereq–1001 or 2002W or #)
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 cr; Stdnt Opt. =YOST 4322. Prereq–1001 or 2002W or #)
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 cr; Stdnt Opt. =YOST 4323. Prereq–1001 or 2002W or #)
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 cr; A-F or Aud. =YOST 4401W. Prereq–[2001, one course each in [Anth, Soc, CPsy]] or #)
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.
## Course Designators

The following is an alphabetical list of course designators and their referents under which courses are organized within the Courses section of this catalog. The list is provided to help students find the full description of prerequisite courses and identify the programs to which the courses apply. Directly following each designator and its referent is a “see” note in cases where the program name or names differ from the referent. For example, courses in physiology (PHSL) pertain to the cellular and integrative physiology program. Courses in fields that do not offer graduate programs, but which may be taken for graduate credit if related to a student’s program, also appear in the course section; their designators and referents below are followed by “related courses.”

<table>
<thead>
<tr>
<th>Designator</th>
<th>Course</th>
<th>Referent</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAS</td>
<td>Asian American Studies</td>
<td></td>
<td>232</td>
</tr>
<tr>
<td>ACCT</td>
<td>Accounting</td>
<td></td>
<td>215</td>
</tr>
<tr>
<td>ADED</td>
<td>Adult Education</td>
<td></td>
<td>216</td>
</tr>
<tr>
<td>ADPY</td>
<td>Adult Psychiatry</td>
<td></td>
<td>216</td>
</tr>
<tr>
<td>AEM</td>
<td>Aerospace Engineering and Mechanics</td>
<td></td>
<td>216</td>
</tr>
<tr>
<td>AFEE</td>
<td>Agricultural, Food, and Environmental Education</td>
<td></td>
<td>219</td>
</tr>
<tr>
<td>AFRO</td>
<td>Afro-American Studies</td>
<td></td>
<td>218</td>
</tr>
<tr>
<td>AGRO</td>
<td>Agronomy and Plant Genetics</td>
<td></td>
<td>220</td>
</tr>
<tr>
<td>AKKA</td>
<td>Akkadian</td>
<td></td>
<td>220</td>
</tr>
<tr>
<td>ALL</td>
<td>Asian Languages and Literature</td>
<td></td>
<td>232</td>
</tr>
<tr>
<td>AMIN</td>
<td>American Indian Studies</td>
<td></td>
<td>220</td>
</tr>
<tr>
<td>AMST</td>
<td>American Studies</td>
<td></td>
<td>221</td>
</tr>
<tr>
<td>ANES</td>
<td>Anesthesiology</td>
<td></td>
<td>221</td>
</tr>
<tr>
<td>ANSC</td>
<td>Animal Science</td>
<td></td>
<td>221</td>
</tr>
<tr>
<td>ANTH</td>
<td>Anthropology</td>
<td></td>
<td>222</td>
</tr>
<tr>
<td>APEC</td>
<td>Applied Economics</td>
<td></td>
<td>224</td>
</tr>
<tr>
<td>APSC</td>
<td>Applied Plant Sciences</td>
<td></td>
<td>226</td>
</tr>
<tr>
<td>ARAB</td>
<td>Arabic</td>
<td></td>
<td>226</td>
</tr>
<tr>
<td>ARCH</td>
<td>Architecture</td>
<td></td>
<td>226</td>
</tr>
<tr>
<td>ARM</td>
<td>Aramaic</td>
<td></td>
<td>226</td>
</tr>
<tr>
<td>ARTH</td>
<td>Art History</td>
<td></td>
<td>230</td>
</tr>
<tr>
<td>ARTS</td>
<td>Art</td>
<td></td>
<td>229</td>
</tr>
<tr>
<td>ASL</td>
<td>American Sign Language</td>
<td></td>
<td>221</td>
</tr>
<tr>
<td>AST</td>
<td>Astronomy</td>
<td></td>
<td>233</td>
</tr>
<tr>
<td>BA</td>
<td>Business Administration</td>
<td></td>
<td>239</td>
</tr>
<tr>
<td>BBE</td>
<td>Bioproducts and Biosystems Engineering</td>
<td></td>
<td>237</td>
</tr>
<tr>
<td>BIE</td>
<td>Business and Industry Education</td>
<td></td>
<td>239</td>
</tr>
<tr>
<td>BINF</td>
<td>Bioinformatics</td>
<td></td>
<td>235</td>
</tr>
<tr>
<td>BIOC</td>
<td>Biochemistry</td>
<td></td>
<td>234</td>
</tr>
<tr>
<td>BIOL</td>
<td>Biology</td>
<td></td>
<td>235</td>
</tr>
<tr>
<td>BMEN</td>
<td>Biomedical Engineering</td>
<td></td>
<td>236</td>
</tr>
<tr>
<td>BMSC</td>
<td>Biomedical Science</td>
<td></td>
<td>237</td>
</tr>
<tr>
<td>BPHY</td>
<td>Biophysical Sciences</td>
<td></td>
<td>237</td>
</tr>
<tr>
<td>BTHX</td>
<td>Bioethics, Center for</td>
<td></td>
<td>235</td>
</tr>
<tr>
<td>CAPY</td>
<td>Child and Adolescent Psychiatry</td>
<td></td>
<td>245</td>
</tr>
<tr>
<td>CAS</td>
<td>Central Asian Studies</td>
<td></td>
<td>242</td>
</tr>
<tr>
<td>CBIO</td>
<td>Conservation Biology</td>
<td></td>
<td>258</td>
</tr>
<tr>
<td>CE</td>
<td>Civil Engineering</td>
<td></td>
<td>248</td>
</tr>
<tr>
<td>CGSC</td>
<td>Cognitive Science</td>
<td></td>
<td>253</td>
</tr>
<tr>
<td>CHEM</td>
<td>Chemistry</td>
<td></td>
<td>243</td>
</tr>
<tr>
<td>CHEN</td>
<td>Chemical Engineering</td>
<td></td>
<td>242</td>
</tr>
<tr>
<td>CHIC</td>
<td>Chicano Studies</td>
<td></td>
<td>245</td>
</tr>
<tr>
<td>CHN</td>
<td>Chinese</td>
<td></td>
<td>247</td>
</tr>
<tr>
<td>CHPH</td>
<td>Chemical Physics</td>
<td></td>
<td>243</td>
</tr>
<tr>
<td>CI</td>
<td>Curriculum and Instruction</td>
<td></td>
<td>259</td>
</tr>
<tr>
<td>CL</td>
<td>Comparative Literature</td>
<td></td>
<td>255</td>
</tr>
<tr>
<td>CLS</td>
<td>Clinical Laboratory Science</td>
<td></td>
<td>252</td>
</tr>
<tr>
<td>CMB</td>
<td>Comparative and Molecular Biosciences</td>
<td></td>
<td>254</td>
</tr>
<tr>
<td>CMPE</td>
<td>Computer Engineering</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>CNES</td>
<td>Classical and Near Eastern Studies</td>
<td></td>
<td>253</td>
</tr>
<tr>
<td>COMM</td>
<td>Communication Studies</td>
<td></td>
<td>251</td>
</tr>
<tr>
<td>COPT</td>
<td>Coptic</td>
<td></td>
<td>259</td>
</tr>
<tr>
<td>CPSY</td>
<td>Child Psychology</td>
<td></td>
<td>246</td>
</tr>
<tr>
<td>CSCI</td>
<td>Computer Science</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>CSCI</td>
<td>Cultural Studies and Comparative Literature</td>
<td></td>
<td>259</td>
</tr>
<tr>
<td>CSDS</td>
<td>Comparative Studies in Discourse and Society</td>
<td></td>
<td>255</td>
</tr>
<tr>
<td>CSDY</td>
<td>Control Science and Dynamical Systems</td>
<td></td>
<td>259</td>
</tr>
<tr>
<td>CSPH</td>
<td>Center for Spirituality and Healing</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>DENT</td>
<td>Dentistry</td>
<td></td>
<td>267</td>
</tr>
<tr>
<td>DES</td>
<td>Design</td>
<td></td>
<td>268</td>
</tr>
<tr>
<td>DHA</td>
<td>Design, Housing, and Apparel</td>
<td></td>
<td>268</td>
</tr>
<tr>
<td>DNCE</td>
<td>Dance</td>
<td></td>
<td>266</td>
</tr>
<tr>
<td>DSSC</td>
<td>Development Studies and Social Change</td>
<td></td>
<td>270</td>
</tr>
<tr>
<td>DTHCH</td>
<td>Dutch</td>
<td></td>
<td>270</td>
</tr>
<tr>
<td>EAS</td>
<td>East Asian Studies</td>
<td></td>
<td>270</td>
</tr>
<tr>
<td>ECON</td>
<td>Economics</td>
<td></td>
<td>271</td>
</tr>
<tr>
<td>ECP</td>
<td>Experimental and Clinical Pharmacology</td>
<td></td>
<td>292</td>
</tr>
<tr>
<td>EDHD</td>
<td>Education and Human Development</td>
<td></td>
<td>274</td>
</tr>
<tr>
<td>EDPA</td>
<td>Educational Policy and Administration</td>
<td></td>
<td>274</td>
</tr>
<tr>
<td>EDUC</td>
<td>Education</td>
<td></td>
<td>274</td>
</tr>
<tr>
<td>EE</td>
<td>Electrical and Computer Engineering</td>
<td></td>
<td>284</td>
</tr>
<tr>
<td>EEB</td>
<td>Ecology, Evolution, and Behavior</td>
<td></td>
<td>270</td>
</tr>
<tr>
<td>ENGL</td>
<td>English: Literature</td>
<td></td>
<td>288</td>
</tr>
<tr>
<td>ENGW</td>
<td>English: Creative Writing</td>
<td></td>
<td>287</td>
</tr>
<tr>
<td>ENT</td>
<td>Entomology</td>
<td></td>
<td>289</td>
</tr>
<tr>
<td>EPSY</td>
<td>Educational Psychology</td>
<td></td>
<td>278</td>
</tr>
<tr>
<td>ESPH</td>
<td>Environmental Sciences, Policy, and Management</td>
<td></td>
<td>290</td>
</tr>
<tr>
<td>FIN</td>
<td>Finnish</td>
<td></td>
<td>294</td>
</tr>
<tr>
<td>FINA</td>
<td>Finance</td>
<td></td>
<td>294</td>
</tr>
<tr>
<td>FM</td>
<td>Financial Mathematics</td>
<td></td>
<td>294</td>
</tr>
<tr>
<td>FMCH</td>
<td>Family Medicine and Community Health</td>
<td></td>
<td>292</td>
</tr>
<tr>
<td>FPOL</td>
<td>Family Policy Minor</td>
<td></td>
<td>292</td>
</tr>
<tr>
<td>FR</td>
<td>Forest Resources</td>
<td></td>
<td>296</td>
</tr>
<tr>
<td>FREN</td>
<td>French</td>
<td></td>
<td>297</td>
</tr>
<tr>
<td>FRET</td>
<td>French and Italian</td>
<td></td>
<td>298</td>
</tr>
<tr>
<td>FSCN</td>
<td>Food Science and Nutrition</td>
<td></td>
<td>295</td>
</tr>
<tr>
<td>FSOS</td>
<td>Family Social Science</td>
<td></td>
<td>292</td>
</tr>
<tr>
<td>FSSP</td>
<td>Foreign Study—SPAN</td>
<td></td>
<td>296</td>
</tr>
<tr>
<td>FW</td>
<td>Fisheries and Wildlife</td>
<td></td>
<td>294</td>
</tr>
<tr>
<td>GCD</td>
<td>Genetics, Cell Biology and Development</td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>GEO</td>
<td>Geology and Geophysics</td>
<td></td>
<td>303</td>
</tr>
<tr>
<td>GEOE</td>
<td>Geological Engineering</td>
<td></td>
<td>303</td>
</tr>
<tr>
<td>GEOG</td>
<td>Geography</td>
<td></td>
<td>301</td>
</tr>
<tr>
<td>GER</td>
<td>German</td>
<td></td>
<td>305</td>
</tr>
<tr>
<td>GERO</td>
<td>Gerontology</td>
<td></td>
<td>306</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information Science</td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>GLBT</td>
<td>Gay, Lesbian, Bisexual, and Transgender Studies</td>
<td></td>
<td>298</td>
</tr>
<tr>
<td>GLOS</td>
<td>Global Studies</td>
<td></td>
<td>306</td>
</tr>
<tr>
<td>GRAD</td>
<td>Graduate School</td>
<td></td>
<td>307</td>
</tr>
<tr>
<td>GRK</td>
<td>Greek</td>
<td></td>
<td>307</td>
</tr>
<tr>
<td>GSD</td>
<td>German, Scandinavian, and Dutch</td>
<td></td>
<td>305</td>
</tr>
<tr>
<td>GWSS</td>
<td>Gender, Women, and Sexuality Studies</td>
<td></td>
<td>298</td>
</tr>
<tr>
<td>HEBR</td>
<td>Hebrew</td>
<td></td>
<td>308</td>
</tr>
<tr>
<td>HINF</td>
<td>Health Informatics</td>
<td></td>
<td>307</td>
</tr>
<tr>
<td>HIST</td>
<td>History</td>
<td></td>
<td>308</td>
</tr>
<tr>
<td>HMED</td>
<td>History of Medicine</td>
<td></td>
<td>312</td>
</tr>
<tr>
<td>HMGNG</td>
<td>Hmong</td>
<td></td>
<td>313</td>
</tr>
<tr>
<td>HNDI</td>
<td>Hindi</td>
<td></td>
<td>308</td>
</tr>
<tr>
<td>HORT</td>
<td>Horticultural Science</td>
<td></td>
<td>313</td>
</tr>
<tr>
<td>HRD</td>
<td>Human Resource Development</td>
<td></td>
<td>314</td>
</tr>
<tr>
<td>HRIR</td>
<td>Human Resources and Industrial Relations</td>
<td></td>
<td>315</td>
</tr>
<tr>
<td>HSCI</td>
<td>History of Science and Technology</td>
<td></td>
<td>313</td>
</tr>
<tr>
<td>HUMF</td>
<td>Human Factors</td>
<td></td>
<td>314</td>
</tr>
<tr>
<td>IDSC</td>
<td>Information and Decision Sciences</td>
<td></td>
<td>318</td>
</tr>
<tr>
<td>IE</td>
<td>Industrial Engineering</td>
<td></td>
<td>317</td>
</tr>
<tr>
<td>INAR</td>
<td>Interdisciplinary Archaeological Studies</td>
<td></td>
<td>317</td>
</tr>
<tr>
<td>INS</td>
<td>Insurance and Risk Management</td>
<td></td>
<td>319</td>
</tr>
<tr>
<td>IREL</td>
<td>Interpersonal Relationships Research</td>
<td></td>
<td>320</td>
</tr>
<tr>
<td>IS</td>
<td>Innovation Studies</td>
<td></td>
<td>319</td>
</tr>
<tr>
<td>ISE</td>
<td>Infrastructure Systems Engineering</td>
<td></td>
<td>319</td>
</tr>
<tr>
<td>ISG</td>
<td>Introduced Species and Genotypes</td>
<td></td>
<td>320</td>
</tr>
<tr>
<td>ITAL</td>
<td>Italian</td>
<td></td>
<td>320</td>
</tr>
</tbody>
</table>

---

University of Minnesota 2009–10 Graduate School Catalog
<table>
<thead>
<tr>
<th>Code</th>
<th>Department/Program Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOUR</td>
<td>Journalism and Mass Communication</td>
<td>321</td>
</tr>
<tr>
<td>JPN</td>
<td>Japanese</td>
<td>320</td>
</tr>
<tr>
<td>JWST</td>
<td>Jewish Studies</td>
<td>321</td>
</tr>
<tr>
<td>KIN</td>
<td>Kinesiology</td>
<td>323</td>
</tr>
<tr>
<td>LA</td>
<td>Landscape Architecture</td>
<td>325</td>
</tr>
<tr>
<td>LAMP</td>
<td>Laboratory Medicine and Pathology</td>
<td>325</td>
</tr>
<tr>
<td>LAT</td>
<td>Latin</td>
<td>327</td>
</tr>
<tr>
<td>LGTT</td>
<td>Language, Teaching, and Technology</td>
<td>326</td>
</tr>
<tr>
<td>LING</td>
<td>Linguistics</td>
<td>327</td>
</tr>
<tr>
<td>LM</td>
<td>Logistics Management</td>
<td>328</td>
</tr>
<tr>
<td>LS</td>
<td>Liberal Studies</td>
<td>327</td>
</tr>
<tr>
<td>MAR</td>
<td>Marathi</td>
<td>331</td>
</tr>
<tr>
<td>MATH</td>
<td>Mathematics</td>
<td>333</td>
</tr>
<tr>
<td>MATS</td>
<td>Materials Science</td>
<td>332</td>
</tr>
<tr>
<td>MBT</td>
<td>Master of Business Taxation</td>
<td>331</td>
</tr>
<tr>
<td>MCDG</td>
<td>Molecular Cellular Developmental Biology and Genetics</td>
<td>342</td>
</tr>
<tr>
<td>MCOM</td>
<td>Managerial Communications</td>
<td>330</td>
</tr>
<tr>
<td>ME</td>
<td>Mechanical Engineering</td>
<td>338</td>
</tr>
<tr>
<td>MEDC</td>
<td>Medicinal Chemistry</td>
<td>340</td>
</tr>
<tr>
<td>MELC</td>
<td>Middle Eastern Languages and Cultures</td>
<td>342</td>
</tr>
<tr>
<td>MEST</td>
<td>Medieval Studies</td>
<td>341</td>
</tr>
<tr>
<td>MGMT</td>
<td>Management</td>
<td>328</td>
</tr>
<tr>
<td>MHA</td>
<td>Master of Healthcare</td>
<td>332</td>
</tr>
<tr>
<td>MICA</td>
<td>Microbiology, Immunology, and Cancer Biology</td>
<td>341</td>
</tr>
<tr>
<td>MICB</td>
<td>Microbiology</td>
<td>341</td>
</tr>
<tr>
<td>MICE</td>
<td>Microbial Engineering</td>
<td>341</td>
</tr>
<tr>
<td>MKTG</td>
<td>Marketing</td>
<td>331</td>
</tr>
<tr>
<td>MOT</td>
<td>Management of Technology</td>
<td>329</td>
</tr>
<tr>
<td>MS</td>
<td>Manufacturing Systems</td>
<td>330</td>
</tr>
<tr>
<td>MST</td>
<td>Museum Studies</td>
<td>342</td>
</tr>
<tr>
<td>MTHE</td>
<td>Mathematics Education</td>
<td>337</td>
</tr>
<tr>
<td>MUED</td>
<td>Music Education</td>
<td>346</td>
</tr>
<tr>
<td>MUS</td>
<td>Music</td>
<td>342</td>
</tr>
<tr>
<td>MUSA</td>
<td>Music Applied</td>
<td>346</td>
</tr>
<tr>
<td>NPSE</td>
<td>Nanoparticle Science and Engineering</td>
<td>348</td>
</tr>
<tr>
<td>NR</td>
<td>Natural Resources Science and Management</td>
<td>348</td>
</tr>
<tr>
<td>NSC</td>
<td>Neuroscience</td>
<td>348</td>
</tr>
<tr>
<td>NSCI</td>
<td>Neuroscience Department</td>
<td>349</td>
</tr>
<tr>
<td>NSU</td>
<td>Neurosurgery</td>
<td>349</td>
</tr>
<tr>
<td>NURS</td>
<td>Nursing</td>
<td>349</td>
</tr>
<tr>
<td>NUTR</td>
<td>Nutrition</td>
<td>354</td>
</tr>
<tr>
<td>OBIO</td>
<td>Oral Biology</td>
<td>355</td>
</tr>
<tr>
<td>OMS</td>
<td>Operations and Management Sciences</td>
<td>355</td>
</tr>
<tr>
<td>OT</td>
<td>Occupational Therapy</td>
<td>354</td>
</tr>
<tr>
<td>OTOL</td>
<td>Otolaryngology</td>
<td>356</td>
</tr>
<tr>
<td>PA</td>
<td>Public Affairs</td>
<td>370</td>
</tr>
<tr>
<td>PAV</td>
<td>Public Administration</td>
<td>362</td>
</tr>
<tr>
<td>PBS</td>
<td>Plant Biological Sciences</td>
<td>362</td>
</tr>
<tr>
<td>PHCL</td>
<td>Pharmacology</td>
<td>357</td>
</tr>
<tr>
<td>PHIL</td>
<td>Philosophy</td>
<td>358</td>
</tr>
<tr>
<td>PHM</td>
<td>Pharmaceutics</td>
<td>357</td>
</tr>
<tr>
<td>PHYS</td>
<td>Physiology</td>
<td>361</td>
</tr>
<tr>
<td>PHYS</td>
<td>Physics</td>
<td>359</td>
</tr>
<tr>
<td>PLPA</td>
<td>Plant Pathology</td>
<td>362</td>
</tr>
<tr>
<td>PLSH</td>
<td>Polish</td>
<td>363</td>
</tr>
<tr>
<td>PMED</td>
<td>Physical Medicine and Rehabilitation</td>
<td>359</td>
</tr>
<tr>
<td>POL</td>
<td>Political Science</td>
<td>363</td>
</tr>
<tr>
<td>PORT</td>
<td>Portuguese</td>
<td>367</td>
</tr>
<tr>
<td>PREV</td>
<td>Preventive Science Minor</td>
<td>367</td>
</tr>
<tr>
<td>PSY</td>
<td>Psychology</td>
<td>367</td>
</tr>
<tr>
<td>PT</td>
<td>Physical Therapy</td>
<td>359</td>
</tr>
<tr>
<td>PUBH</td>
<td>Public Health</td>
<td>373</td>
</tr>
<tr>
<td>RAD</td>
<td>Radiology</td>
<td>375</td>
</tr>
<tr>
<td>REC</td>
<td>Recreation, Park, and Leisure Studies</td>
<td>375</td>
</tr>
<tr>
<td>RELS</td>
<td>Religious Studies</td>
<td>377</td>
</tr>
<tr>
<td>RRM</td>
<td>Recreation Resource</td>
<td>375</td>
</tr>
<tr>
<td>RSC</td>
<td>Rehabilitation Science</td>
<td>376</td>
</tr>
<tr>
<td>RUSS</td>
<td>Russian</td>
<td>377</td>
</tr>
<tr>
<td>SACP</td>
<td>Social, Administrative, and Clinical Pharmacy</td>
<td>382</td>
</tr>
<tr>
<td>SAGR</td>
<td>Sustainable Agricultural Systems</td>
<td>390</td>
</tr>
<tr>
<td>SAPH</td>
<td>Social and Administrative Pharmacy</td>
<td>379</td>
</tr>
<tr>
<td>SCAN</td>
<td>Scandinavian</td>
<td>378</td>
</tr>
<tr>
<td>SCB</td>
<td>Stem Cell Biology</td>
<td>389</td>
</tr>
<tr>
<td>SCIC</td>
<td>Scientific Computation</td>
<td>378</td>
</tr>
<tr>
<td>SCMC</td>
<td>Studies in Cinema and Media</td>
<td>377</td>
</tr>
<tr>
<td>SENG</td>
<td>Software Engineering</td>
<td>383</td>
</tr>
<tr>
<td>SKT</td>
<td>Sanskrit</td>
<td>378</td>
</tr>
<tr>
<td>SLHS</td>
<td>Speech-Language-Hearing Sciences</td>
<td>386</td>
</tr>
<tr>
<td>SOC</td>
<td>Sociology</td>
<td>382</td>
</tr>
<tr>
<td>SOIL</td>
<td>Soil, Water, and Climate</td>
<td>384</td>
</tr>
<tr>
<td>SPAN</td>
<td>Spanish</td>
<td>385</td>
</tr>
<tr>
<td>SPPT</td>
<td>Spanish and Portuguese</td>
<td>386</td>
</tr>
<tr>
<td>SST</td>
<td>Studies of Science and Technology</td>
<td>389</td>
</tr>
<tr>
<td>STAT</td>
<td>Statistics</td>
<td>388</td>
</tr>
<tr>
<td>SUM</td>
<td>Sumerian</td>
<td>390</td>
</tr>
<tr>
<td>SURG</td>
<td>Surgery</td>
<td>390</td>
</tr>
<tr>
<td>SW</td>
<td>Social Work</td>
<td>379</td>
</tr>
<tr>
<td>TESL</td>
<td>Teaching English as a Second Language</td>
<td>390</td>
</tr>
<tr>
<td>TH</td>
<td>Theatre Arts</td>
<td>391</td>
</tr>
<tr>
<td>TRAD</td>
<td>Therapeutic Radiology</td>
<td>392</td>
</tr>
<tr>
<td>TRIN</td>
<td>Translation and Interpreting</td>
<td>393</td>
</tr>
<tr>
<td>TXCL</td>
<td>Toxicology</td>
<td>392</td>
</tr>
<tr>
<td>URB</td>
<td>Urban Studies</td>
<td>393</td>
</tr>
<tr>
<td>VBS</td>
<td>Veterinary and Biomedical Sciences</td>
<td>393</td>
</tr>
<tr>
<td>VMED</td>
<td>Veterinary Medicine, Graduate</td>
<td>393</td>
</tr>
<tr>
<td>WHRE</td>
<td>Work and Human Resource Education</td>
<td>396</td>
</tr>
<tr>
<td>WRIT</td>
<td>Writing Studies</td>
<td>397</td>
</tr>
<tr>
<td>WRS</td>
<td>Water Resources Science</td>
<td>395</td>
</tr>
<tr>
<td>YOST</td>
<td>Youth Development and Research</td>
<td>398</td>
</tr>
</tbody>
</table>
Abbreviations, Course Numbers, Symbols, and 214
Abbreviations, Key to Program, 34, 42, 199
Academic Progress 16
Accessibility, Building 3
Access to Student Educational Records 3
Accountancy 42
Accountancy M.Acc. 42
Accounting Courses (ACCT) 215
Administration 6
Admission 8
Academic Staff Applicants 9
Application Procedure 8
Basic Requirements 8
Committee on Institutional Cooperation (CIC) Traveling International Applicants 9
Professional Development Applicants 9
Test Data 9
University of Minnesota Undergraduate Applicants 9
Adult Education Courses (ADED) 215
Adult Psychiatry Courses (ADPY) 215
Aerospace Engineering and Mechanics 43
Aerospace Engineering and Mechanics Courses (AEM) 216
M.Aero.E 43
M.S. 43
Ph.D. 45
Afro-American Studies Courses (AFRO) 218
Agricultural Engineering See Bioproducts and Biosystems Science Engineering and Management
Agricultural, Food, and Environmental Education Courses (AFEE) 219
Agriculture and Applied Economics See Applied Economics
Agronomy and Plant Genetics Courses (AGRO) 220
Akkadian Courses (AKKA) 220
All-University Programs 34
Duluth and Twin Cities Campus Degree Programs 35
Integrated Biosciences M.S. and Ph.D. 35
Toxicology M.S. and Ph.D. 36
Water Resources Science M.S. and Ph.D. 37
Rochester and Twin Cities Campus Degree Program 39
Biomedical Informatics and Computational Biology 39
American Indian Studies Courses (AMIN) 220
American Sign Language Courses (ASL) 221
American Studies 44
American Studies Courses (AMST) 221
M.A. 45
Ph.D. 45
Ancient and Medieval Art and Archaeology See Classical and Near Eastern Studies, See Classical and Near Eastern Studies
Anesthesiology Courses (ANES) 221
Animal Sciences 45
Animal Science Courses (ANSC) 221
M.S. 45
Ph.D. 46
Anthropology 46
Anthropology Courses (ANTH) 222
M.A. 46
Ph.D. 47
Application Procedure 8
Deadlines 8
Special Applicant Categories 9
Applied Developmental Psychology Postbaccalaureate Certificate 47
Applied and Computational Mathematics M.S. (Duluth) 200
Applied Economics 47
Applied Economics Courses (APEC) 224
M.S. 48
Ph.D. 48
Applied Plant Sciences 48
Applied Plant Sciences Courses (APSC) 226
M.S. 49
Ph.D. 50
Specializations 49
Arabic Courses (ARAB) 226
Aramaic Courses (ARM) 226
Architecture 50
Courses (ARCH) 226
M.Arch. 51
M.S. 51
M.S./M.Arch. Dual Degree 51
Army and Air Force ROTC 13
Art 52
Art Courses (ARTS) 229
M.F.A. 52
Art Education See Education, Curriculum, and Instruction
Art—Graphic Design M.F.A. (Duluth) 201
Art History 52
Art History Courses (ARTH) 230
M.A. 53
Ph.D. 53
Asian American Studies Courses (AAS) 232
Asian Languages and Literatures Courses (ALL) 232
Asian Literatures, Cultures, and Media 53
M.A. 54
Ph.D. 54
Assistantships and Fellowships 10
Astronomy Courses (AST) 233
Astrophysics 54
M.S. 55
Ph.D. 55
Audiology See Speech-Language-Hearing Sciences
Biochemistry Courses (BIOC) 234
Biochemistry, Molecular Biology, and Biophysics 55, 201
M.S. 56
Ph.D. 56
Bioethics 56
Bioethics, Center for, Courses (BTHX) 235
M.A. 57
Minor Only 57
Bioinformatics 56, 58
Bioinformatics Courses (BINF) 235
Minor Only 58
Biological Science 58
M.B.S. 59
Biology Courses (BIOL) 235
Biomedical Engineering 59
Biomedical Engineering Courses (BMEN) 236
M.S. 60
Ph.D. 60
Biomedical Informatics and Computational Biology (All-University Rochester/Twin Cities Campus Degree Program) 39
See also All-University Programs
Biomedical Science Courses (BMSC) 237
Biophysical Sciences and Medical Physics 61
M.S. 61
Ph.D. 61
Bioproducts and Biosystems Science Engineering and Management 61
Bioproducts and Biosystems Engineering Courses (BBE) 237
M.S.B.B.S.E.M. 62
Ph.D. 62
Biosciences, Integrated, M.S. 207, 209
Biostatistics 62
M.S. 65
Ph.D. 65
Index

Biosystems and Agricultural Engineering  See Bioproducts and Biobiosystems Science Engineering and Management
Business Administration 63
Business Administration Courses (BA) 239
M.B.A. (Duluth) 201
Ph.D. 65
Business and Industry Education Courses (BIE) 239
Business Taxation 65
M.B.T. 65

C
Calendars 411
Campus and Community 4
Campus Maps 2
Candidacy for the Ph.D. 24
Career Development Program 4
Cell and Developmental Biology  See Molecular, Cellular, Developmental Biology and Genetics
Cellular and Integrative Physiology 66
M.S. 67
Ph.D. 67
Center for Spirituality and Healing Courses (CSPH) 240
Center for Teaching and Learning (CTL) 14
Central Asian Studies Courses (CAS) 242
Certificate, Specialist in Education 21
Certificates, Postbaccalaureate 16
Change of Campus 15
Change of Major, Track, or Degree Objective 15
Chemical Engineering and Materials Science and Engineering 67
M.Ch.E 68
M.Mat.S.E 68
Ph.D. 68
Chemical Engineering Courses (CHEN) 242
Chemical Physics 68
Chemical Physics Courses (CHPH) 243
M.S. 69
Ph.D. 69
Chemistry 69
Chemistry Courses (CHEM) 243
M.S. (Duluth) 202
M.S. (Twin Cities) 70
Ph.D. 70
Chicano Studies Course (CHIC) 245
Child and Adolescent Psychiatry Courses (CAPY) 245
Child Psychology 70
M.A. 70
Ph.D. 71
Child Psychology Courses (CPSY) 246
Chinese  See Asian Literatures, Cultures, and Media
Chinese Courses (CHN) 247
Civil Engineering 71
Civil Engineering Courses (CE) 248
M.C.E. 72
M.S. 72
Ph.D. 72
Classical and Near Eastern Studies 72
Ancient and Medieval Art and Archaeology Track
M.A. 73
Ph.D. 73
Classical and Near Eastern Studies Courses (CNES) 251
Classics Track
M.A. 73
Ph.D. 73
Greek Track
M.A. 74
Ph.D. 74
Latin Track
M.A. 74
Ph.D. 74
Religions in Antiquity Track
M.A. 74
Ph.D. 74
Classics  See Classical and Near Eastern Studies
Class Schedule 2
Clinical Laboratory Science 74
Clinical Laboratory Science Courses (CLS) 252
M.S. 75, 76
Clinical Research 75
Cognitive Science 76
Cognitive Science Courses (CGSC) 253
Ph.D. 77
Commencement 29
Communication Disorders  See Speech-Language-Hearing Sciences
Communication Sciences and Disorders
M.A. (Duluth) 203
Communication Studies 77
Communication Studies Courses (COMM) 253
M.A. 78
Ph.D. 78
Comparative and Molecular Biosciences 78
Comparative and Molecular Biosciences Courses (CMB) 254
M.S. 79
Ph.D. 79
Comparative Literature 79
Comparative Literature Courses (CL) 255
M.A. 79
Ph.D. 80
Comparative Studies in Discourse and Society 80
Comparative Studies in Discourse and Society Courses (CSDS) 255
M.A. 80
Ph.D. 80
Complementary Therapies and Healing Practices 81
Minor Only 81
Postbaccalaureate Certificate 81
Health Coaching 82
Composition, Literacy, and Rhetorical Studies  See Literacy and Rhetorical Studies
Computational Biology  See Biomedical Informatics and Computer Engineering Courses (CMPE) 256
Computer Science 82
Computer Science Courses (CSCI) 256
M.C.S 83
M.S. (Duluth) 203
M.S. (Twin Cities) 83
Ph.D. 84
Conservation Biology 84
Conservation Biology Courses (CBO) 258
M.S. 85
Ph.D. 85
Control Science and Dynamical Systems 85
Control Science and Dynamical Systems Courses (CSDY) 259
Ph.D. 86
Coptic Courses (COPT) 259
Council of Graduate Schools in the United States
Resolution on Financial Offers 10
Council of Graduate Students 14
Counseling and Consulting Services 4
Career Development Program 4
Organizational Development Program 4
Student Academic Success Services 4
Student Affairs Office of Measurement Services (OMS) 4
Testing Center 4
Counseling and Student Personnel Psychology  See Educational Psychology
Course Designators, Guide to 400
Course Numbers, Symbols, and Abbreviations 214
Designators 214
Numbers 214
Symbols and Abbreviations 214
Creative Writing 86
English: Creative Writing Courses (ENGW) 287
M.F.A. 86
### Index

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Requirements, Minimum</td>
<td>18, 20</td>
</tr>
<tr>
<td>Criminology M.A. (Duluth)</td>
<td>204</td>
</tr>
<tr>
<td>Cultural Studies and Comparative Literature Courses (CSCL)</td>
<td>259</td>
</tr>
<tr>
<td>Culture and Teaching See Education, Curriculum, and Instruction</td>
<td></td>
</tr>
<tr>
<td>Curriculum and Instruction Courses (CI)</td>
<td>259</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td></td>
</tr>
<tr>
<td>Dance Courses (DNCE)</td>
<td>266</td>
</tr>
<tr>
<td>Degree Programs and Majors, List of</td>
<td>30</td>
</tr>
<tr>
<td>Dentistry</td>
<td>86</td>
</tr>
<tr>
<td>Dentistry Courses (DENT)</td>
<td>267</td>
</tr>
<tr>
<td>M.S.</td>
<td>87</td>
</tr>
<tr>
<td>Design</td>
<td>88</td>
</tr>
<tr>
<td>Design Courses (DES)</td>
<td>268</td>
</tr>
<tr>
<td>M.A.</td>
<td>88</td>
</tr>
<tr>
<td>M.F.A.</td>
<td>88</td>
</tr>
<tr>
<td>M.S.</td>
<td>88</td>
</tr>
<tr>
<td>Design, Housing, and Apparel Courses (DHA)</td>
<td>268</td>
</tr>
<tr>
<td>Development Studies and Social Change</td>
<td></td>
</tr>
<tr>
<td>Development Studies and Social Change Courses (DSSC)</td>
<td>270</td>
</tr>
<tr>
<td>Minor Only</td>
<td>89</td>
</tr>
<tr>
<td>Directory Information See also Student Educational Records, Access</td>
<td>3</td>
</tr>
<tr>
<td>Disability Services</td>
<td>3</td>
</tr>
<tr>
<td>Building Accessibility</td>
<td>3</td>
</tr>
<tr>
<td>Doctor of Audiology</td>
<td>29</td>
</tr>
<tr>
<td>Doctor of Education</td>
<td>28</td>
</tr>
<tr>
<td>Doctor of Musical Arts</td>
<td>29</td>
</tr>
<tr>
<td>Doctor of Philosophy Degree</td>
<td>22</td>
</tr>
<tr>
<td>Changes in</td>
<td>24, 25, 27</td>
</tr>
<tr>
<td>Dissertation</td>
<td>26, 28</td>
</tr>
<tr>
<td>Examinations</td>
<td>24, 27</td>
</tr>
<tr>
<td>Grade Requirements, Minimum</td>
<td>24</td>
</tr>
<tr>
<td>Language Requirement</td>
<td>24</td>
</tr>
<tr>
<td>Major Field Credits</td>
<td>24</td>
</tr>
<tr>
<td>Minor Field or Supporting Program</td>
<td>24</td>
</tr>
<tr>
<td>Official Candidacy</td>
<td>24</td>
</tr>
<tr>
<td>Official Program</td>
<td>23</td>
</tr>
<tr>
<td>Pre-Thesis Exams</td>
<td>22</td>
</tr>
<tr>
<td>Registration Requirement for</td>
<td>22</td>
</tr>
<tr>
<td>Thesis</td>
<td>26</td>
</tr>
<tr>
<td>Time Limit</td>
<td>23</td>
</tr>
<tr>
<td>Transfer of Credits</td>
<td>23</td>
</tr>
<tr>
<td>Doctor of Physical Therapy</td>
<td>29</td>
</tr>
<tr>
<td>Duluth Degree Programs and Faculty</td>
<td></td>
</tr>
<tr>
<td>Applied and Computational Mathematics M.S.</td>
<td>200</td>
</tr>
<tr>
<td>Art—Graphic Design M.F.A.</td>
<td>201</td>
</tr>
<tr>
<td>Biochemistry, Molecular Biology, and Biophysics</td>
<td>201</td>
</tr>
<tr>
<td>Business Administration M.B.A.)</td>
<td>201</td>
</tr>
<tr>
<td>Chemistry M.S.</td>
<td>202</td>
</tr>
<tr>
<td>Communication Sciences and Disorders (M.A.)</td>
<td>203</td>
</tr>
<tr>
<td>Computer Science M.S.</td>
<td>203</td>
</tr>
<tr>
<td>Criminology M.A.</td>
<td>204</td>
</tr>
<tr>
<td>Electrical and Computer Engineering M.S.E.C.E.</td>
<td>205</td>
</tr>
<tr>
<td>Engineering Management</td>
<td>205</td>
</tr>
<tr>
<td>Geological Sciences M.S.</td>
<td>207</td>
</tr>
<tr>
<td>Integrated Biosciences M.S. and Ph.D. (All-University)</td>
<td>35</td>
</tr>
<tr>
<td>Liberal Studies M.L.S.</td>
<td>207</td>
</tr>
<tr>
<td>Linguistics (Minor Only)</td>
<td>208</td>
</tr>
<tr>
<td>Music M.M.</td>
<td>208</td>
</tr>
<tr>
<td>Physics M.S.</td>
<td>208</td>
</tr>
<tr>
<td>Social Work M.S.W.</td>
<td>209</td>
</tr>
<tr>
<td>Teaching and Learning Ed.D.</td>
<td>199</td>
</tr>
<tr>
<td>Dutch Courses (DTCH)</td>
<td>270</td>
</tr>
</tbody>
</table>

### E

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Childhood Policy Postbaccalaureate Certificate</td>
<td>89</td>
</tr>
<tr>
<td>East Asian Studies See Asian Literatures, Cultures, and Media</td>
<td></td>
</tr>
<tr>
<td>East Asian Studies Courses (EAS)</td>
<td>270</td>
</tr>
<tr>
<td>Ecology, Evolution, and Behavior</td>
<td>90</td>
</tr>
<tr>
<td>Ecology, Evolution, and Behavior Courses (EE)</td>
<td>270</td>
</tr>
<tr>
<td>M.S.</td>
<td>91</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>91</td>
</tr>
<tr>
<td>Economics</td>
<td>91</td>
</tr>
<tr>
<td>Economics Courses (ECON)</td>
<td>271</td>
</tr>
<tr>
<td>M.A.</td>
<td>91</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>92</td>
</tr>
<tr>
<td>Educational Policy and Administration</td>
<td>94</td>
</tr>
<tr>
<td>Ed.D.</td>
<td>95</td>
</tr>
<tr>
<td>Ed.S. Certificate</td>
<td>95</td>
</tr>
<tr>
<td>Educational Policy and Administration Courses (EDPA)</td>
<td>274</td>
</tr>
<tr>
<td>M.A.</td>
<td>95</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>95</td>
</tr>
<tr>
<td>Educational Psychology 95</td>
<td></td>
</tr>
<tr>
<td>Counseling and Student Personnel Psychology Certificate of Specialist Requirements</td>
<td>96</td>
</tr>
<tr>
<td>K-12 School Counseling</td>
<td>96</td>
</tr>
<tr>
<td>M.A.</td>
<td>96</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>96</td>
</tr>
<tr>
<td>Educational Psychology Courses (EPSY)</td>
<td>278</td>
</tr>
<tr>
<td>Psychological Foundations</td>
<td></td>
</tr>
<tr>
<td>M.A.</td>
<td>97</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>97</td>
</tr>
<tr>
<td>Quantitative Methods in Education (QME)</td>
<td></td>
</tr>
<tr>
<td>M.A.</td>
<td>97</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>97</td>
</tr>
<tr>
<td>School Psychology</td>
<td></td>
</tr>
<tr>
<td>Certificate of Specialist Requirements</td>
<td>98</td>
</tr>
<tr>
<td>M.A.</td>
<td>97</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>97</td>
</tr>
<tr>
<td>Special Education</td>
<td></td>
</tr>
<tr>
<td>Certificate of Specialist Requirements</td>
<td>98</td>
</tr>
<tr>
<td>M.A.</td>
<td>98</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>98</td>
</tr>
<tr>
<td>Educational Records, Access to Student</td>
<td>3</td>
</tr>
<tr>
<td>Education and Human Development Courses (EDHD)</td>
<td>274</td>
</tr>
<tr>
<td>Education Courses (EDUC)</td>
<td>274</td>
</tr>
<tr>
<td>Education, Curriculum, and Instruction</td>
<td>92</td>
</tr>
<tr>
<td>M.A.</td>
<td>93</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>93</td>
</tr>
<tr>
<td>Education Sciences, Minor Only</td>
<td>93</td>
</tr>
<tr>
<td>Education, Specialist Certificate in</td>
<td>21</td>
</tr>
<tr>
<td>Electrical and Computer Engineering Courses (EE)</td>
<td>284</td>
</tr>
<tr>
<td>Electrical and Computer Engineering M.S.E.C.E. (Duluth)</td>
<td>205</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>98</td>
</tr>
<tr>
<td>M.S.E.E.</td>
<td>99</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>99</td>
</tr>
<tr>
<td>Elementary Education See Education, Curriculum, and Instruction</td>
<td></td>
</tr>
<tr>
<td>E-Mail</td>
<td>3</td>
</tr>
<tr>
<td>Employment, Student</td>
<td>12</td>
</tr>
<tr>
<td>Engineering</td>
<td></td>
</tr>
<tr>
<td>Biomedical</td>
<td>59</td>
</tr>
<tr>
<td>Electrical and Computer M.S.E.C.E. (Duluth)</td>
<td>205</td>
</tr>
<tr>
<td>Engineering Management M.S.E.M. (Duluth)</td>
<td>205</td>
</tr>
<tr>
<td>Engineering, Professional Master’s Degree in</td>
<td>20</td>
</tr>
<tr>
<td>English</td>
<td>100</td>
</tr>
<tr>
<td>Creative Writing Courses (ENGW)</td>
<td>287</td>
</tr>
<tr>
<td>Literature Courses (ENGL)</td>
<td>288</td>
</tr>
<tr>
<td>M.A. (Duluth)</td>
<td>206</td>
</tr>
<tr>
<td>M.A. (Twin Cities)</td>
<td>100</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>101</td>
</tr>
</tbody>
</table>
**Index**

<table>
<thead>
<tr>
<th>English as a Second Language</th>
<th>101</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.A.</td>
<td>101</td>
</tr>
<tr>
<td>Entomology</td>
<td>101</td>
</tr>
<tr>
<td>Entomology Courses (ENT)</td>
<td>289</td>
</tr>
<tr>
<td>M.S.</td>
<td>102</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>102</td>
</tr>
<tr>
<td>Environmental Health</td>
<td>102</td>
</tr>
<tr>
<td>M.S.</td>
<td>103</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>103</td>
</tr>
<tr>
<td>Environmental Sciences, Policy, and Management Courses</td>
<td>(ESPM) 290</td>
</tr>
<tr>
<td>Epidemiology</td>
<td>103</td>
</tr>
<tr>
<td>M.S.</td>
<td>104</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>104</td>
</tr>
<tr>
<td>Equal Opportunity</td>
<td>3</td>
</tr>
<tr>
<td>Ergonomics</td>
<td>See Human Factors/Ergonomics</td>
</tr>
<tr>
<td>Examinations for Admissions</td>
<td>9</td>
</tr>
<tr>
<td>Examinations for Degree</td>
<td>19, 20, 24, 27</td>
</tr>
<tr>
<td>Experimental and Clinical Pharmacology Courses</td>
<td>(ECP)</td>
</tr>
<tr>
<td>Experimental Surgery</td>
<td>188</td>
</tr>
</tbody>
</table>

**F**

<table>
<thead>
<tr>
<th>Faculty and Degree Programs</th>
<th>35, 42, 198</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Medicine and Community Health Courses</td>
<td>(FMCH) 292</td>
</tr>
<tr>
<td>Family Policy</td>
<td></td>
</tr>
<tr>
<td>Family Policy Minor Courses</td>
<td>292</td>
</tr>
<tr>
<td>Minor Only</td>
<td>104</td>
</tr>
<tr>
<td>Family Social Science</td>
<td>105</td>
</tr>
<tr>
<td>Family Social Science Courses (FSOS)</td>
<td>292</td>
</tr>
<tr>
<td>M.A.</td>
<td>106</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>106</td>
</tr>
<tr>
<td>Family, Youth and Community</td>
<td>See Education, Curriculum, and Instruction</td>
</tr>
<tr>
<td>Fellowships, Assistantships</td>
<td>10</td>
</tr>
<tr>
<td>Departmental Fellowships</td>
<td>11</td>
</tr>
<tr>
<td>Diversity of Views and Experiences Fellowship</td>
<td>(DOVE) 11</td>
</tr>
<tr>
<td>Graduate Fellowships</td>
<td>11</td>
</tr>
<tr>
<td>Graduate School Fellowships</td>
<td>11</td>
</tr>
<tr>
<td>Underrepresented and Educationally Disadvantaged Students</td>
<td>for 11</td>
</tr>
<tr>
<td>Feminist Studies</td>
<td>106</td>
</tr>
<tr>
<td>M.A.</td>
<td>107</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>107</td>
</tr>
<tr>
<td>Finance Courses (FINA)</td>
<td>294</td>
</tr>
<tr>
<td>Financial Aid</td>
<td>34, 198</td>
</tr>
<tr>
<td>Financial Assistance</td>
<td>12</td>
</tr>
<tr>
<td>Student Employment</td>
<td>12</td>
</tr>
<tr>
<td>Financial Mathematics</td>
<td>107</td>
</tr>
<tr>
<td>Financial Mathematics Courses (FM)</td>
<td>294</td>
</tr>
<tr>
<td>M.F.M.</td>
<td>108</td>
</tr>
<tr>
<td>Finnish Courses (FIN)</td>
<td>294</td>
</tr>
<tr>
<td>Fisheries</td>
<td>See Conservation Biology</td>
</tr>
<tr>
<td>Fisheries and Wildlife Courses (FW)</td>
<td>294</td>
</tr>
<tr>
<td>Food Science</td>
<td>108</td>
</tr>
<tr>
<td>M.S.</td>
<td>108</td>
</tr>
<tr>
<td>Food Science and Nutrition Courses (FSCN)</td>
<td>295</td>
</tr>
<tr>
<td>Foreign Study—SPAN Courses (FSSP)</td>
<td>296</td>
</tr>
<tr>
<td>Forest Resources Courses (FR)</td>
<td>296</td>
</tr>
<tr>
<td>Forestry</td>
<td>See Natural Resources Science and Management</td>
</tr>
<tr>
<td>French</td>
<td>109</td>
</tr>
<tr>
<td>French Courses (FREN)</td>
<td>297</td>
</tr>
<tr>
<td>M.A.</td>
<td>109</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>109</td>
</tr>
<tr>
<td>French and Italian Courses (FRIT)</td>
<td>298</td>
</tr>
<tr>
<td>French Studies Postbaccalaureate Certificate</td>
<td>109</td>
</tr>
</tbody>
</table>

**G**

| Gay, Lesbian, Bisexual, and Transgender Studies Courses | (GLBT) 298 |
| Gender, Women, and Sexuality Studies Courses | (GWSS) 298 |
| General Information | 8 |
| Genetics | See Molecular, Cellular, Developmental Biology and Gen |
| Genetics, Cell Biology and Development Courses | (GCD) 300 |
| Geographic Information Science | 110 |
| Geographic Information Science Courses (GIS) | 300 |
| M.G.I.S. | 110 |
| Geography | 111 |
| Geography Courses (GEOG) | 301 |
| M.A. | 111 |
| Ph.D. | 111 |
| Geological Engineering | 112 |
| Geological Engineering Courses (GEOE) | 303 |
| M.Geo.E. | 112 |
| M.S. | 112 |
| Geological Sciences M.S. (Duluth) | 207 |
| Geology | 113 |
| M.S. | 113 |
| Ph.D. | 114 |
| Geology and Geophysics Courses | (GEO) 303 |
| Geophysics | 114 |
| M.S. | 114 |
| Ph.D. | 115 |
| German Courses (GER) | 305 |
| Germanic Studies | 115 |
| German and Scandinavian Studies Track | Ph.D. 116 |
| Germanic Medieval Studies Track | M.A. 116 |
| German Track | M.A. 115 |
| Ph.D. | 115 |
| Scandinavian Studies Track M.A. | 116 |
| Teaching Track M.A. | 116 |
| German, Scandinavian, and Dutch Courses (GSD) | 305 |
| Gerontology | 124 |
| Gerontology Courses (GERO) | 306 |
| Minor Only | 117 |
| Global Studies Courses (GERO) | 306 |
| Grading System | 15 |
| Graduate Assistantships | 10 |
| Health Care Plan | 11 |
| Graduate Diversity, Outreach, and Retention, Office of | 15 |
| Graduate School | Cooperative Programs | 201 |
| Degree Programs | 34, 41, 198 |
| Financial Aid | 34, 198 |
| Graduate School Courses (GRAD) | 307 |
| Graduation, Clearance for | 29 |
| Graphic Design M.F.A. (Duluth) | 201 |
| Greek | See Classical and Near Eastern Studies |
| Greek Courses (GRK) | 307 |
| Grievance Procedures, Student | 13 |

**H**

| Health Informatics | 117 |
| Health Informatics Courses (HINF) | 307 |
| M.H.I. | 118 |
| M.S. | 118 |
| Ph.D. | 118 |
| Health Journalism and Communication | 119 |
| M.A. | 119 |
| Health Services Research, Policy, and Administration | 119 |
| M.S. | 120 |
| Ph.D. | 120 |
J

Japanese  See Asian Literatures, Cultures, and Media
Japanese Courses (JPN) 320
Jewish Studies Courses (JWST) 321
Joint Degrees 29
Journalism  See Mass Communication
Journalism and Mass Communication Courses (JOUR) 321

K

Key to Abbreviations 199
Kinesiology 130
Kinesiology Courses (KIN) 323
M.A. 130
Ph.D. 130

L

Laboratory Medicine and Pathology Courses (LAMP) 325
Landscape Architecture 131
Landscape Architecture Courses (LA) 325
M.L.A. 132
M.L.A./M.U.R.P. 132
M.S. 132
Language, Teaching, and Technology Courses (LTT) 326
Latin  See Classical and Near Eastern Studies
Latin Courses (LAT) 327
Law Minor Only 132
Learning Technologies  See Education, Curriculum, and Instruction
Liberal Studies 133
M.L.S. (Duluth) 207
M.L.S. (Twin Cities) 133
Liberal Studies Courses (LS) 327
Libraries 5
Linguistics 133
Graduate Minor Only (Duluth) 208
M.A. 134
Ph.D. 134
Linguistics Courses (LING) 327
Linguistics (Minor Only) 208
Literacy and Rhetorical Studies Minor Only 134
Literacy Education  See Education, Curriculum, and Instruction
Location 2
Logistics Management Courses (LM) 328
Luso-Brazilian Literature  See Hispanic and Lusophone Literatures, Cultures, and Linguistics
Lusophone Literatures and Cultures  See Hispanic and Lusophone Literatures, Cultures, and Linguistics

M

Majors and Degrees 30, 198
Management Courses (MGMT) 328
Management of Technology 135
Management of Technology Courses (MOT) 329
M.S.MOT. 136
Managerial Communications Courses (MCOM) 330
Manufacturing and Systems Engineering  See Industrial and Systems Engineering
Manufacturing Systems Courses (MS) 330
Marathi Courses (MAR) 331
Marketing Courses (MKTG) 331
Mass Communication 136
M.A. 136
Ph.D. 136
Master of Business Taxation Courses (MBT) 331
Master of Fine Arts 21
Index

Master of Healthcare Administration Courses (MHA) 332
Master's Degree 16
Language Requirement 18
Minimum Grade Requirements 18
Plan A With Thesis 18, 19
Plan B Without Thesis 20
Plan C Coursework Only 16
Registration Requirement 16
Transfer of Credits 17
Materials Science and Engineering See Chemical Engineering and Materials Science and Engineering
Materials Science Courses (MATS) 332
Mathematics 137
Applied and Computational M.S. (Duluth) 200
Mathematics Courses (MATH) 333
M.S. 137
Ph.D. 137
Mathematics Education See Education, Curriculum, and Instruction
Mathematics Education Courses (MTHE) 337
M.B.A. 201
Mechanical Engineering 138
Mechanical Engineering Courses (ME) 338
M.S.M.E. 138
Ph.D. 138
Mechanics See Aerospace Engineering and Mechanics
Medical Physics See Biophysical Sciences and Medical Physics; See Biophysical Sciences and Medical Physics
Medicinal Chemistry 139
Medicinal Chemistry Courses (MEDC) 340
M.S. 139
Ph.D. 139
Medieval Studies
Medieval Studies Courses (MEST) 341
Minor Only 139
Microbial Ecology Minor Only 140
Microbial Engineering (ME) 140
Microbial Engineering Courses (MICE) 341
M.S. 141
Microbiology Courses (MICB) 341
Microbiology, Immunology, and Cancer Biology 141
Microbiology, Immunology, and Cancer Biology Courses (MICA) 341
M.S. 142
Ph.D. 142
Middle Eastern Languages and Cultures Courses (MELC) 342
Mission, University of Minnesota 2
Molecular, Cellular, Developmental Biology and Genetics 143
Courses (MCDG) 342
M.S. 144
Ph.D. 144
Molecular Cellular Developmental Biology and Genetics Courses (MCDG) 342
Molecular Veterinary Biosciences See Comparative and Molecular Biosciences
Museum Studies
Minor Only 144
Museum Studies Courses (MST) 342
Music 144
D.M.A. 145
M.A. 145
M.M. 145
Duluth 208
Twin Cities 145
Music Applied Courses (MUSA) 346
Music Courses (MUS) 342
Ph.D. 146
Music Education See Music
Music Education Courses (MUED) 346

N
Nanoparticle Science and Engineering Minor Only 146
Nanoparticle Science and Engineering Courses (NPSE) 348
Natural Resources Science and Management 147
M.S. 148
Natural Resources Science and Management Courses (NR) 348
Ph.D. 148
Neuroscience 148
M.S. 149
Neuroscience Courses (NSC) 348
Neuroscience Department Courses (NSCH) 349
Ph.D. 149
Neurosurgery See Related Fields, Twin Cities
Neurosurgery Courses (NSU) 349
Nonprofit Management Postbaccalaureate Certificate 149
Nursing 150
Nursing Courses (NURS) 349
Ph.D. 151
Post-Master's (M.S.) Certificate 151
Nutrition 151
M.S. 152
Nutrition Courses (NUTR) 354
Ph.D. 152

O
Occupational Therapy 153
M.S. 153
Occupational Therapy Courses (OT) 354
Office of Student Finance (OSF) 12
Operations and Management Sciences Courses (OMS) 355
Oral Biology 153
M.S. 154
Oral Biology Courses (OBIO) 355
Ph.D. 154
Organizational Development Program 4
Orientation to the Twin Cities Campus 14
Otolaryngology 155
M.S. 155
M.S.Otol. 155
Otolaryngology Courses (OTOL) 356
Ph.D.Otol. 155

P
Pediatrics 195
Pharmaceutics 156
M.S. 156
Pharmaceutics Courses (PHM) 357
Ph.D. 156
Pharmacology 156
M.S. 157
Pharmacology Courses (PHCL) 357
Ph.D. 157
Philosophy 157
M.A. 158
Ph.D. 158
Philosophy Courses (PHIL) 358
Physical Education and Recreation See Kinesiology
Physical Medicine and Rehabilitation Courses (PMED) 359
Physical Therapy 158
D.P.T. 159
Physical Therapy Courses (PT) 359
Physics 159
M.S. 159
Duluth 208
Twin Cities 160
Ph.D. 160
Physics Courses (PHYS) 359
Index

Physiology See Cellular and Integrative Physiology

Physiology Courses (PHSL) 361

Planning See Urban and Regional Planning

Plant Biological Sciences 160
  M.S. 161
  Ph.D. 161
  Plant Biological Sciences Courses (PBS) 362
  Plant Biology Courses (PBIO) 362

Plant Pathology 161
  M.S. 162
  Ph.D. 162

Plant Pathology Courses (PLPA) 362

Policies 3

Policy Issues on Work and Pay Postbaccalaureate Certificate 162

Polish Courses (PLSH) 363

Political Psychology Minor Only 163

Political Science 163
  M.A. 164
  Ph.D. 164
  Political Science Courses (POL) 363

Population Studies Minor Only 164

Portuguese Courses (PORT) 367

Postbaccalaureate Certificates 16

Postsecondary Teaching and Learning Assistantships 11

Preparing Future Faculty (PFF) 14

Prevention Science Minor Only 165

Preventive Science Minor Courses (PREV) 367

Program Evaluation Minor Only 165

Psychiatry 195

Psychological Foundations of Education See Educational Psychology

Psychology 124, 166
  M.A. 167
  Ph.D. 167
  Psychology Courses (PSY) 367

Public Affairs 167
  M.P.A. 167
  Public Affairs Courses (PA) 370

Public Art Minor Only 168

Publications 2

Public Health
  Minor Only 168
  Public Health Courses (PHU) 373

Public Information See Student Educational Records, Access to

Public Policy 168
  M.P. 169

Quaternary Paleocology Minor Only 169

R

Radiology Courses (RAD) 375

Readmission 15

Reciprocity 8

Recreation, Park, and Leisure Studies Courses (REC) 375

Recreation Resource Management Courses (RSM) 375

Regents 6

Registration 14
  Registration Categories for Advanced Graduate Students 15
  Requirements 14
  Special Registration Categories 15

Rehabilitation Science 170
  M.S. 170
  Ph.D. 170
  Rehabilitation Science Courses (RSC) 376

Related Fields, Duluth 210
  American Indian Studies 210
  Anthropology 210
  Art History 210
  Behavioral Sciences 210
  Chemical Engineering 210
  Communication 210
  Cultural Studies 210
  French 210
  Geography 210
  German 210
  Health Education 210
  History 210
  Industrial Engineering 210
  Journalism 210
  Mechanical Engineering 210
  Philosophy 210
  Physical Education 210
  Political Science 211
  Psychology 211
  Recreation 211
  Sociology 211
  Spanish 211
  Special Education 211
  Theatre 211
  Women’s Studies 211

Related Fields, Twin Cities 195
  Family Practice and Community Health 195
  Neurosurgery 195
  Pediatrics 195
  Psychiatry (ASPY and CAPY) 195
  Russian 195
  Therapeutic Radiology 195

Religions in Antiquity See Classical and Near Eastern Studies

Religious Studies
  Minor Only 170
  Religious Studies Courses (RELS) 377

Research Centers 5

Research Opportunities 5

Residence 8

Resident Tuition Benefit 8

Resident Benefit for Graduate Fellows and Trainees 11

Rhetoric and Scientific and Technical Communication 171
  M.A. 171
  Ph.D. 172

Risk Analysis for Introduced Species and Genotypes Minor Only 172

Rochester Degree Programs See also All-University Programs
  Biomedical Informatics and Computational Biology 39
  Russian Courses (RUSS) 377

S

Sanskrit Courses (SKT) 378

Scandinavian Courses (SCAN) 378

Scandinavian Studies See Germanic Studies

School Psychology See Educational Psychology

Science Education See Education, Curriculum, and Instruction

Science, Technology, and Environmental Policy 173
  M.S. 173
  M.S. 174
  Ph.D. 174

Scientific Computation 174
  M.S. 175
  Ph.D. 175

Scientific Computation Courses (SCIC) 378

Second Languages and Cultures Education See Education, Curriculum, and Instruction
Index

Security Technologies M.S.S.T. 175
Sexual Harassment 13
Smoke-Free Campus Policy 3
Social, Administrative, and Clinical Pharmacy 176
M.S. 177
Ph.D. 177
Social, Administrative, and Clinical Pharmacy Courses (SACP) 382
Social and Administrative Pharmacy Courses (SAPH) 379
Social and Philosophic Studies of Education Minor
Only 177
Social Studies Education See Education, Curriculum, and Instruction
Social Work 178
M.S.W. (Duluth) 209
M.S.W. (Twin Cities) 179
Ph.D. 179
Social Work Courses (SW) 379
Sociology 179
M.A. 179
Ph.D. 180
Sociology Courses (SOC) 382
Software Engineering 180
M.S.S.E. 180
Software Engineering Courses (SENG) 383
Soil Science 180
M.S. 181
Ph.D. 181
Soil, Water, and Climate Courses (SOIL) 384
Spanish and Portuguese Courses (SPPT) 386
Spanish Courses (SPAN) 386
Special Education See Educational Psychology
Specialist Certificate in Education 21
Speech-Language-Hearing Sciences 181
Au.D. 182
M.A. 182
Ph.D. 182
Speech-Language-Hearing Sciences Courses (SLHS) 386
Sport Management 182
M.A. 183
Statistics 183
M.S. 183
Ph.D. 184
Statistics Courses (STAT) 388
Stem Cell Biology 184
Stem Cell Biology Courses (SCB) 389
M.S. 184
Strategic Communication M.A. 185
Stream Restoration Science and Engineering
Postbaccalaureate Certificate 185
Student Academic Success Services 4
Student Affairs Office of Measurement Services (OMS) 4
Student Conduct Code 13
Student Educational Records, Access to 3
Student Employment 12
Studies in Africa and the African Diaspora Minor
Only 186
Studies in Cinema and Media Culture Courses (SCMC) 389
Studies of Science and Technology
Minor Only 187
Studies of Science and Technology Courses (SST) 389
Sumerian Courses (SUM) 390
Surgery 187 See All-University Programs
M.S.Exp.Surg. 188
M.S.Surg. 188
Ph.D.Surg. 188
Surgery Courses (SURG) 390
Sustainable Agriculture Systems
Minor Only 188
Sustainable Agricultural Systems Courses (SAGR) 390

T
Teaching and Learning Ed.D. (Duluth) 199
Teaching English as a Second Language Courses (TESL) 390
Technical Communication Postbaccalaureate Certificate 188
Termination of Graduate Student Status 16
Testing Center 4
Theatre Arts 189
M.A. 190
M.F.A. 190
Ph.D. 190
Theatre Arts Courses (TH) 391
Therapeutic Radiology Courses (TRAD) 392
Toxicology See also All-University Programs
Toxicology Courses (TXCL) 392
Toxicology M.S. 34, 36
Toxicology Ph.D. 34, 36
Translation and Interpreting Courses (TRIN) 393
Transportation Studies Postbaccalaureate Certificate 190
Tuition and Fees 8

U
Urban and Regional Planning 191
M.U.R.P. 192
Urban Studies Courses (URBS) 395
Use of Human or Animal Subjects in Research 5

V
Veterinary and Biomedical Sciences Courses (VBS) 393
Veterinary Medicine 192
M.S. 193
Ph.D. 193
Veterinary Medicine Graduate Courses (VMED) 393

W
Water Resources Science See also All-University Programs
M.S. and Ph.D. 37
Water Resources Science Courses (WRS) 395
Work and Human Resource Education 193
Ed.D. 194
M.A. 194
Ph.D. 194
Work and Human Resource Education Courses (WHRE) 396
Writing Studies Courses (WRIT) 397

Y
Youth Development and Research Courses (YOST) 398
### Twin Cities Campus Calendars

#### 2009–2010

<table>
<thead>
<tr>
<th>Fall Semester 2009 (70 class days)</th>
<th>Spring Semester 2010 (74 class days)</th>
<th>May Session 2010 (14 class days)</th>
<th>Summer Session 2010 (39 class days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 7 Labor Day holiday</td>
<td>January 18 Martin Luther King Jr. holiday</td>
<td>May 24 Memorial Day holiday</td>
<td>June 14 Classes begin</td>
</tr>
<tr>
<td>September 8 Classes begin</td>
<td>January 19 Classes begin</td>
<td>May 31 May session begins</td>
<td>July 5 Independence Day holiday</td>
</tr>
<tr>
<td>November 26–27 Thanksgiving holiday</td>
<td>March 15–19 Spring Break</td>
<td>June 11 Last day of class</td>
<td>August 6 8-week summer session ends</td>
</tr>
<tr>
<td>December 16 Last day of instruction</td>
<td>March 19 Floating holiday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December 20 Study day</td>
<td>May 7 Last day of instruction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December 17–19 Final examinations</td>
<td>May 8–9 Study days</td>
<td></td>
<td></td>
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<tr>
<td>and 21–23</td>
<td>May 10–15 Final examinations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December 23 End of term</td>
<td>May 15 End of term</td>
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</tbody>
</table>

| December 20 Last day of instruction | December 16–18 Final examinations     | December 22 End of term          |
| and 21–23                            | and 20–22                             |                                  |
| December 16–19 Final examinations    | December 23 End of term               |                                  |
| and 21–23                            | December 22 End of term               |                                  |

#### 2010–2011

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<tr>
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</table>

For up-to-date, campus calendar information, visit [http://onestop.umn.edu/calendars/index.html](http://onestop.umn.edu/calendars/index.html).