



This is the Graduate School section of the 2007-2009 Duluth Catalog for the University of Minnesota

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Graduate students at UMD enjoy state-of-the-art, fully networked library resources.

Graduate School

Associate Dean: Lawrence M. Knopp, Jr.
431 Darland Administration Building, 218-726-7523

E-mail: grad@d.umn.edu

Web site: www.d.umn.edu/grad

(For up-to-date graduate faculty listings see www.grad.umn.edu/faculty_rosters/step1.asp.)

The University of Minnesota Duluth awards the doctor of education (Ed.D.), its highest professional degree, in teaching and learning. The Ed.D. recognizes satisfactory academic preparation and demonstrated competence for professional activity in that field. Standards and procedures for admission, and expectations for scholastic performance, are comparable to those for the doctor of philosophy degree (Ph.D.) offered at the Twin Cities campus. Rules and procedures governing examinations, candidacy, time limits, appointment of committees, and the thesis for the Ph.D. apply in general to the Ed.D.

For specific information about requirements and procedures for the Ed.D. in teaching and learning at UMD, please see www.d.umn.edu/grad/edd or contact the Graduate School's UMD office, 431 Darland Administration Building, 1049 University Drive, Duluth, MN 55812 (218-726-7523; grad@d.umn.edu).

The UMD Graduate School also awards the master of fine arts in art (emphasis in graphic design); master of arts in communication sciences and disorders, criminology and English (emphases in literary studies, English studies, and publishing and print culture); master of science in applied and computational mathematics, chemistry, computer science, geological sciences, integrated biosciences, and physics; master of business administration; master of science in electrical and computer engineering; master of science in engineering management; master of liberal studies; master of music; and master of social work.

All-University master of science and doctor of philosophy programs in toxicology and water resources science are offered jointly with the Twin Cities campus. In addition, several graduate programs operate at UMD under the aegis of graduate programs on the Twin Cities campus. Cooperative programs offered at both the master's and doctoral levels include biochemistry, molecular biology, and biophysics; microbiology, immunology, and cancer biology; pharmacology; and cellular and integrative physiology.

Admission

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 dean for admission. 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 Graduate School dean. The Graduate School operational standard for admission is an undergraduate grade point average (GPA) of 3.00. Individual programs may require a higher GPA. Applicants should consult the program to which they are applying for more specific information about admission standards.

Before registering in the Graduate School, students must have received an undergraduate degree.

Graduate School faculty and staff encourage applications from persons of color or other groups that have been underrepresented in the student body.

Application Fee

For *each* program, the Graduate School application fee is \$55 for U.S. applicants and \$75 for international applicants. This fee is subject to change. The most detailed and up-to-date information about the fee is included in the *Graduate School Application for Admission* instructions.

Transcripts

Two copies of official transcripts of all previous academic study must be submitted. Also, during the program of study, students often need a complete set of official credentials covering previous college and university training. Applicants, therefore, are urged to request three sets of official credentials when preparing their application for admission: one to be submitted with the application, one to be filed permanently in the Graduate School office, and one for personal use.

International Applicants

International applicants must submit complete credentials. Details on the types of transcripts required are given in the *Graduate School Application for Admission* instructions.

Tests

GMAT

Business administration applicants must take the Graduate Management Admission Test (GMAT) and request that an official report of the results is sent to the Graduate School from the Educational Testing Service as part of the admission application. Because this test is given at limited times and places during the year, applicants are advised to register early for the examination. For more information, contact the Educational Testing Service, Box 6000, Princeton, NJ 08541-6000 or online at www.ets.org/. Under certain circumstances, alternatives to the GMAT can be used; contact the director of the business administration program for more information at 218-726-6817 or lsbe@d.umn.edu.

GRE

Students who submit undergraduate narrative transcripts or transcripts containing pass/no credit (S-N), credit, or other ungraded notations for a substantial number of courses taken during the junior and senior years, or whose transcripts do not show a substantial number of letter grades during these years, must submit the results of the Graduate Record Examination (GRE) General Test and, if available, a Subject Test appropriate to the proposed major in the Graduate School.

The GRE General Test is required of all applicants for programs in applied and computational mathematics, computer science, education, English, geological sciences, and integrated biosciences. International applicants who are applying for assistantships from any science program not listed here are also strongly urged to submit GRE general test scores in support of their applications. Arrangements to take these tests can be made through the Educational Testing Service, Box 6000, Princeton, NJ 08541-6000 USA or online at www.ets.org/.

TOEFL

This examination is required of all international applicants whose native language is not English and who have not lived in the United States for at least one year while completing at least 16 graded semester credits within the past 24 months. This requirement will not be waived. Test scores must be less than two years old. For more information, write to TOEFL, Box 899, Princeton, NJ 08541-6151 USA. If desired, the Michigan English Language Assessment Battery (MELAB) is an alternative to the TOEFL; a minimum score of 80 is required. Information about the MELAB is available by writing to the English Language Institute, Testing and Certification, 3020 North

University Building, University of Michigan, Ann Arbor, MI 48109-1057 USA.

Another alternative to the TOEFL is the International English Language Testing System (IELTS). The minimum acceptable score is 6.5. Further information about this test can be obtained at www.ceii.org/.

Additional Information

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

Application Procedure

Requests for application materials may be sent to the Graduate School, 431 Darland Administration Building, University of Minnesota Duluth, MN 55812. Requests should specify the applicant's proposed major field, degree objective, and desired date of entry. Requests can also be entered and application and forms can be downloaded at www.d.umn.edu/grad on the Web.

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, complete with all required materials, must be submitted by the following deadlines.

Fall semesterJuly 15
Spring semester.....November 1
Summer sessionMay 1

Deadlines that occur on a holiday or weekend will be extended through the next regular business day. 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 on those deadlines and requirements from the specific program descriptions in this catalog and from the director of graduate studies in the proposed major field.

Professional Development

Applicants who wish to enroll in a field in the Graduate School but are not interested in a graduate degree may apply for admission for professional development courses. These applicants must complete the usual application materials and meet existing deadlines and admission standards. Because some major fields restrict admission to 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.

Visiting Graduate Students

Students who have registered within the previous two years in a graduate degree program at another recognized U.S. graduate school and who wish to enroll for a summer session or a single semester in the Graduate School of the University of Minnesota in order to earn credits to apply toward their degree program may be admitted as visiting graduate students. Visiting graduate status may not be granted for more than one semester or one summer term. Students seeking visiting graduate status should request and complete the Visiting Application available from the UMD Graduate School Office, 431 Darland Administration Building, University of Minnesota Duluth, Duluth, MN 55812. This form must be approved by the Graduate School before registering for classes.

Academic Staff

University of Minnesota staff members who hold 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 courses.

Registration

New graduate students will receive directions for registration at the UMD Graduate School office with their admission letter. Graduate tuition and fees are listed on the Graduate School Web site at www.d.umn.edu/grad.

Registration Requirements

The University requires that graduate students holding appointments as teaching or research assistants or administrative fellows must register for at least 6 A–F or S–N credits in the Graduate School each term that an appointment is held. This does not apply to summer terms. Students may submit a petition to the program's director of graduate studies for exceptions to this requirement. To be exempt from FICA withholding, a graduate assistant must register for 3 or more credits. Audit registration by itself is not acceptable for maintaining an assistantship. Medical fellows must also register each term an appointment is held, including summer terms.

Students receiving other types of financial aid from the University or other agencies, international students with certain types of visas, and students wishing to use various University services and facilities may have to meet specific registration requirements of other agencies or

University units. These students are responsible for securing information about such requirements from the appropriate offices.

Master's degree candidates are not required to register for any specific number of semesters.

Types of Registration

The two types of registration used by graduate students at UMD are:

For Coursework—The maximum number of credits for which a graduate student may register in a single semester during the academic year is 18; in a single summer session, 11. Exceptions are granted by the UMD Graduate School Office, 431 Darland Administration Building, however only under unusual circumstances.

Thesis Credit—Regardless of their initial dates of entry to the Graduate School, all students enrolled in a Plan A master's program must register for at least 10 master's thesis credits (8777), and all students enrolled in a doctoral program must register for at least 24 doctoral thesis credits (8888). Doctoral thesis credits can only be taken after the semester in which the preliminary examination is passed.

Doctoral Pre-Thesis Credits (8666)

These credits are available for doctoral students who have not yet passed their preliminary oral examination but who 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.

Registration Holds

Registration holds may be placed on student records when students fail to file official degree programs and/or thesis proposals or when they accumulate an excessive number of incompletes. Students who fail to meet Graduate School or major field standards for scholarly achievement may also have a hold placed on their registration.

International Students

International students are normally required to maintain registration in the Graduate School to satisfy the rules of the Immigration and Naturalization Service (INS). Students should, therefore, plan their programs carefully to meet this requirement. The Graduate School is required to notify the INS office when an international student fails to maintain registration.

Official Transcripts

Official transcripts of Graduate School students are available online at www.d.umn.edu/registrar/transcripts.html *except* for students who registered in the Graduate School summer session II, 1972 or earlier. Official records for these students are maintained in the Office of the Registrar, University of Minnesota, 200 Fraser Hall, 106 Pleasant Street S.E., Minneapolis, MN 55455.

Students may obtain unofficial copies of their transcripts online or by submitting a request, in writing, to UMD Transcripts, 184 Darland Administration Building, 1049 University Drive, Duluth, MN 55812. Unofficial transcripts can also be requested from the on-the-spot transcript service at the Student Assistance Center, 21 Solon Campus Center. There is no charge for these copies, but students are limited to one copy per visit.

A student can print or view an online copy of their transcript and grades by going to www.d.umn.edu/registrar/transcripts.html.

Changes in Registration

All registration changes require an adviser's signature. During fall and spring semesters, the end of the second week of the semester is the last day to add a course or change sections of a course, change grading option (including to or from auditor status), or cancel a course without a W (indicating withdrawal) appearing on the transcript. During the summer term, the deadline for such changes is the fifth day of instruction.

Students may cancel courses through the end of the eighth week of the semester; canceling courses after the eighth week requires the approval of the adviser, instructor, and UMD Graduate School office. During the summer term, students may cancel a course through the last day of instruction with the adviser's signature.

If withdrawal from a course occurs within the first two weeks of the semester, no record of this course is shown on the transcript. If withdrawal occurs after the second week of the semester, the transcript will show the course with a "W" (withdrawal).

Students cannot change their registration after the last day of instruction of a semester or register for previous semesters.

Rate Structure

Students registering for 1 to 5 credits (part time) do so on a per-credit basis. Students registering for 6 to 14 credits do so on a flat-rate basis. Registration for credits beyond 14 credits is on a per-credit basis.

Students from North Dakota, South Dakota, Wisconsin, and Manitoba may wish to take advantage of tuition reciprocity. Because tuition procedures differ, contact the UMD Office of Admissions, 23 Solon Campus Center (218-726-7171), for specific information.

Readmission and Other Changes

Readmission, Change of Major or Degree

Admitted students who have not registered in the Graduate School each semester (excluding summer) must request readmission before registering for classes, submitting petitions, filing for graduation, scheduling examinations, or submitting a degree program/thesis. If readmitted, the student must also register in the Graduate School. Students who have completed a degree or certification program and who wish to complete additional work in the Graduate School must apply for readmission.

Currently enrolled students who wish to change their major field or degree objective from that originally approved by the Graduate School must complete and submit a Change of Status form and pay a change of status fee. Readmission or Change of Status forms may be obtained from the UMD Graduate School Office, 431 Darland Administration Building. A minimum of six weeks before the desired date of enrollment is typically required to process these requests.

Change of Campus

Students who are enrolled in the Graduate School on one campus of the University of Minnesota and who wish to complete their studies on another University of Minnesota campus should complete and submit a Change of Status form.

Transfer of Credits

Master's degree students are required by the Graduate School to complete at least 60 percent of the course credits (excluding thesis credits if any) for their official degree programs as registered Graduate School students. With the approval of the adviser, director of graduate studies in the major field (and the director of graduate studies in the minor field if the courses are to be applied to a designated minor), and the Graduate School, students are permitted to transfer up to 40 percent of the degree coursework from other recognized graduate schools or from Continuing Education at the University of Minnesota,

in any desired combination. Individual graduate programs may, at their discretion, specify a lower percentage of coursework for transfer.

The work to be transferred must be postbaccalaureate graduate level that was taken for graduate credit and taught by faculty authorized to teach graduate courses. Continuing Education courses must bear transcript entry verifying that they were completed for graduate credit. Credits transferred from other institutions must appear on official transcripts of the institutions. Credit for courses taken before the awarding of the baccalaureate degree cannot be transferred.

Any transfer course that will be used to satisfy degree requirements must be included on the proposed degree program. If the course has been completed by the time the degree program is approved, the transfer process is automatic. If the transfer course has not been completed by the time the degree program is approved, the course is not automatically transferred. To complete this transfer an appropriate petition must be submitted and approved. More information regarding this process can be obtained from the UMD Graduate School Office, 431 Darland Administration Building.

In the case of a transfer from a non-U.S. institution, credits must have been earned in a program comparable to a graduate degree program at a regionally accredited U.S. institution.

Financial Aid

Fellowships and scholarships are available through the Graduate School. For more information, contact the director of graduate studies in the particular program or the UMD Graduate School Office, 431 Darland Administration Building (218-726-7523).

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. Graduate assistants on a 25 percent or greater appointment are entitled to health, medical, and dental insurance coverage at reduced premiums.

Some residence counseling positions may be available. For information, write to the Housing Office, 149 Lake Superior Hall, University of Minnesota Duluth, MN 55812.

Inquiries regarding loan funds, living accommodations, employment, and placement should be addressed to the vice chancellor for academic support and student life, 297 Darland Administration Building, University of Minnesota Duluth, MN 55812.

Master's Degree Requirements

The master's degree is offered under two plans. Plan A (involving a thesis) and Plan B (involving additional coursework and/or special projects in place of a thesis). Plan B is the only plan available at Duluth for majors in art, business administration, communication sciences and disorders, English, liberal studies, music, and social work. Majors in applied and computational mathematics, chemistry, computer science, criminology, electrical and computing engineering, engineering management, geological sciences, integrated biosciences, and physics may select either Plan A or Plan B. Integrated biosciences is offered only under Plan A.

Time Requirement

The maximum time allowed by the Graduate School for completion of the master's degree is seven years. The seven-year period begins with the oldest work included on the official degree program, including any transfer work applied. The graduate faculty in a specific program may set more stringent time requirements.

Grading System

The Graduate School uses two grading systems, A-B-C-D-F (with pluses and minuses) and S-N. Except in courses in which grading has been restricted to one system or the other, students have the option of choosing the system under which they will be graded. Students must declare a grading system choice as part of their initial registration. Changes in grading options must be made by the end of the second week of class (end of the first week during summer sessions). For information about courses in which grading is restricted, students should consult the department offering the course. Instructors must explain to students the achievement level necessary to earn an S grade for a course.

Course instructors may, at their discretion, set a time limit for removal of incomplete grades. In general, it is recommended that incomplete grades be removed within one calendar year. A student with an excessive number of incompletes may be denied further registration until some of them have been removed.

The Graduate School discourages retaking courses to improve grades. Permission of the course instructor and the major adviser is required to take a course again. If a course is retaken, all registrations for it remain on the student's transcript.

Minimum Grade Requirements

The minimum GPA required by the Graduate School for courses included on the official program for any master's degree is 2.80 (on a 4.00 scale). Students may apply 5xxx and 8xxx courses with grades of A, B, C (including C-), and S to a Graduate School degree program. 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. Grades of A, B, C, and S are acceptable, but grades of S are not calculated in the GPA. At least two thirds of the course credits taken in the Graduate School (excluding thesis credits) and included in any degree program must be taken A-F.

Individual major fields may set higher grade requirements, and students should be familiar with special requirements in their major field.

Transfer of Plan

A student transfers from one plan for the master's degree to the other by submitting to the Graduate School a revised program form signed by the adviser, director of graduate studies for the major, and director of graduate studies for the minor if a minor is declared.

Plan A: Master's Degree With Thesis

Major and Related Field(s) or Minor—Students must complete an approved program of coursework consisting of at least 14 semester credits in the major field, at least 6 semester credits in one or more fields outside the major, and at least 10 thesis credits (8777).

Students who wish to complete a designated minor (certified on the transcript; related fields option is not) must complete at least 6 semester credits in a single field. A designated minor must be approved by the director of graduate studies in the minor field.

In cases where the student takes coursework beyond the minimum requirements, both the adviser and the Graduate School may demand comparable standards of performance for all work taken.

Admission to the Graduate School requires the specification of a major field. Any proposal for a subsequent change in major necessitates a formal request to the Graduate School.

Official Degree Program—After completing 10 credits and ordinarily not later than the second semester of registration (the second year for longer programs), students must file an official degree program with the Graduate School. This requirement may vary with the program.

The program form is available in the UMD Graduate School Office, 431 Darland Administration Building. Students list all coursework, completed and proposed, that will be offered to fulfill degree requirements, including transfer work. If a foreign language is required, it is specified. The members of a student's final examining committee (who are the thesis reviewers for Plan A) are appointed by the Graduate School dean on recommendation of the faculty in the major field at the time the student's official degree program is approved. A degree program approved by the Graduate School must be on file before reviewers report, examination, or graduation forms can be released to the student.

Program Changes—Once approved, the program must be followed to meet graduation requirements. Alterations in the program, including committee changes, must be requested in advance by means of a Graduate School petition form.

Language Requirement—See the appropriate major field under Program Statements below to determine the language requirement, if any, for that field. The Graduate School monitors the fulfillment of the language requirement when a major field specifies one. Information about how the student must demonstrate proficiency and the conditions under which proficiency will be recorded on the official transcript is available from the UMD Graduate School office.

Master's Thesis—The thesis must be on a topic related to the major, be written in acceptable English, demonstrate the student's ability to work independently, and display the student's power of independent thought both in perceiving problems and in making satisfactory progress toward their solution. Familiarity with the bibliography of the special field and correct citation of authorities are expected.

Two unbound copies of the thesis must be provided and a \$10 fee paid. One copy is for the University library in Minneapolis, and one is for the Duluth campus library. The student's adviser(s) must sign unbound copies of the thesis to confirm that they are complete and satisfactory in all respects and that all revisions required by the final examining committee have been made.

One of the copies must be on 20-pound linen stock of 75 percent rag content. Both must contain all illustrative material; if photographs are included, copies must contain original photographs (i.e., no photocopies). Ample margins should be left for binding purposes. The body of the thesis should be double spaced, but footnotes may be single spaced. Photocopy methods of reproduction will be accepted (except photographs), provided that 20-pound rag content bond is used and adequate contrast and clarity is provided.

The thesis is examined by a committee of not less than three members, appointed by the Graduate School dean upon recommendation of the adviser and the director of graduate studies. The examining committee will include at least two representatives of the major field and one representative of the related or minor field. This committee must be unanimous in certifying that the thesis is ready for defense, and a record of this action must be filed in the UMD Graduate School office on the appropriate form before the candidate may be admitted to the final written or oral examination.

The thesis may include materials that students have published while at University of Minnesota as 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. The adviser should notify the Graduate School in writing of the intent to publish part of the thesis materials, but Graduate School approval is not required.

If the thesis is accepted, the candidate should immediately begin to have it prepared in its final form and should submit the *Application for Degree* before the first working day of the month the candidate plans to graduate. *Application for Degree* forms must be obtained from the UMD Graduate School Office, 431 Darland Administration Building. Both unbound copies of the thesis, and the \$10 fee must be submitted to the UMD Graduate School office by the last working day of the month of proposed graduation.

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 examination covers the major and minor or related fields and may include other related work, and is coordinated by the chair of the student's examining committee. A majority vote of the committee, all members present and voting, is required for a pass. Results are reported to the Graduate School on a Final Examination Report, which is issued to the chair when the oral exam is scheduled. In case of failure, unanimous consent of the examining committee is required to retake the examination, providing the reexamination is conducted by the original committee.

Reports—Forms are provided for signed reports concerning the thesis and the final written or oral examinations. All reports must be filed in the UMD Graduate School office by the published deadline.

Plan B: Master's Degree Without Thesis

The requirements for this plan follow Plan A in matters of admission and language requirements. Unless otherwise specified by the program, a Plan B student must pass either a final written examination or a final oral examination, or both, at the discretion of the graduate faculty in the major field.

Plan B differs from Plan A in substituting for the thesis a heavier course requirement and/or special projects. For professional purposes, the master's degree program under Plan B is less focused on research interests and more adapted to individuals who will profit from a broader range of knowledge in their fields. Whether taken for professional or personal purposes, the requirements for Plan B are meant to test interests and intellectual abilities at the same level as that of Plan A, but for a different purpose.

Under Plan B, students must complete an approved program of coursework consisting of at least 30 semester credits. At least 14 of these credits must be in the major field, a minimum of 6 credits must be in one or more fields outside the major, and the remaining credits may be in either the major or in fields outside the major. Normally a majority of the program credits are in the major field. These are minimum credit requirements; some major fields require additional work.

After completing 10 credits and ordinarily not later than the second semester of registration (the second year for longer programs), students must file an official degree program with the Graduate School. This requirement may vary with the program. The program form is available in the UMD Graduate School Office, 431 Darland Administration Building. Students list all coursework, completed and proposed, that will be offered to fulfill degree requirements, including transfer work. If a foreign language is required, it is specified. The members of a student's final examining committee are appointed by the Graduate School dean on recommendation of the faculty in the major field at the time the student's official degree program is approved. A degree program approved by the Graduate School must be on file before reviewers report, examination, or graduation forms can be released to the student.

Students who wish to complete a designated minor (certified on the transcript; related fields option is not) must complete at least 6 semester credits in a single field. A designated minor must be approved by the director of graduate studies in the minor field.

If Plan B projects are required, these should take a combined minimum of 120 hours of effort on the part of the student. This requirement may be satisfied through papers written in conjunction with regular courses, papers written in specially designed courses, presentation of a studio show (art), or other appropriate methods. Students should consult individual programs concerning the project's requirement. If one Plan B project is required, it must be in the major; additional projects may be in related field(s).

In cases where the student takes coursework beyond the minimum requirements, both the adviser and the Graduate School may demand comparable standards of performance for all work taken and, in evaluating and approving the minimum program submitted, will reject the minimum degree program if the GPA for the total number of courses taken falls below 2.80 and may terminate candidacy.

Under this plan, the candidate is examined by a committee of not less than three members, two from the major field and one from a related field or minor, appointed by the Graduate School dean upon recommendation of the adviser and the director of graduate studies. The adviser is expected to contact the UMD Graduate School office before the student's final examination for the degree to obtain an Examination Report Form for use by the student's committee. The student makes available to the examining committee for its review the projects prepared to fulfill the required 120 hours of effort, within an adequate period of time to allow for evaluation before the examination(s). A majority vote of the committee, all members present and voting, is required to pass. The vote is reported to the Graduate School on a form the student must obtain from the UMD Graduate School office before taking the examination. In case of failure, unanimous consent of the examining committee is required to retake the master's final examination, providing the original committee conducts the reexamination.

Two Degrees

Students may have a maximum of eight semester credits in common between two Plan A master's degrees, two Plan B master's degrees, or a Plan A and Plan B master's degree.

Termination of Graduate Student Status

When performance is unsatisfactory in terms of grades or normal progress standards, as established and promulgated by the graduate faculty in the major field, graduate student status may be terminated. All guidelines stated in this catalog represent minimal requirements, and each program is free to set more specific terms by which progress is measured for purposes of continuation. Notice of termination is made in writing.

Attendance at Commencement

Subject to satisfying participation requirements, attendance at commencement is voluntary. However, all candidates are individually recognized at the ceremony and must inform the Graduate School whether or not they will attend. The policy governing commencement ceremony participation is attached to the *Application for Degree* available in the UMD Graduate Office, 431 Darland Administration Building.

Sexual Harassment

See the Policies and Procedures section of this catalog for information on sexual harassment.

Program Statements

A synopsis of information concerning each major and minor field follows. Further details are available from the director of graduate studies in each school or department. Courses in each area are listed in Course Descriptions under the appropriate department headings.

General information concerning graduate work on the Duluth campus may be obtained from the UMD Graduate School Office, 431 Darland Administration Building, University of Minnesota Duluth, Duluth, MN 55812 (www.d.umn.edu/grad/). The University of Minnesota *Graduate School Catalog* may be requested by writing to the Graduate School, University of Minnesota, 316 Johnston Hall, 101 Pleasant Street S.E., Minneapolis, MN 55455. The zip code of the recipient is required for mailing catalogs. The catalog is also available online at www.catalogs.umn.edu.

Degree Programs

Education—Teaching and Learning Ed.D.

Director of Graduate Studies:
Associate Professor Joyce Strand

The doctor of education degree (Ed.D.) with a major in Teaching and Learning is an applied degree for the professional development of P-12, community college and university faculty and administrators, professionals in other human service professions such as coaching, athletic training, criminal justice, social work, extension, community agency administration, university student personnel, as well as business professionals involved in education and training activities. The mission of the program is to produce scholarly practitioners. The goals of doctoral study in this program are to help students (1) acquire greater content knowledge in teaching and learning; (2) develop abilities for research in the field of teaching and learning; (3) evolve a broadened professional background in areas related to teaching and learning, such as systems and system interactions, and methods for program improvement; and (4) increase levels of cultural competence. Students will be immersed in research on best practices in teaching and learning, and will acquire the skills needed to apply best practices in their own schools and organizations.

Admission Requirements

Admission standards include (1) a master's degree, or a comparable foreign degree from a recognized college or university, in education or a related field (e.g., special education, curriculum and instruction, human development, psychology, social work, management science, criminology); (2) preferred minimum graduate GPA of 3.00; (3) submission of GRE scores (preferred minimum score of 500 on verbal and quantitative portions); and (4) minimum TOEFL score of 550 (paper-based) or 213 (computer-based).

The application must include three letters of recommendation, a minimum of three work samples (e.g., written reports, articles, presentations, curricula, or other professional artifacts), and a personal statement of career objectives. The statement of career objectives will be used to (1) evaluate how well this program will meet the needs of the applicant, (2) determine if appropriate concentration courses are available, and (3) conduct an initial evaluation of writing skills. GRE scores will be considered as part of a holistic evaluation of the application. Students will also be required to complete an assessment

designed to determine an individual's fit with the hybrid online delivery model. Results of the survey will also be used as part of a holistic evaluation of the application.

Ed.D. Degree Requirements

Required Core courses (37 cr)

- Psy 5052—Advanced Statistical Methods (3 cr)
- Educ 8015—Research Design (3 cr)
- Educ 8016—Theory and Practice in Qualitative Research Methods (3 cr)
- Educ 8017—Theory and Practice in Quantitative Research Methods (3 cr)
- Educ 8020—Doctoral Seminar (1 credit each of 4 terms)
- Educ 8001—Historical and Philosophical Foundations of Education (3 cr)
- Educ 8003—Educational Policy (3 cr)
- Educ 8005—Curriculum Evaluation: Theory into Practice (3 cr)
- Educ 8007—Research on Knowledge and Learning (3 cr)
- Educ 7005—Teaching and Learning in a Systems Context (3 cr)
- Educ 8009—Distance Education in 21st Century: From Theory to Practice (3 cr)
- Educ 8021—Assessment (3 cr)
- Related Field courses (minimum 15 credits)
- Educ 8888—Thesis (24 cr)

Language Requirement—None

Preliminary Written and Oral Exam—Preliminary written and oral examinations are required and will be administered after completion of all research and major course work.

Project—A project designed to build a knowledge base relevant to problems in schools and organizations

Final Exam—An oral defense of the project is required.

For specific information about requirements and procedures for the Ed.D. in teaching and learning at UMD, please see www.d.umn.edu/grad/edd or contact the Graduate School's UMD office, 431 Darland Administration Building, 1049 University Drive, Duluth, MN 55812, (218-726-7523; grad@d.umn.edu).

Applied and Computational Mathematics M.S.

Plan A and Plan B

Director of Graduate Studies: Professor Zhuangyi Liu

This program is for those wishing to pursue careers that use applied mathematics and statistics in science, industry, business, and teaching, and for those wishing to go on for doctoral degrees in mathematics or statistics. It emphasizes the use of modern modeling techniques and computational

methods with areas of concentration available in continuous modeling, probability/statistics, and discrete mathematics. The faculty is drawn largely from the Department of Mathematics and Statistics, but includes members from the Departments of Computer Science, Electrical and Computer Engineering, Chemical Engineering, and Biology.

Admission Requirements

Applicants should have completed an undergraduate degree in mathematics or statistics. However, a student with a degree in another major, and with a substantial background in mathematics or statistics (e.g., computer science or engineering), may also qualify; students lacking certain prerequisites may make up deficiencies concurrently with graduate work.

Applicants must submit scores from the General Test of the GRE, 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. Students may apply at any time; however, submission of all applications materials by January 15 for fall semester is strongly encouraged to ensure priority consideration for university fellowships. The deadline for applying for assistantships awarded for the next academic year is March 1. Students can be admitted any term. Students whose native language is not English must submit their TOEFL scores.

M.S. Degree Requirements

The master of science degree is offered under both Plan A (with thesis) and Plan B (without thesis). All students must complete at least 33 credits, of which at least 17 must be from approved mathematics or statistics courses or seminars (including a graduate seminar and two of the three core courses), and 6 must be from a minor or related field (statistics is a related field). Plan A also requires 10 thesis credits. Plan B requires a 2-credit project and an additional 8 credits from approved graduate-level mathematics, statistics, or related-field courses.

Language Requirements—None.

Final Exam—The final exams are written and oral.

Minor Requirements for Students Majoring in Other Fields—A minor for the master's degree requires 6 credits in approved Math or Stat courses.

Art—Graphic Design M.F.A.

Plan B

Director of Graduate Studies: Associate Professor Janice Kmetz

The master of fine arts degree with an emphasis in graphic design may be earned full- or part-time. All requirements for the master's degree must be completed and the degree awarded within seven years. Full time students usually finish the program in five semesters. The department's financial aid does not extend beyond six semesters. Within a liberal arts setting, our program is tailored to each individual's educational, artistic and professional strengths. Expanding the boundaries of conventional design education, it includes the following areas of study: new media; motion graphics; print communication; design in the public realm; experience design; graphic design history, theory, criticism; and preparation for college teaching. Academic study and studio practice are equally emphasized. The program draws on faculty with international and national experience as designers and artists who are recognized for the quality of their teaching, research and professional design activities.

Admission Requirements

Applicants must have adequate undergraduate education and experience in the area of emphasis and a bachelor of arts, science, or fine arts in graphic design or art. Individuals with undergraduate degrees in other disciplines who have completed a substantial number of design courses or who have extensive professional graphic design portfolios also may be considered for admission.

A portfolio of 20 design works (Mac format CD or DVD), a letter of intent, a writing sample (written in or translated into English), and three letters of recommendation are also required as part of the application. Applicants must have a minimum undergraduate GPA of 3.00. The GRE is not required. For more information about the M.F.A., visit the program's web site www.d.umn.edu/art/program/mfa.html.

For more information about Graduate School admissions, see the Graduate School section of this catalog, or visit the Graduate School Web site.

M.F.A. Degree Requirements

The M.F.A. is offered under Plan B, and requires 60 credits. The time frame for completion of the coursework and research required for a master of fine arts degree with an emphasis in graphic design is usually three years for full-time students. The graduate school requires completion of the

degree in seven years. For more complete information on degree requirements please see *MFA Handbook* online at www.d.umn.edu/art/program/download/pdf/Grad_hnbk_11-11-06.pdf.

Language Requirements—None.

Final Exam—An oral exam based on the project and supporting paper is required.

Biochemistry

See Cooperative Programs.

Business Administration M.B.A.

Plan B, Coursework Only

Director of Graduate Studies: Associate Professor Rajiv Vaidyanathan

The master of business administration program meets the needs of those who are currently employed full-time in professional managerial careers and would like to pursue a graduate management education primarily on a part-time basis. The program offers courses in both Duluth and Rochester. Most courses offered in Duluth meet one evening per week from 6 to 9 p.m. during the 15 weeks of the semester. Most courses offered in Rochester meet from 3 to 9:30 p.m. on Fridays and 8 a.m. to 12:30 p.m. on Saturdays every other week over a period of seven weeks. It is possible to enroll in the program on a full-time basis by registering for 6 or more credits per semester.

Admission Requirements

Applicants must have a bachelor's degree from an accredited college or university with prerequisite courses in calculus, statistics, and computer application; completed foundation courses in financial accounting, economics, finance, production/operations, marketing, organizational management, and human resource management; and have an acceptable score on the GMAT, passed the Certified Professional Accountant (CPA) examination, or completed a graduate degree from an accredited college or university. In addition, international students must have an acceptable score on the TOEFL.

The bachelor's degree may be in any field; however, students who have had little or no undergraduate or other education in business administration must complete foundation courses in the areas identified above. These courses must be completed before admission to the M.B.A. program; no graduate credit or credit toward M.B.A. program requirements is granted for foundation courses.

M.B.A. Degree Requirements

The M.B.A. requires 32 credits. All students must complete six core and three support area courses, which provide exposure to financial analysis and markets; the domestic and global environments of business and organizations; the creation and distribution of goods and services; and human behavior in organizations. Also required are a capstone strategic management course and at least 2 credits of cross-functional experiences selected from special topics, workshops, projects, or field study. Students then choose one of two options for completing an additional 6 credits of elective coursework: coursework only or field research (Plan B). M.B.A. students may include selected 4xxx and/or 5xxx courses for electives in their degree programs subject to M.B.A. director approval.

Language Requirements—None.

Final Exam—For Plan B, students meet with their faculty committee for a final review of their completed project. For coursework only, no final exam is required.

Chemistry M.S.

Plan A and Plan B

Director of Graduate Studies: Professor Paul Siders

The master of science program offers a broad-based education in chemistry that is well suited for students going on to doctoral programs, careers in industry, or professional schools. Both Plan A (with thesis) and Plan B (without thesis) are available. For Plan A, emphases include analytical, biological, inorganic, organic, and physical chemistry. The faculty includes members from the Departments of Chemistry and Chemical Engineering in the College of Science and Engineering; the Departments of Biochemistry and Molecular Biology and Medical Microbiology and Immunology in the School of Medicine; as well as members from the Natural Resources Research Institute, and the College of Pharmacy.

Admission Requirements

Applicants must have completed an undergraduate chemistry or biochemistry major, including a junior-senior level course in inorganic chemistry, physical chemistry, mathematics through calculus, and one year of college physics, preferably taught using calculus. Students lacking some of these prerequisites may make up deficiencies concurrently with graduate work.

M.S. Degree Requirements

All students must complete 31 credits, including a seminar and four core courses. All students must complete at least 14 credits in the major and at least 6 credits in a related field or minor. In addition, Plan A students must register for 10 thesis credits; Plan B students must complete an additional 10 course credits and write three papers. Attendance and presentation at the chemistry seminar are required. Individual programs are designed to best serve the interests of the student. 4xxx courses must be approved by the director of graduate studies.

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 in chemistry courses. Individual programs must be approved by the director of graduate studies in chemistry.

Communication Sciences and Disorders (CSD) M.A.

Plan B

Director of Graduate Studies: Associate Professor Kent R. Brorson

The graduate program in communication sciences and disorders effectively combines academic and clinical endeavors to prepare students to become speech-language pathologists. The program places a major emphasis on the development of clinical skills, although students have the opportunity to engage in a wide variety of academic and research activities as well. The curriculum, which is based on five semesters of study, is accredited by the Council of Academic Accreditation (CAA) and is accredited in speech-language pathology and also by the American Speech-Language Hearing Association (ASHA).

Admission Requirements

Applicants must have a bachelor's degree in communication sciences and disorders. Three letters of recommendation evaluating the applicant's scholarship and clinical potential are required. At least two letters should be from academic faculty familiar with the applicant. A personal statement of the applicant's short- and long-term goals is also required.

M.A. Degree Requirements

The M.A. is offered only under Plan B. At least 43 credits are required, including 31 credits of required CSD courses, 2 credits of Plan B project (CSD 8099), 4 credits of internship, and at least

6 credits of approved courses (4xxx and higher) from related fields. All Plan B projects must be pre-approved by the student's examining committee, which also must give final approval.

Language Requirements—None.

Final Exam—The final exam is oral.

Computer Science M.S.

Plan A and Plan B

Director of Graduate Studies: Professor Carolyn J. Crouch
Computer science is a discipline that involves understanding the design of computers and computational processes. The discipline ranges from the theoretical study of algorithms to the design and implementation of software at the systems and applications levels.

The master of science is a two-year program that provides the necessary foundational studies for graduates planning to pursue either a doctorate in computer science or a career as a computer scientist in business or industry.

Admission Requirements

The program is designed for students with undergraduate degrees in computer science or computer engineering. These students should be able to enroll immediately in 8xxx computer science courses. Students with other backgrounds may be considered if they have completed the following courses or their equivalents: CS 1511–1521—Computer Science I–II; CS 2511—Software Analysis and Design; CS 2521—Computer Organization and Architecture; CS 3511—Computer Science Theory; CS 5621—Computer Architecture or CS 5651—Computer Networks; and CS 5631—Operating Systems. The appropriate math prerequisites, namely Math 1296–1297—Calculus I–II and Statistics 3611—Introduction to Probability and Statistics, are also required. Students who lack only a small number of these required courses may be admitted provisionally and must complete them before proceeding with their graduate work. The GRE General Test is required of all applicants; the TOEFL is also required of international students.

M.S. Degree Requirements

The master of science degree is offered under Plan A (thesis) and Plan B (non-thesis). At least 33 credits are required, including 16 credits from 8xxx courses in computer science, 1 credit of CS 8993—Seminar, and 6 credits from a specified set of courses outside of computer science (minor or related field). Plan A also requires 10 thesis credits; Plan B requires at least 10 credits in additional computer science courses, 5xxx or above. All courses are chosen in consultation

with the student's adviser, subject to approval by the director of graduate studies. 4xxx computer science courses may not be included in degree programs for the master of science degree in computer science.

Language Requirements—None.

Final Exam—Students present a departmental colloquium, followed by an oral exam.

Minor Requirements for Students Majoring in Other Fields—At least 6 credits in computer science are required for a master's minor.

Criminology M.A.

Plan A and Plan B

Director of Graduate Studies:
Associate Professor John Hamlin

The core courses for the master of arts in criminology feature relevant theoretical perspectives in understanding criminal behavior, methods of research and data analysis, and critical analysis of the criminal justice system. The curriculum is based on the premise that a liberal education in the social sciences includes the development of a student's ability to (1) define problems effectively by asking appropriate questions; (2) understand and respect people with diverse opinions, backgrounds, characteristics, and lifestyles; (3) respect the right of freedom of inquiry, willingly challenge conventional wisdom, and be intellectually flexible when challenged by factual information; and (4) understand the significance of inequality in the way that criminal justice is administered. The theme of inequality is incorporated into the graduate program as it is in the undergraduate program. In particular, structural forms of oppression are examined, and emphasis is placed on issues of social justice, human rights, and treatment/rehabilitation.

The framework of the program provides students with opportunities to develop a knowledge base that enhances understanding of criminal behavior and the workings of the criminal justice system. Core requirements give students experience in using various methods of research, analyzing and interpreting data, understanding and critiquing the main theoretical traditions in the field, and examining the organization of the criminal justice system. Furthermore, course electives enable students to focus on more specific interests (e.g., policing, courts, youth justice, etc.).

The M.A. in criminology provides an opportunity for both intellectual and professional development. The program serves those students with undergraduate degrees in criminology (or a related social science) who are interested in pursuing the advanced study of crime and justice. The program also serves those who have been employed

in organizations and agencies and who wish to expand their knowledge and understanding in ways that may enhance their professional careers.

Admission Requirements

Applicants must have a baccalaureate degree from an accredited U.S. institution or a foreign equivalent for admission to the master's program. Preference is given to applicants with undergraduate degrees in criminology, criminal justice, corrections, or sociology. Applicants with an undergraduate minor in criminology, criminal justice, corrections, sociology, law enforcement, or a major in a related field may also be considered. Undergraduate degrees in criminology, criminal justice, corrections, or sociology, or a related field from foreign universities may also be considered, as long as those degrees are equivalent to a four-year American university baccalaureate degree. Admission to the M.A. program is competitive.

Applicants must have successfully completed an introduction to criminology or criminal justice course, the equivalent of one semester of research methods and/or statistics beyond the introductory level, and a course devoted primarily to social/behavioral theory. The minimum GPA for regular admissions is 3.00. Students with a GPA less than 3.00 are considered on an individual basis and may be admitted conditionally. Students admitted with a conditional status are reviewed after completing 6 credit hours of graduate work and are expected to have received grades of B or better and have successfully completed remedial work with grade(s) of B or better to receive full admission to the M.A. program.

Applicants must supply: (1) an official transcript from all colleges and universities attended; (2) three letters of recommendation evaluating the applicant's scholarship and potential for graduate study (at least two letters should be from academic faculty familiar with the applicant); (3) an essay explaining why an advanced degree in criminology is of interest, why the applicant merits serious consideration, and a personal statement of the applicant's short and long-term professional goals and commitment to and preparation for graduate study in criminology. International students whose native language is not English also are required to submit scores from the TOEFL examination.

M.A. Degree Requirements

The M.A. is offered under both Plan A and Plan B and each requires 38 credits. The Plan A option involves thesis work; the Plan B option involves a special project based upon a student's practicum work. The Plan B paper combines theories,

concepts, principles, and/or best practices from at least one course in the student's program of study with work being done in a practicum. All students must take CRIM 8100 (3 credits), CRIM 8200 (4 credits) and CRIM 8300 (3 credits). Plan A students must enroll in CRIM 8777—Masters Thesis Credits (minimum of 10 credits required). Plan B students must enroll in CRIM 8600—Criminology Practicum (minimum of 10 credits required). In addition to the credits listed above, all students must choose at least 12 additional credits in sociology courses, 5xxx-level or above. Students are expected to include additional elective courses (6 credits) outside the major (in a minor or related field) as part of their program of study. The related field courses must be chosen in consultation with, and approved by, the student's advising/examining committee. Upon the advice and approval of the director of graduate studies, students may use 4xxx courses in related fields as appropriate. Sociology 4xxx courses may not be included in the degree programs for the M.A. in criminology.

Language Requirement—None.

Final Exam—Students present a department colloquium, followed by an oral examination

Minor Requirements for Students Majoring in other Fields—A master's minor requires 4 credits in methods/statistics, 3 credits in theory, and 3 credits of electives.

Electrical and Computer Engineering M.S.E.C.E.

Plan A and Plan B

Director of Graduate Studies: Associate Professor Imran M. Hayee

The master of science in electrical and computer engineering (M.S.E.C.E.) combines scholarship and research in a program oriented towards students and engineering practitioners in the private and public sectors who are interested in advanced coursework and applied research. The program requires 31 credits of graduate coursework and research, and focuses on core departmental strengths of design and implementation of computer hardware and software embedded controllers, computer networks, distributed computing, analog and digital VLSI circuit design and application, signal processing, communication systems, computational intelligence, robotics, and control systems.

Admission Requirements

Applicants should have completed an undergraduate degree in electrical, computer, electrical and computer engineering, or a related discipline, and must meet the general admission requirements of the Graduate School. A preferred performance level of 3.00/4.00 GPA from an accredited U.S. institution or foreign equivalent is required, together with two letters of recommendation concerning the student's readiness for graduate education and academic abilities. Industrial experience and professional licensure is considered. Previous graduate-level coursework completed after receiving a baccalaureate degree may qualify for transfer credit upon recommendation and approval by the director of graduate studies.

M.S.E.C.E. Degree Requirements

The M.S.E.C.E. degree provides both thesis (Plan A) and non-thesis (Plan B) options. The Plan B option is primarily for new engineering graduates and practicing engineers who want and need more technical education than would be provided by courses and an applied research-oriented project component. The Plan A option is primarily for those students wishing to prepare themselves for advanced doctoral studies and careers in research and academia.

Plan A students must complete a minimum of 31 semester credits in graduate courses. At least 15 credits must be electrical and computer engineering courses with at least 6 credits in courses numbered 4xxx or higher, 6 credits in courses numbered 5xxx or higher, and at least 3 credits in courses at 8xxx. At most, 8 credits for courses in ECE 4xxx level will be counted toward a degree. An additional 6 credits in graduate level courses must be in a related field or minor. The student must register for a minimum of 10 semester credits for the master's thesis. The director of graduate studies must approve all programs.

Plan B students must complete a minimum of 31 credits in graduate courses. At least 9 credits must be ECE courses numbered 5xxx and higher with at least 3 of those credits numbered 8xxx, excluding colloquium and Plan B project credits. Of the remaining credits, 12 must be in ECE courses numbered 4xxx or higher. At most, 8 credits will be counted for courses at ECE 4xxx level. For the remaining 10 credits, at least 6 of these must be outside of electrical and computer engineering. The program cannot contain more than 4 credits from projects. The director of graduate studies must approve all programs.

Language Requirements—None.

Final Exam—A formal defense of the thesis is required for Plan A students. The final exam for Plan B is a formal report and oral presentation.

Minor Requirements for Students Majoring in Other Fields—A master's minor requires 6 courses in electrical and computer engineering courses. Individual programs must be approved by the director of graduate studies in electrical and computer engineering.

Engineering Management M.S.E.M.

Plan A and Plan B

Director of Graduate Studies: Professor Richard R. Lindeke

The master of science in engineering management (M.S.E.M.) program provides engineers with tools to more effectively manage people, projects, technology, and information in their careers in order to promote economic growth, competitiveness, ethical decision-making, and environmental responsibility. As people in engineering positions often manage technical projects of varying size and complexity, the M.S.E.M. provides an excellent foundation. To meet the needs of practitioners, courses are offered in the evening and are available to remote sites by interactive television. Full-time enrollment is possible and the course structure allows for unique research opportunities.

Admission Requirements

All applicants must meet the general admission requirements to the Graduate School. Applicants should have completed an undergraduate degree in an engineering discipline. However, an applicant with a degree in another technical major, and with a substantial background in engineering may qualify. Such students may be admitted on a case-by-case basis and are asked to submit documentation that substantiates their engineering experience and responsibilities.

A minimum 3.00 GPA from an accredited U.S. institution or foreign equivalent is required. Applicants must provide two letters of recommendation concerning their academic ability and readiness for graduate education.

M.S.E.M. Degree Requirements

Plan A students must complete at least 31 credits, including a minimum of 12 credits in the major core sequence, 6 credits from a related field, a minimum of 3 credits of electives from EMGT, and 10 thesis credits. Individual programs are designed to best serve the interests of the student. The director of graduate studies must approve all programs

Plan B students must complete at least 30 credits, including the 12-credit major core sequence, a minimum of 3 additional credits in the major, a 3-credit capstone project course, and 6 credits in a related field or minor. Students must complete an additional 6 credits in engineering management or other electives. The capstone project course requires a formal report and oral presentation. Individual programs are designed to best serve the interest of the student. The director of graduate studies must approve all programs.

Students, upon the advice and approval of the director of graduate studies, may use 4xxx courses in related fields as appropriate for both Plan A and Plan B.

Language Requirement—None.

Final Exam—A formal defense of the thesis is required for Plan A students. The final exam is a formal report and oral presentation in EMGT 8310 for Plan B students.

Minor Requirements for Students Majoring in Other Fields—A master's minor requires 6 credits in engineering management courses. Individual programs must be approved by the director of graduate studies in engineering management.

English M.A.

Plan B

Director of Graduate Studies: Associate Professor Krista Sue-Lo Twu

The master of arts program offers courses in English, Irish, and American literature; creative writing; linguistics; composition and rhetorical theory; book history; publishing; and English education. The program has three master's emphases: a literary studies emphasis for concentrated study of literature, an interdisciplinary emphasis in English studies, and an emphasis in publishing and print culture.

Admission Requirements

Students applying to this program must submit GRE General Test scores, two writing samples such as course papers, and three letters of recommendation. Entering students should have completed 30 credits in English (these may include credits in literature, language, and advanced composition), including 20 upper division English courses that offer broad coverage of English and American literature and at least one course in English language or English linguistics. Any deficiencies will be determined by the director of graduate studies in consultation with the graduate committee. Certain course prerequisites may be taken concurrently with graduate work and may

be applied toward degree requirements. For more information, see the program's Web site at www.d.umn.edu/eng/englishgrad/main/index.php.

M.A. Degree Requirements

Literary Studies Emphasis (Plan B)

Requires a minimum of 30 credits, including at least 24 credits in the major, 6–8 credits in a related field, and two Plan B projects.

English Studies Emphasis (Plan B)

Requires a minimum of 31 credits, including at least 25 credits in the major, distributed in literature, linguistics, and composition/rhetoric; 6–8 credits in a related field; and two Plan B projects.

Publishing and Print Culture Emphasis (Plan B)

Requires a minimum of 31 credits, including at least 25 credits within the major, distributed in literature, publishing, and print culture; 6–8 credits in a related field; and two Plan B projects. 4xxx courses in English, composition, and linguistics may not be included in degree programs in English but some 4xxx courses are permitted in the related field.

Language Requirements—The emphases in literary studies and publishing and print culture require certification of a reading knowledge of Latin, Greek, French, Italian, Spanish, Russian, or another approved language.

The English studies emphasis requires certification of a reading knowledge of a foreign language appropriate to the candidate's area of study and approved by the English graduate committee, or completion of at least 6 course credits beyond the 31 required credits. Candidates whose professional objectives are best served by completing the additional 6 credits select courses from literature and literary analysis, linguistics, composition/rhetoric, print culture, publishing, or courses closely related to their field of concentration.

Final Exam—Final exams are written and oral.

Students must submit two Plan B projects totaling 120 hours of effort before taking the exam. The projects normally are completed in connection with courses in English or in a related field. A completed project must be approved by a graduate faculty member.

Minor Requirements for Students Majoring in Other Fields—At least 8 credits in English, composition, and/or linguistics is required for a master's minor.

Geological Sciences M.S.

Plan A and Plan B

Director of Graduate Studies: Associate Professor Penelope Morton

The master of science program in geological sciences includes areas of economic geology, geophysics, glacial geology and geomorphology, hydrogeology, igneous and metamorphic petrology, isotope and aqueous geochemistry, limnogeology, paleoclimatology, planetary geology, sedimentology and stratigraphy, surface processes, and structure-tectonics. Several of these areas are strengthened by collaboration with the Large Lakes Observatory and the Natural Resources Research Institute.

Admission Requirements

Most candidates will have completed a bachelor's degree in geology, geophysics, or a related field. However, students with degrees in fields such as chemistry, physics, or biology are encouraged to apply. At least one year of study in calculus, chemistry, and physics is required. Field camp and/or undergraduate research experience is recommended. GRE General Test scores are also required.

M.S. Degree Requirements

The master of science degree is offered under Plan A (thesis) and Plan B (non-thesis). Courses are selected with approval of the student's adviser and the director of graduate studies. All courses must be at the 4xxx, 5xxx or 8xxx levels.

For Plan A, a candidacy exam that involves oral defense of written thesis research proposal during the second semester of residency is required. Plan A requires 31 credits, including 14 course credits in the major, 6 course credits in a minor or related field, a 1-credit course (Geol 8200), and 10 thesis credits. For Plan B, a written candidacy exam during the second semester is required. Plan B requires 31 credits in approved courses, including three Plan B papers.

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 and is decided in consultation with the student's adviser and the director of graduate studies in geology.

Integrated Biosciences M.S.

Plan A

Director of Graduate Studies: Professor Matthew T. Andrews

The program offers study toward the master of science degree under Plan A (coursework and original thesis). The program has two areas of emphasis: cell, molecular, and physiological (CMP); and biology and ecology, organismal, and population (EOP) biology.

Admission Requirements

Applicants must have a bachelor's degree or equivalent from an accredited college or university in the biological or physical sciences or a related field. Applicants should have taken at least one year of chemistry, one year of physics and one semester of calculus. Because of the integrative nature of the program, a wide variety of scientific backgrounds will be considered for admission to the IBS program, and applicants are expected to have taken advanced science in preparation. Thus, courses in advanced chemistry, biology, additional calculus, and introductory statistics are strongly encouraged and will be viewed favorably. Examples of advanced knowledge and subdisciplines include, but are not limited to, biochemistry, botany, cell biology, developmental biology, ecology, evolution, genetics, immunology, limnology, microbiology, molecular biology, neuroscience, physiology, physical chemistry, psychology, and zoology.

Applicants deficient in some of these requirements may be admitted with the provision that these 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.

As part of their application materials, applicants must also submit GRE General Test scores not more than two years old.

M.S. Degree Requirements

Students must complete at least 14 course credits in the major; a minimum of 6 credits of electives in other 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.

The following comprises the core curriculum in common for all IBS students: IBS 8011, IBS 8012, IBS 8099, STAT 5411, IBS 8020, IBS 8030 and IBS 8077.

Students must designate one of the areas of emphasis during their second semester. The additional course requirements of each emphasis are as follows:

EOP Emphasis—IBS 8201—Ecological Processes (2 credits), electives (7 credits), required common coursework (14 credits).

CMP Emphasis—IBS 5101—Biochemistry Molecular Biology or IBS 8102—Cell Molecular Development Biology (3 credits), IBS 8103—Comparative Animal Physiology (3 credits) or BIOL 5601—Plant Physiology (2 credits), electives (3 credits), and required common coursework (14 credits).

Language Requirements—None

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

Minor Requirements for Students Majoring in Other Fields—No minor is available in the IBS graduate program.

Liberal Studies M.L.S.

Plan B

Director of Graduate Studies: Associate Professor Gesa Zinn

The interdisciplinary master of liberal studies (M.L.S.) is a community outreach program that provides citizens with the opportunity to return to higher education to broaden their intellectual horizons without having to focus on specific professional goals. Two emphases include the traditional M.L.S. emphasis and a contemporary ecology, economics, and ethics (E.E.E.) emphasis. In both emphases, one to three papers or creative projects with an in-depth exploration of an interdisciplinary topic are required.

Admission Requirements

Applicants must have a bachelor's degree from a recognized college or university with a 3.00 GPA. The application should include three letters of recommendation and a thoughtfully composed letter stating, in narrative form, reasons for wishing to pursue the M.L.S., and describing education and career experiences. This letter should be addressed to the director of graduate studies in the UMD Graduate School office.

M.L.S. Degree Requirements

The M.L.S. is offered only under Plan B. Students in either emphasis must complete 32 credits, including at least 4 credits of IS 8001—Introduction to Liberal Studies. Students electing the traditional emphasis must take IS 8501—Seminar: Ethics and the Human Condition and 24 elective credits. Students selecting

the ecology, economics, and ethics emphasis must take IS 8250—Ecological Economics and IS 8502—Ecology, Economics, and Ethics and an additional 20 credits of electives. One to three Plan B papers or creative projects are required in both emphases. Inclusion of 4xxx courses on degree program forms is subject to adviser and director of graduate studies approval.

Language Requirements—None.

Final Exam—The final exam is oral.

Linguistics (Minor Only)

Coordinator: Professor Michael D. Linn

Graduate students may elect linguistics—which is offered interdepartmentally and through the Program in Linguistics—as a related field, or, with approval of the director of graduate studies of the major, as a designated minor.

Minor Requirements

The minor in linguistics requires a minimum of 6 credits selected from Anth 4628—Language and Culture (3 cr), Engl 5811—Introduction to Modern English (4 cr), Engl 5821—History of the English Language (4 cr), Ling 5195—Special Topics (3 cr), Ling 5802—Applied Linguistics (4 cr), Ling 5852—Practicum in Teaching Linguistics (3 cr), Ling 8500—Graduate Seminar (3 cr), and Ling 8591—Independent Study in Linguistics (1–3 cr).

Microbiology

See Cooperative Programs.

Music M.M.

Plan B

Director of Graduate Studies: Professor Judith Kritzmire

The master of music program offers students an opportunity to acquire advanced understandings and skills in music education theory and practice or in musical performance. A course of study is designed to meet the interests and objectives of the student.

Admission Requirements

Applicants must have an undergraduate degree in music with a 3.00 or higher GPA and must have applied to the University of Minnesota Graduate School. In addition, the following must be submitted for review by the music graduate committee: (1) a completed *Department of Music Graduate Study Application*; (2) a sample of professional writing (a three- to five-page paper addressing current issues in music education or

music performance); (3) two letters of reference from professional colleagues and/or supervisors describing the candidate's potential for success in the graduate music program; and (4) an entrance performance audition on the major instrument (performance emphasis) or a videotape of classroom teaching or conducting (education emphasis). Students seeking admission as a vocal performer must demonstrate foreign language proficiency or enroll in remedial courses.

M.M. Degree Requirements

The M.M. Plan B in music education and performance emphases each requires 30 credits. The music education emphasis requires 14 credits in music education/education, 8 credits in the related field of music, 6 credits for the Plan B paper, and 2 elective credits.

The performance emphasis requires 14 credits in performance/pedagogy (includes recital credit), 8 credits in music theory and literature, 6 credits in research/foundations courses, 2 elective credits, and a solo recital. The recital fulfills the Plan B project requirement.

Inclusion of 4xxx courses on degree program forms is subject to adviser and director of graduate studies approval.

Language Requirements—None.

Final Exam—A comprehensive final examination is required.

Pharmacology

See Cooperative Programs.

Physics M.S.

Plan A and Plan B

Acting Director of Graduate Studies: Assistant Professor Jonathan Maps

The master of science program provides a grounding in the fundamentals of physics, combined with significant research involvement. The primary areas of research are computational physics, high-energy neutrino physics, experimental work in condensed-matter physics, and observational and theoretical work in physical limnology.

Admission Requirement

An undergraduate degree in physics or the equivalent is required.

M.S. Degree Requirements

The master of science degree is offered under both Plan A and Plan B. All students take 11 credits in a common core of courses (including PHYS 5501, 5511, 5521, and 2 credits in 5090), 3 credits in a methods course (PHYS 5052 or 5053 or 5061), and 6 credits in a minor or related field. Plan A also requires 10 thesis credits. Plan B requires one or more projects for a total of 120 hours of work, preparation of a written report for each project, and 10 additional course credits in physics. These courses may include 4xxx courses if appropriate and if approved for graduate credit; for distinctly interdisciplinary programs, the courses may be outside physics. In all cases, the overall plan of study and selection of elective courses must form a coherent program and be approved by the director of graduate studies.

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, of which no more than 1 credit can be from PHYS 5090.

Physiology

See Cooperative Programs.

Social Work M.S.W.

Plan B (coursework only)

Director of Graduate Studies: Professor Dennis R. Falk

The master of social work (M.S.W.) program offers a concentration in advanced generalist practice that prepares students to practice in a variety of human service settings. Graduates undertake a variety of professional social work roles ranging from counselor and case manager to community organizer and administrator. The curriculum has a special focus on services to American Indians and their communities. Coursework is also available in the area of child welfare practice. The M.S.W. program is accredited by the Council on Social Work Education.

Admission Requirements

Applicants should have a bachelor's degree from a regionally accredited college or university. This degree should include a solid background in the liberal arts, as evidenced on the transcript by courses in the arts, cultural studies, and behavioral and social sciences. Applicants should be knowledgeable about diverse cultures, social problems, social conditions, and the social, psychological, and biological determinants of human

behavior. Applicants with undergraduate degree majors in social work or a related field or discipline are given preference over applicants with other majors.

Completion of at least 15 semester credits in two or more social science disciplines, such as sociology, psychology, economics, anthropology, or political science is required, as well as strong academic preparation as demonstrated by a minimum undergraduate GPA of 3.00.

Applicants should show potential to contribute to the social work profession. Preference is given to applicants with professional experience in human service settings, particularly when this experience involves working with underrepresented and protected classes.

Enrollment Prerequisites—Admitted applicants must complete a college-level biology course with content on human anatomical and physiological development and a college-level statistics course. The biology course must be completed before registering for the first semester in the M.S.W. program, and the statistics course must be completed before registering for the first research course. Interested persons can apply and be admitted before completing the enrollment prerequisites.

Advanced Standing—Applicants with a bachelor of social work degree from a program accredited by the Council on Social Work Education may apply for admission to the advanced standing program. All other applicants are ineligible for this program.

Degree Requirements

The M.S.W. requires 51 credits (34 credits for students admitted with advanced standing), including a minimum of 41 credits in social work courses (28 credits for advanced standing students), a master's project and final examination. The program requires two field placements in human service agencies (one field placement for students with advanced standing). A minimum GPA of 3.00 for courses included in the degree program is required. A level of personal and professional competence, as indicated by social work course and field placement evaluations, is required. Inclusion of 4xxx courses on degree program forms is subject to adviser and director of graduate studies approval.

Language Requirements—None.

Final Exam—None.

Toxicology Ph.D. and M.S.

M.S. Plan A and Plan B

Associate Director of Graduate Studies: Professor Kendall Wallace

This University-wide program provides comprehensive training in the broad scope of toxicology. Toxicology, the science of poisons, is devoted to identifying and quantifying potential noxious agents in our environment. Although most chemical agents at sufficiently large doses may be toxic, not all present a significant risk to human health or to environmental organisms or ecosystems. Accordingly, the essence of the science of toxicology is defining the fine line that distinguishes a risk from a residue. To accomplish this requires scientific expertise in such areas as analytical and environmental chemistry, biology, and mathematics. Advanced courses and research are also available in such subdisciplines as human health risk assessment, epidemiology, environmental chemistry and engineering ecotoxicology food additives and nutritional toxicology biochemical and physiological mechanisms histopathology diagnostic and analytical toxicology drug metabolism chemical carcinogenesis behavioral toxicology and the toxicity of noxious agents to various organ systems (e.g., nervous, heart, liver, kidneys).

Admission Requirements

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 is expected. 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 Ph.D. and M.S.

M.S. Plan A and Plan B

Associate Director of Graduate Studies: Associate Professor Josef P. Werne

This interdisciplinary program produces scientists with strong technical skills in disciplines relevant to water resources science and promotes 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 the Twin Cities campus Departments of Anthropology; Applied Economics; Biosystems and Agricultural 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; Landscape Architecture; Plant Biology; and Soil, Water, and Climate; in addition to the Humphrey Institute of Public Affairs. It also involves the Duluth campus Departments of Biology, Chemical Engineering, Chemistry, Economics, Geography, and Physics.

Admission Requirements

Applicants must have a bachelor of science degree in a physical or biological science or engineering with a 3.00 minimum GPA, and normally will have taken at least two courses each in calculus, chemistry, and physics, and one course in biological sciences. Students who do not have a master's degree in a related subject are admitted to the master's program first, even if their long-term goal is a doctorate degree. The GRE General Test is recommended for all applicants.

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 five courses in four core areas (hydrology, environmental/water chemistry, limnology, and water resources policy, law, and administration) and at least three electives (in emphasis areas such as aquatic biology, hydrologic science, watershed management, and water quality engineering). One elective must be from an approved list of technical courses dealing with water quality science/management; two electives must be in the student's focus area within aquatic science. Related field credits should be in courses outside of aquatic science.

If a student has had none of the core courses in previous studies, at least 28 course credits (plus 10 thesis credits) are required for Plan A and at least 30 credits are required for Plan B (up to 3 credits of independent study may be used for the Plan B project). If a student has met some core course requirements, the minimum number of credits for Plan A may be reduced proportionately, but never to less than the Graduate School minimum of 20 course credits.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master's minor requires 10 credits, including WRS 5101 (3 credits), WRS 8100 (1 credit), a core course from one of the program's emphasis areas, and an elective within that field of specialization. In aquatic biology and limnology, the core course is EEB 4601; in hydrological science, watershed management, and water engineering, the core course is in hydrology.

Ph.D. Requirements

Coursework is tailored to student interests, and many areas of specialization are possible. Core courses are offered on both the Twin Cities and Duluth campuses or are available in both regions through interactive video.

Degree Requirements

Students complete coursework equivalent to that of a master of science degree in water resources science, with additional coursework in an area of specialization. There are no specific credit requirements in the major, but doctorate programs normally include at least 40 course credits beyond the bachelor's degree 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 14 credits, including WRS 5101 (3 credits), WRS 8100 (1 credit), a core course from one of the program's emphasis areas, and two electives within one field of specialization. In aquatic biology and limnology, the core course is EEB 4601; in hydrological science, watershed management, and water engineering, the core course is in hydrology.

Cooperative Programs

Biochemistry, Molecular Biology, and Biophysics Ph.D. and M.S.

M.S. Plan A

Associate Director of Graduate Studies: Professor Lester R. Drewes

The UMD Department of Biochemistry and Molecular Biology faculty participate fully in the University's biochemistry, molecular biology, and biophysics graduate program (www.d.umn.edu/medweb/biochem/). Students are subject to the same entrance and degree requirements as all other University biochemistry graduate students. Up to two semesters of coursework on the Twin Cities campus may be required for doctoral students, depending on their needs and interests. Postdoctoral students are welcome and find favorable opportunities for continued research. Teaching and research assistantships are available to some students through the department as a form of financial aid.

Cellular and Integrative Physiology Ph.D. and M.S.

M.S. Plan A

Associate Director of Graduate Studies: Associate Professor Lorentz Wittmers

Advanced degrees in physiology at the University of Minnesota can be earned through the cellular and integrative physiology graduate program. The Department of Physiology and Pharmacology on the Duluth campus, in cooperation with the Department of Physiology on the University's Minneapolis campus, offers a course of study leading to a master's degree in several areas of physiology. A doctoral degree can be pursued on the UMD campus as well.

On the UMD campus, opportunities exist to pursue studies in cardiovascular, muscle, neurophysiology, respiratory, and endocrine physiology; mammary physiology and disease; as well as in membrane transport, temperature regulation, and certain areas of neuroscience.

All course requirements for the master of science degree can be completed on the UMD campus. Students are expected to complete degree requirements over a period of two calendar years. The master's degree program requires at least 20 semester credits in physiology and 6 semester credits in a minor or related field of study. Fulfillment of master's degree requirements also includes the presentation and defense of a thesis and the completion of 10 thesis credits. Advanced physiology courses as well as research projects leading to the doctorate degree are available on the UMD campus. However, students are required to complete a portion of their doctoral course requirements (typically two semesters) from selections offered on the Twin Cities campus.

Microbiology, Immunology, and Cancer Biology Ph.D. and M.S.

M.S. Plan A

This program is associated with the graduate program in microbiology on the Twin Cities campus. Preparative coursework is offered primarily on the Twin Cities campus and can be completed in one year. Thesis research is conducted in molecular genetics, bacteriology, virology, mycology, or immunology.

Pharmacology Ph.D. and M.S.

M.S. Plan A

Associate Director of Graduate Studies:
Associate Professor Janet L. Fitzakerley

This program is associated with the graduate program in pharmacology on the Twin Cities campus. All requirements for the master of science degree can be completed on the Duluth campus. Up to two semesters of coursework on the Twin Cities campus may be required for doctoral students. Courses and research provide opportunities for training in biochemical and physiological pharmacology, immunopharmacology, and toxicology. All students complete coursework in biochemistry, physiology, and statistics as well as the major courses in pharmacology. In general, applicants should be well grounded in chemical and biological sciences and mathematics. Applicants must submit GRE General Test scores. Financial aid in the form of research assistantships is available through the department. When applying, students should specify that they are

applying for the master's or doctorate program at UMD. Applications and information may be obtained from the associate director of graduate studies, Department of Physiology and Pharmacology, University of Minnesota Medical School Duluth, Duluth, MN 55812.

Collegiate Graduate Programs

Master of Advocacy and Political Leadership M.A.P.L.

Director: Wy Spano
214 Cina Hall

Web site: www.d.umn.edu/map

For information about the master of advocacy and political leadership (M.A.P.L.) degree program, see College of Liberal Arts in the Colleges and Schools section of this catalog or write to the program director, 112 Cina Hall.

Master of Education M.Ed.

Director: Jackie Millslagle
120 Bohannon Hall

Web site: www.d.umn.edu/cehsp/GradProg/

For information about the master of education (M.Ed.) degree program, see College of Education and Human Service Professions in the Colleges and Schools section of this catalog, or write to the program director, 125 Bohannon Hall.

Master of Environmental Health and Safety M.E.H.S.

Director: To be announced,
229 Voss Kovach Hall

Web site: <http://mehs.d.umn.edu>

For information about the master of environmental health and safety (MEHS) degree program, see College of Science and Engineering in this section of the catalog, or write to the program director, 229 Voss-Kovach Hall.

Master of Special Education M.Sp.Ed.

Director: Joyce Strand
125 Bohannon Hall

Web site: www.d.umn.edu/cehsp/GradProg/

For information about the master of special education (M.Sp.Ed.) degree program, see College of Education and Human Service Professions in the Colleges and Schools section of this catalog, or write to the program director, 125 Bohannon Hall.