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

M.A. Degree Requirements

Students select an emphasis in park and recreation administration, outdoor education/recreation, sport management, or therapeutic recreation.

The M.A. is offered under Plan A and Plan B. Plan A requires 30 credits, including at least 14 credits in recreation, park, and leisure studies, 6 credits in a minor or related field, and 10 thesis credits (Rec 8777). Plan B also requires 30 credits, including at least 14 credits in recreation, park, and leisure studies, 6 credits in a minor or related field, and 4 credits of a research project (Rec 8995). A 3.00 minimum GPA is required to maintain good standing and to graduate.

Language Requirements—None.

Final Exam—The final exam is oral.

Rehabilitation Science

Contact Information—Program in Rehabilitation Science, MMC 388, 420 Delaware St. S.E., Minneapolis, MN 55455, (612)-625-3966; fax 612-625-7192; ada@umn.edu; <www.med.umn.edu/Research/umn.edu/Rehabsci/ >

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor

Richard DiFabio, SM
Carl Kukulka, SM
Robert Patterson, SM

Associate Professor

James Carey, SM
Dennis Dykstra, SM
Virgil Malhotra, SM
Glenn Scudder, M2
Erica Stern, SM
LaDora Thompson, SM

Assistant Professor

Paula Ludewig, SM
Jon Samuel Nelson, M

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

Curriculum—Physical rehabilitation optimizes recovery from disease or injury. The program prepares individuals to have a critical mind and research skills that will advance this clinical science. Emphasis areas in neurological rehabilitation and musculoskeletal rehabilitation are offered.

Prerequisites for Admission—Applicants must hold a bachelor’s degree or graduate degree in a discipline related to rehabilitation such as biomedical engineering, medicine, occupational therapy, physical therapy, or speech/audiology. International students must hold a comparable foreign degree from an accredited program. Depending on the educational background of the applicant, admission may be contingent upon completion of selected prerequisite coursework (i.e., physics). All applicants must have a minimum undergraduate GPA of 3.00 and an agreement from a rehabilitation science faculty member to serve as an adviser. Compatibility of research interests is a major determinant in the selection of a student/adviser relationship.

Special Application Requirements—Applicants must submit the following materials: GRE General Test scores; official transcripts; three letters of reference; and TOEFL score for international students.

Courses—Please refer to Rehabilitation Science (RSc) and Physical Medicine and Rehabilitation (PMed) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on degree program forms requires adviser and director of graduate studies approval. The use of 4xxx courses on degree program forms is highly discouraged.

M.S. Degree Requirements

Plan A (thesis) requires a minimum of 33 credits: a minimum of 14 credits in the major, including 6 credits of rehabilitation science seminar (PMed 8100) and a research design course in rehabilitation science; a minimum of 6 credits in a minor or related fields; a statistics course (EPsy 5261 or equivalent); and a minimum of 10 thesis credits (RSc 8777). In place of the 10 thesis credits for Plan A, Plan B (without thesis) requires courses chosen in consultation with an adviser and a Plan B project. Students must maintain a 3.00 minimum GPA for all coursework taken in the program. The Graduate School requires ethics in research training. Students should work with an adviser to identify a plan to meet this requirement. For additional information, visit <www.research.umn.edu/ethics> or contact the program.

Language Requirements—None.

Final Exam—For Plan A, the final exam is oral; for Plan B, it may be written, oral, or both.

Ph.D. Degree Requirements

The Ph.D. requires a minimum of 36 course credits: 16 credits in core courses, including 6 credits of rehabilitation science seminar (PMed 8100); 12 credits in a minor or supporting program; 8 credits in statistics (credits earned in core courses and statistics cannot be applied to the minor or supporting program); and 24 thesis credits. Students must maintain a 3.00 minimum GPA for all coursework taken in the program. In addition to these minimum requirements, the adviser may require additional courses. The Graduate School requires ethics in research training. Students should work with an adviser to identify a plan to meet this requirement. For additional information, visit <www.research.umn.edu/ethics> or contact the program.

Language Requirements—None.

Religions in Antiquity

See Classical and Near Eastern Studies.

Religious Studies

Minor Only

Contact Information—Director of Graduate Studies, Department of Classical and Near Eastern Studies, University of Minnesota, 305 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-625-5335).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor

Frederick M. Asher, Art History, M
Bernard S. Bachrach, History, M
Cesar E. Farah, African American and African Studies, M
Jasper S. Hopkins, Philosophy, M
Riv-Ellen Pfeil, American Studies, M
Theofanis G. Stavrou, History, M
James D. Tracy, History, M
Gayle Graham Yates, American Studies, M

Associate Professor

William W. Malandra, M
Jonathan S. Paradise, M
Philip H. Seillev, M

Curriculum—The minor in religious studies is available to master’s (M.A. and M.S.) and doctoral students in relevant fields such as history, classics, English, anthropology, philosophy, and American studies, and is under the general direction of members of the graduate faculty who represent a broad spectrum of disciplines.

Prerequisites for Admission—Admission is contingent on prior admission to a master’s or doctoral degree-granting program within the Graduate School.

Special Application Requirements—Students should consult with the director of graduate studies for the program as early as possible, and in any case no later than their third semester of study. The director of graduate studies must approve the applicant’s proposed course of study and sign the student’s degree program form.

Use of 4xxx Courses—Inclusion of 4xxx courses on degree program forms is subject to approval by the director of graduate studies.

Minor Only Requirements

The minor requires 9 credits for an M.A. and 12 credits for the Ph.D. All minors will have at least one of the religious studies graduate faculty as members of their examination committees. All students enrolled in the minor take RelA 5700—Theory and Method in Religious Studies, and choose two (M.A.) or three (Ph.D.) from the following courses to complete the program: AFro 5036, AmSt 5101, AINE 5501/2, 5503/4, Anth 5059, Arab 5542, Arth 5795, Clas 5088/9, 5252, JwSt 5013, 5960, 5111, Phil 8081, 8550, RelA 5071, 5072, 5073, 5080, 8310, SALC 5412/3.

Language Requirements—There are no special language requirements beyond those of the student’s major program.
**Rhetoric and Scientific and Technical Communication**

**Contact Information**—Department of Rhetoric, University of Minnesota, 64 Classroom Office Building, 1994 Buford Avenue, St. Paul, MN 55108 (612-624-4761; fax 612-624-3617; rhetoric@umn.edu; <www.rhetoric.umn.edu>.

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

**Rhetoric and Scientific and Technical Communication Graduate Faculty**

**Professor**

John H. Beatty, Ecology, Evolution, and Behavior, ASM
Carol Ann Berkenkotter, SM
Lillian S. Bradwell-Bowles, English, ASM
Karin K. Campbell, Communication Studies, ASM
Terence G. Collins, General College, AM
Ann Hill Dunn, SM
Shirley N. Garey, English, ASM
Michael F. Graves, Curriculum and Instruction, ASM
Alan G. Gross, Rhetoric, SM
Laura J. Gurak, Rhetoric, SM
Mary M. Lay, Rhetoric, SM
Helen E. Longino, Women's Studies, AM
Earl E. McDowell, Rhetoric, SM
Victoria M. Mikelonis, Rhetoric, SM
Donald J. Ross, Jr., English, AM
Edward A. Schiappa, Communication Studies, ASM
Robert L. Scott (emeritus), Communication Studies, ASM
Dale Lee Sullivan, SM
Richard A. Swanson, Work, Community, and Family Education, ASM
Elaine E. Tarone, SM
Billie J. Wahlstrom, Rhetoric, SM
Arthur E. Walzer, Rhetoric, SM

**Associate Professor**

Lisa Albrecht, General College, AM
William A. Babcock, Journalism and Mass Communication, AM
Robert L. Brown, Jr., Cultural Studies and Comparative Literature, ASM
Simon Hooper, Curriculum and Instruction, AM
Thomas M. Scanlan, Rhetoric, M2

**Assistant Professor**

Lee-Ann Kastman Breuch, M2
Janel Anderson Crider, M2
Richard J. Graff, M2
John Logie, M2
Bernadette C. Longo, M2
Daniel J. Philippon, M2

**Scientific and Technical Communication Graduate Faculty**

**Professor**

Carol Ann Berkenkotter, M2
Ann Hill Dunn, M2
Alan G. Gross, Rhetoric, M2
Laura J. Gurak, Rhetoric, M2
Mary M. Lay, Rhetoric, M2
Earl E. McDowell, Rhetoric, M2
Victoria M. Mikelonis, Rhetoric, M2
Dale Lee Sullivan, M2
Billie J. Wahlstrom, Rhetoric, M2
Arthur E. Walzer, Rhetoric, SM

**Associate Professor**

Thomas M. Scanlan, Rhetoric, M2

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

**Curriculum**—The M.S. focuses on applying basic theory and research to the practice of scientific and technical communication in the workplace. It is designed for students who plan to be technical communicators or information developers in business and industry. Required courses include Rhet 5111, 5112, and 5511.

The M.A. and Ph.D. in rhetoric and scientific and technical communication prepare students to address complex issues in language, science, and technology. The programs are flexible enough to allow students to approach their studies from a variety of perspectives and research methods. This option prepares students for teaching at a university and conducting research in rhetoric and scientific and technical communication. The programs can also prepare students for specialist positions in industry and government that require the analysis and design of human communication systems. Required courses include theory, research, and practice in rhetoric and scientific and technical communication and in a minor or related field.

All M.S., M.A., and Ph.D. applicants must meet the admission requirements of the Graduate School and will be expected to have completed coursework or have equivalent experience in advanced communication (e.g., writing/editing, oral communication, visual communication, organizational communication, or communication theory) and one of the following areas: computer science, management information systems, science, technology, mathematics, engineering, or other related fields.

**Special Application Requirements**—Scores from the General Test of the GRE that are less than five years old are required of students with baccalaureate degrees from U.S. institutions. International students are encouraged to take the General Test of the GRE and to have those results forwarded to the Graduate School. Non-native speakers of English are required to take the TOEFL with satisfactory scores. All applicants must submit three letters of recommendation, two writing samples, and a professional objective statement. M.S. deadlines are June 15 for fall semester admission and October 15 for spring semester admission. All M.A. and Ph.D. applicants begin in the fall semester and have a January 15 deadline.

**Courses**—Please refer to Rhetoric (Rhet) in the course section of this catalog for courses pertaining to the program.

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

**M.S. and M.A. Degree Requirements**

The M.S. in scientific and technical communication requirements for Plan A and Plan B are the same except that Plan A requires a thesis (10 credits) and 24 course credits and Plan B requires 30 course credits and 5 project credits. Students take six courses in theory, research, and practice in technical communication. An internship is required for any student who has not yet worked as a technical communicator in industry. Students take additional electives in rhetoric to complete 34 credits for Plan A or 35 credits for Plan B.

The M.A. requirements for Plan A and Plan B are the same except that Plan A requires a thesis (10 credits) and Plan B requires a project (5 credits). Students take six courses (18 credits) in theory, research, and practice in rhetoric and scientific and technical communication and in a minor or related field. An internship (3 credits) is required for those intending to pursue research or specialist positions in industry. Minor or related fields (6 credits) may focus on areas such as communication studies, English, curriculum and instruction, women’s studies, cognitive psychology, and history of science.

**Language Requirements**—None for M.S. students. M.A. students must demonstrate proficiency in a foreign language of their choice either by taking 3 credits of a beginning level language course or having their adviser and the director of graduate studies certify that they have reading comprehension in a particular language. A student could fulfill this requirement by taking a beginning 3 credit course or by completing a non-credit course such as Fren 0001—Reading French in the Arts and Sciences or Ger 222—Beginning German.

These courses are offered through the College of Continuing Education, usually in the summer.

**Final Exam**—For both Plans A and B, students must pass an oral examination in which they defend their master’s work and demonstrate competence in their chosen field of study.

**Ph.D. Degree Requirements**

Ph.D. students in rhetoric and scientific and technical communication are required to earn a minimum of 42 credits beyond the master’s. This plan requires a minimum of 21 credits in rhetoric seminars—two of those seminars must be in rhetorical theory and criticism within rhetoric course offerings. Students take two courses (6 credits) in rhetorical theory and criticism beyond the M.A. requirements; two courses in technical communication research and theory (6 credits) including Rhet 8011 and 8012; two courses (6 credits) in a particular area of study such as rhetoric of science and technology; feminist theory in science, technology, and communication; scientific and technical communication pedagogy; or technology and culture; 6 credits in research methods courses; and 12 credits in a minor or...
related field. Minor or supporting programs may focus on areas such as communication studies, English, curriculum and instruction, women’s studies, cognitive psychology, or history of science. In addition, 6 elective credits are needed to fulfill the minimum credit requirement. Students must fulfill 18 credits of Ph.D. work in completing M.A. requirements (usually two courses in rhetorical theory and three courses in other core areas). Twenty-four thesis credits are also required. The final exam is oral.

Language Requirements—Ph.D. students must demonstrate proficiency in a foreign language of their choice either by taking 3 credits of a beginning level language course or having their adviser and the director of graduate studies certify that they have reading comprehension in a particular language. A student could fulfill this requirement by taking a beginning 3 credit course or by completing a non-credit course such as Frem 0001—Reading French in the Arts and Sciences or Ger 222—Reading German. These courses are offered through the College of Continuing Education, usually in the summer.

Minor Requirements for Students
Majoring in Other Fields—For M.A. and M.S. students, the minor requires 6 credits in 5xxx and 8xxx rhetoric courses. The minor for Ph.D. students requires 12 credits of 5xxx and 8xxx courses (6 of which can be taken for the M.A. or M.S. degree) with one course being in rhetorical theory and criticism. Students may choose the remaining courses from any of rhetoric’s graduate courses.

Russian Area Studies

Contact Information—Russian Area Studies, Area Studies Programs, University of Minnesota, 214 Social Sciences Building, 267 19th Avenue S., Minneapolis, MN 55455 (612-624-8543; fax 612-626-2242).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor
John S. Adams, Public Affairs, M2
Iraj Bashir, Linguistics, ESL, and Slavic Languages and Literatures, M2
Gary R. Jahn, Linguistics, ESL, and Slavic Languages and Literatures, M2
Anatoly Liberman, German, Scandinavian, and Dutch, M2
Theofanis G. Stavrou, History, M2

Associate Professor
Irina H. Corten, Linguistics, ESL, and Slavic Languages and Literatures, M2
Leonard A. Polakiewicz, Linguistics, ESL, and Slavic Languages and Literatures, M2

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

Curriculum—This program provides students with the knowledge to better understand the Russian world, its history, culture, and restructuring in the post-Soviet era. As Russia redefines its place in the world, and as trade and cultural links between Russian and the United States grow, Russian area specialists are increasingly needed. Areas of concentration include Russian history, Russian literature, and twentieth-century Russia.

Prerequisites for Admission—A bachelor’s degree from an accredited university or college is required.

Special Application Requirements—The following must be forwarded directly to the department: three letters of recommendation, a copy of one or more papers representative of current level of scholarly development, and a statement of the student’s purpose. Scores from the General Test of the GRE are required. Prospective students should contact the department for further information. Students are admitted each semester.

Courses—Please refer to Russian Area Studies (RAS), Russian (Russ), Global Studies (GloS), Central Asian Studies (CAS), Polish (Psh), and Slavic (Slav) in the course section of this catalog for courses pertaining to the program.

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

M.A. Degree Requirements

The M.A. program uses an interdisciplinary approach involving both the humanities and the social sciences. Students must complete required coursework, master appropriate theoretical frameworks, and acquire a concise understanding of topic(s) developed in the Plan A thesis or in three Plan B papers. The thesis/papers must show a broad knowledge of the Russian area, methodological sophistication, and clear evidence of research in Russian language sources. Students must also demonstrate advanced Russian language proficiency.

All students complete six distribution courses (18 credits), including two courses on Russian literature (Russ 5421—Literature: Middle Ages to Dostoevsky in Translation and Russ 5422—Literature: Tolstoy to the Present in Translation), one course in social science (Geog 5181—Russia and Environs), two graduate level courses in Russian history, and a scope and methods course (Area 8061). Plan A students must complete three additional courses (9 credits) in their declared area of concentration and 10 thesis credits. Plan B students must complete four additional courses (12 credits) in their declared area of concentration.

Language Requirements—Students must demonstrate advanced Russian language proficiency by passing a special exam or by earning a B or better average in Russ 3001-02 or the equivalent and completion of three courses (9 credits) in the field, including at least two semesters of seminars/proseminars.

Scandinavian Studies

See Germanic Studies.

School Psychology

See Educational Psychology.

Science, Technology, and Environmental Policy

Contact Information—Director of Admission, Hubert Humphrey Institute of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax 612-625-3513; admissions@hhh.umn.edu; <www.hhh.umn.edu>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Regents Professor
G. Edward Schuh, AM

Professor
Dean E. Abrahamson (emeritus), AM
John S. Adams, M2
Sandra O. Archibald, M2
Ragui A. Assaad, M2
J. Brian Atwood, M2
John E. Brandl, M2
John M. Bryson, M2
Nancy N. Eustis, M2
Katherine Fennelly, M2
Edward G. Goetz, M2
Stephen A. Hoenack, M2
Robert T. Holt, AM
Ethan B. Kapstein, M2
Kenneth H. Keller, M2
Sally J. Kenney, M2
Morris M. Kleiner, M2
Robert T. Kudrle, M2
Ann R. Markusen, M2
Samuel E. Myers, M2
Carlsle F. Ringe, Applied Economics, AM
Esther Wattenberg, Social Work, AM

Associate Professor
Maria J. Hanratty, M2
Deborah Levison, M2
Melissa M. Stone, M2

Assistant Professor
Kevin J. Krizek, M2

Other
Zbigniew M. Bochniarz, AM
Harry C. Boyte, AM
William Craig, AM
Barbara C. Crosby, AM
Marsha A. Freeman, AM
Ali K. Galavdy, AM
Thomas F. Luce, AM
Barbara L. Lukermann, AM
Lee W. Mannich, AM
Joseph H. Nathan, AM
Joseph A. Ritter, AM
Jodi R. Sandfort, AM
Paul C. Stone, AM

Along with the program-specific requirements listed below, please read the General Information section of this catalog for Graduate School requirements that apply to all major fields.
Curriculum—The M.S. program provides students with an understanding of the role of science and technology in food and health, the economy, energy and the environment, security, and education; the impact of science and technology on the political and economic relationships among nations; and the analysis and design of policies for appropriate promotion and regulation of science and technology regionally, nationally, and internationally. The program educates students with natural and social science backgrounds to assume roles in public policy development. An M.S./Juris doctor dual degree program is available.

Prerequisites for Admission—Students typically have undergraduate degrees or advanced coursework in one of the natural or engineering sciences. They are also expected to have completed the equivalent of an introductory course in microeconomics and have a U.S. bachelor’s degree or foreign equivalent.

Special Application Requirements—In addition to the materials submitted to the Graduate School, applicants must submit to the Humphrey Institute a photocopy of the Graduate School application, the Humphrey Institute Applicant Data Form, copies of all academic transcripts, a statement of purpose, at least three letters of recommendation, and a GRE official score report. Students who wish to be considered for financial aid should apply no later than January 1 of the preceding academic year. Entry is for fall semester.

Courses—Please refer to Public Affairs (PA) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted with instructor’s and adviser’s permission.

M.S. Degree Requirements

The M.S., which is offered under both Plan A (thesis) and Plan B (without thesis), requires 40 credits including at least 21 credits in five core areas—12 credits in the area of science, technology, and environmental policy and 9 credits of the politics of public affairs, economic reasoning, and empirical analysis. Students should take an additional 6 credits to complement their previous training: appropriate courses in natural or engineering science or its history or philosophy for those with social science backgrounds; appropriate courses in the social sciences for those with natural or engineering science backgrounds. Plan A also requires 10 thesis credits. Plan B requires completion of a Plan B paper (3 credits). The remaining elective credits are chosen in consultation with the student’s adviser.

Language Requirements—None.

Final Exam—The final exam is oral.

Scientific and Technical Communication

See Rhetoric and Scientific and Technical Communication.

Scientific Computation

Contact Information—Director of Graduate Studies, 139 Smith Hall, 207 Pleasant St. S.E., Minneapolis, MN 55455 (612-625-0769; fax 612-626-7541; <www.scicomp.umn.edu>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Regents Professor

Daniel D. Joseph, Aerospace Engineering and Mechanics, SM
L. E. Scriven, Chemical Engineering and Materials Science, SM

Professor

Ronald E. Anderson, Sociology, SM
Daniel L. Bosey, Computer Science and Engineering, SM
Graham V. Candler, Aerospace Engineering and Mechanics, SM
James R. Chelikowsky, Chemical Engineering and Materials Science, SM
J. Bernardo Cockburn, Mathematics, SM
Christopher J. Cramer, Chemistry, SM
Jeffrey J. Derby, Chemical Engineering and Materials Science, SM
Timothy J. Ebner, Neuroscience, SM
Jiali Gao, Chemistry, SM
Efi Foufoula-Georgiou, Civil Engineering, SM
Apostolos P. Georgopoulos, Neuroscience, SM
Alexander Y. Grosberg, Physics and Astronomy, SM
Thomas W. Jones, Astronomy, SM
Daniel J. Kersten, Psychology, SM
Vipin Kumar, Computer Science and Engineering, SM
David J. Lilja, Electrical and Computer Engineering, SM
John S. Lowengrub, Mathematics, SM
Mitchell B. Luskin, Mathematics, SM
John L. Nieber, Biostatistics and Agricultural Engineering, SM
Hans G. Othmer, Mathematics, SM
N. P. Papankopolou, Computer Science and Engineering, SM
Haesun Park, Computer Science and Engineering, SM
Yoosuf Saad, Computer Science and Engineering, SM
Guilermo R. Sapiro, Electrical and Computer Engineering, SM
George R. Sell, Mathematics, SM
J. Iiia Siepmann, Chemistry, SM
Jaideep Srivastava, Computer Science and Engineering, SM
Harlan W. Stech, Mathematics and Statistics, Duluth, SM
David D. Thomas, Biochemistry, SM
Luke Jon Tierney, Statistics, SM
Donald G. Truhlar, Chemistry, SM
Vaughn R. Voller, Civil Engineering, SM
George L. Wilcox, Neuroscience, SM
Paul R. Woodward, Astronomy, SM
David A. Yuen, Geology and Geophysics, SM

Associate Professor

David M. Ferguson, Medicinal Chemistry, Pharmacognosy, SM

Assistant Professor

Victor H. Barocas, SM
George Karypis, Computer Science and Engineering, M2
Norman J. Trouiller, Computer Science and Engineering, M2
Darrin M. York, Chemistry, SM

Other

Daniel M. Kroll, Pharmacy, M2

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

Curriculum—This program encompasses coursework and research on the fundamental principles for using intensive computation to support research in the physical, biological, and social sciences and engineering. Emphasis is on research issues, state-of-the-art methods, and applying these methods to outstanding problems in science, engineering, and other fields that use scientific computation, numerical analysis and algorithm development, symbolic and logic analysis, high-performance computing tools, supercomputing and heterogeneous networks, and visualization. A handbook that describes the program and degree requirements in detail is available from the program.

Prerequisites for Admission—Applicants should complete a form provided by the program as well as applicable Graduate School forms. A bachelor’s degree in a field that uses scientific computation is required for admission.

Special Application Requirements—Applicants should submit scores from the General Test of the GRE, three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts, and a clearly written statement of career interests, goals, and objectives. Students may apply at any time; however, submission of all application materials by January 1 is strongly encouraged to ensure priority consideration for fellowships and assistantships.

Courses—Please refer to the Scientific Computation (ScIC) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx courses on degree program forms is subject to adviser and director of graduate studies approval. Students from other majors may include such courses subject to their own program’s approval.

M.S. Plan A Degree Requirements

The program is offered under Plan A (thesis), which includes a minimum of 20 course credits and 10 thesis credits. The course credits must include at least 6 credits from the scientific computation core and at least 6 credits in a minor. Only 3 credits from courses offered in a student’s minor may be counted toward the core requirements in scientific computation. A course listed in both the core requirements of scientific computation and a student’s minor may not be counted under both.

Language Requirements—None.

Final Exam—The final exam is oral.
Minor Requirements for Students Majoring in Other Fields—The master’s minor requires approval of the director of graduate studies; a minimum of 4 credits from the core curriculum; the credits may not be from courses in the student’s major field.

Ph.D. Degree Requirements
A minimum of 24 course credits is required with a minimum of 12 credits in core courses; 24 thesis credits are also required. Students have two options:

1) Ph.D. with supporting program. In addition to the core credits, this option requires 12 credits in subjects that support computational science—these can include core credits beyond the required 12 credits.

2) Ph.D. with minor. In addition to the core credits, this option requires 12 credits in a minor. Many minor programs require more than 12 credits; in such cases, the greater requirements will be in effect. The minor field must be declared before the student takes the preliminary oral exam.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires approval of the director of graduate studies and a minimum of 12 credits (a minimum of 6 of these in core courses with remaining credits from supplementary courses). A student may use one course from their major field to satisfy the requirement of a minor in scientific computation, provided there is no rule prohibiting this in the student’s major field.

Social, Administrative, and Clinical Pharmacy
Contact Information—College of Pharmacy, University of Minnesota, 7-155 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-624-2973; fax 612-625-9931; tesda001@umn.edu).

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

Professor
Robert J. Cipolle, Pharmaceutical Care and Health Systems, SM
James C. Cloyd, Experimental and Clinical Pharmacology, SM
Judith M. Garrard, Public Health, SM
Cynthia R. Gross, Experimental and Clinical Pharmacology, SM
David R. Guay, Experimental and Clinical Pharmacology, M2
Ronald S. Hadsall, Pharmaceutical Care and Health Systems, SM
Joseph T. Hanlon, Experimental and Clinical Pharmacology, SM
Thomas E. Lackner, Experimental and Clinical Pharmacology, M2
Tom Alan Larson, Pharmaceutical Care and Health Systems, M2
Henry J. Mann, Experimental and Clinical Pharmacology, SM
Peter C. Morley, Pharmaceutical Care and Health Systems, SM
Rory P. Remmel, Medicinal Chemistry, SM
John C. Rotschaffer, Experimental and Clinical Pharmacology, M2

Stephen W. Schondelmeyer, Pharmaceutical Care and Health Systems, SM
Stuart M. Speedie, Health Informatics, Medical School, SM
Linda M. Strand, Pharmaceutical Care and Health Systems, SM
Timothy S. Tracy, Experimental and Clinical Pharmacology, SM
Donald L. Uden, Pharmaceutical Care and Health Systems, M2
Vernon E. Weckwerth, Health Services Administration, SM
Dawne E. Zaske, Experimental and Clinical Pharmacology, M2
Cheryl L. Zimmerman, Pharmacometrics, SM

Adjunct Professor
Paul C. Langley, Pharmaceutical Care and Health Systems, ASM
Deborah A. Wingerd, Pharmaceutical Care and Health Systems, AM2

Associate Professor
Sydney B. Benson, Pharmaceutical Care and Health Systems, M2
Richard C. Brundage, Experimental and Clinical Pharmacology, SM
Bran J. Isitets, Pharmaceutical Care and Health Systems, M2
Wendy L. St. Peter, Pharmaceutical Care and Health Systems, M2
Jon C. Schommer, Pharmaceutical Care and Health Systems, SM
Robert J. Straka, Experimental and Clinical Pharmacology, M2

Assistant Professor
Margaret A. Atwood, Experimental and Clinical Pharmacology, M2
Angela K. Birnbaum, Experimental and Clinical Pharmacology, SM
Richard R. Cline, Pharmaceutical Care and Health Systems, M2
Pamela A. Jacobson, Experimental and Clinical Pharmacology, M2
Kristin K. Janke, Pharmaceutical Care and Health Systems, M2
Michael Kotlyar, Experimental and Clinical Pharmacology, M2
Raul Rodriguez, Pharmaceutical Care and Health Systems, M2
Debra J. Skaar, Experimental and Clinical Pharmacology, M2

Adjunct Assistant Professor
Carolyn Harley, Pharmaceutical Care and Health Systems, Al M2
Samuel Wagner, Pharmaceutical Care and Health Systems, AM2

Clinical Professor
Daniel E. Keyler, Experimental and Clinical Pharmacology, AM2

Clinical Associate Professor
John V. St. Peter, Experimental and Clinical Pharmacology, M2

Clinical Assistant Professor
Ange line M. Carlson, Experimental and Clinical Pharmacology, SM
Leo J. Sioris, Experimental and Clinical Pharmacology, M2

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

Curriculum—Students are prepared for research and related activities investigating relationships between biological and physical factors in social settings that involve the drug use process. This flexible interdisciplinary program uses the resources of the University’s many health and social science departments. Programs include courses and offerings from public health, geriatrics, management, sociology, psychology, and public affairs.

The program focuses on the discovery and dissemination of new knowledge to foster appropriate use of drugs in order to improve patient outcomes at the individual and societal level. Students are educated and mentored to become professional scientists. Those who complete the program will understand the process of conducting high quality research and problem solving through the application of disciplinary and interdisciplinary knowledge, theory, and research methodology.

Two program tracks are available. The emphasis of the social and administrative pharmacy (SAPh) track is the application of behavior-oriented interdisciplinary theories to pharmacy problem solving and pharmacy system development. This includes the study of the social, psychosocial, political, legal, public policy, historic, and economic factors that impinge upon the use, non-use, and abuse of drugs.

The emphasis of the experimental and clinical pharmacology (ECP) track is to advance the science of human pharmacology and therapeutics to improve the safe, effective, and economical use of drugs by patients. This includes the translation of both laboratory and clinical research to the medical use process.

Prerequisites for Admission—Although the majority of students in the program are pharmacists, a pharmacy education is not required. A bachelor’s degree or its foreign equivalent from a recognized college of pharmacy and a strong scholastic record are desirable. Individuals from other fields such as economics, engineering, computer science, medicine, psychology, sociology, or public health may be admitted if their undergraduate coursework satisfies the prerequisites for graduate coursework.

Special Application Requirements—Applicants must complete a department supplementary application form in addition to the Graduate School forms. The supplementary form along with three letters of recommendation should be sent directly to the department. GRE scores are required and a minimum score of 580 is required on the TOEFL for all international applicants whose native language is not English.

Courses—Please refer to Social, Administrative, and Clinical Pharmacy (SACP), Social and Administrative Pharmacy (SAPh), and Experimental and Clinical Pharmacology (ECP) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses towards degree requirements is permitted with director of graduate studies approval.
M.S. Degree Requirements
The M.S. program is offered under Plan A and Plan B.

Plan A requires at least 31 credits, including 15 credits in the major field, at least 6 credits in a minor or related field, and 10 thesis credits.

Plan B requires at least 30 credits, including 15 credits in the major field and at least 6 credits in a minor or related field; the balance of coursework is determined by agreement between the student and adviser. Plan B also requires two papers of publishable quality; one paper must include a research component with an analysis of data.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students
Majoring in Other Fields—A master’s minor requires 6 credits in program courses, which is determined in consultation with the director of graduate studies.

Ph.D. Degree Requirements
The Ph.D. requires 34 credits in the major, 12 credits in a minor or supporting program, and 24 thesis credits. Two preliminary written exams are required: one concentrates on research design, methodological issues, and statistical analysis, the other on material specific to the student’s chosen track. Students must also pass a preliminary oral exam.

Language Requirements—None.

Minor Requirements for Students
Majoring in Other Fields—A doctoral minor requires a minimum of 12 credits in program courses determined in consultation with the director of graduate studies.

Social and Philosophic Studies of Education

Minor Only
Contact Information—Department of Educational Policy and Administration, University of Minnesota, 330 Wulling Hall, 86 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-1006; fax 612-624-3377; <http://education.umn.edu/edpa/>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor
John J. Cogan, Educational Policy and Administration, M
Darrell R. Lewis, Educational Policy and Administration, M
Josef A. Mestenhauser (emeritus), Educational Policy and Administration, AM
R. Michael Paige, Educational Policy and Administration, M
Karen Rose Seashore, Educational Policy and Administration, M

Associate Professor
Arthur M. Harkins, Educational Policy and Administration, M
Jean A. King, Educational Policy and Administration, M

Lecturer
Richard Nunneley, Educational Policy and Administration, AM

Curriculum—The graduate minor provides a multidisciplinary foundation for the study of education from the perspectives of history, philosophy, and the social sciences. The minor program is shaped to suit the particular needs and interests of the student at either the master’s or doctoral level. In consultation with a faculty member in social and philosophic studies of education in the Department of Educational Policy and Administration (EdPA), 5xxx and 8xxx courses are selected both in EdPA and in related fields.

Prerequisites for Admission—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. Interested students should consult with a faculty member in social and philosophic studies of education in the Department of Educational Policy and Administration to develop a proposed course of study.

Special Application Requirements—The director of graduate studies in the Department of Educational Policy and Administration must approve the applicant’s proposed course of study by signing the student’s degree program form.

Courses—Please contact the minor program office for information on relevant coursework.

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

Minor Only Requirements
M.A. students must complete at least 9 graduate credits (at least one course each) in the two areas of study below. Doctoral students must complete at least 12 graduate credits (at least two courses each) in the two areas of study.

Area I—history and philosophy of education: EdPA 5021, 5023, 5024, 5028, 5032, Phil 4324, WoSt 5103.

Area II—social sciences and education: EdPA 5041, 5044, 5103, 5128, 5302, 5352, 8104.

Social Work

Contact Information—School of Social Work, University of Minnesota, 105 Peters Hall, 1404 Gortner Avenue, St. Paul, MN 55108 (612-625-1220 or 1-800-779-8636; fax 612-624-3744; <irenard@che.umn.edu; <http://sws.che.umn.edu/>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor
Michael Baizerman, SM
Jerome Beker, SM
Neil F. Bracht (emeritus), ASM
Jeffrey L. Edleson, SM
Jane F. Gilgun, SM
Clifton D. Hollister, SM
Rosalie A. Kane, Public Health, SM

Helen Q. Kivnick, SM
David J. Klaassen, AM
Dario Menanteau-Horta, SM
Susan S. Meyers, M2
Jean K. Quam, SM
Ronald H. Rooney, SM
Mark S. Umbreit, SM
Esther Wattenberg (emeritus), ASM
Susan Wells, SM
Oliver J. Williams, SM

Associate Professor
Sandra Beeman, SM
William Bradshaw, SM
Irl E. Carter (emeritus), SM
Linda E. Jones, SM
James R. Reinardy, SM
Edward Taylor, M2

Assistant Professor
Laura Abrams, M2
Mark G. Frenzel, AM
Priscilla Gibson, M2
Elizabeth Lightfoot, M2
Yat-Sang (Terry) Lum, M2
Ronald L. Pitzer, M2

Instructor
Eileen Arnold, M2

Other
Kevin John Burke, M2
Sonia Davila-Williams, M2
Trude D. Hendrickson, M2
Nancy J. Johnston, M2
Nan L. Kalke, M2
Glenda M. McGee, M2
Janelle Rae Miedema, M2
Megan H. Morrissey, M2
Maura Sullivan, M2
Victoria Van Slyke, M2
Mary Weeks, M2

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

Curriculum—The M.S.W. prepares students for advanced social work practice. A 50-credit program and a 34-credit advanced standing program are available. Concentrations in the master’s program include practice in direct practice and community practice.

The School of Social Work and the Humphrey Institute of Public Affairs offer two dual master’s degrees: the master of social work/master of public policy (M.S.W./M.P.P.), and the master of social work/master of urban and regional planning (M.S.W./M.U.R.P.). Dual degree students generally take coursework in each department for the first two years, and in the third year, take courses concurrently in two departments, facilitating the integration of content from both fields. Students may apply some credits taken in the dual degree programs toward requirements in both departments. Each dual degree option is a minimum sequence of three years of full-time study. Students who choose an M.S.W. concentration in direct practice will need longer than six semesters to complete both programs. Students may begin their studies in either program.

A dual master of social work/master of public health (M.S.W./M.P.H.) is offered with the School of Public Health. The M.S.W./M.P.H. degree provides exposure to a blend
of course offerings in biometry, community health education, environmental health, epidemiology, health services administration, maternal and child health, and public health nutrition. The purpose of this degree is to educate and prepare professional public health social workers that are competent in the practice of professional social work with the additional outlook, skills, and expertise of public health. Students are able to complete the requirements for both degrees in approximately six to eight academic semesters or less, depending upon the number of credits carried each semester. The Ph.D. program prepares students to provide intellectual leadership for the social work profession through advanced levels of scholarship, research, theory development, and policy analysis. Students are expected to acquire skill in research design and statistics and to develop a comprehensive knowledge of social work and social welfare history, theory, and policy.

The Ph.D. program does not focus on the development of advanced skills for clinical practice, although students gain knowledge of practice theory and research related to social work practice is encouraged. Many graduates assume positions as university faculty. Consequently, the program offers opportunities for students to acquire skills in teaching and curriculum development.

Prerequisites for Admission—Applicants to the MSW program must have a background in the liberal arts including completion of 26 semester credits or 39 quarter credits in the social sciences, e.g., sociology, political science, economics, psychology, history, and anthropology, and a college-level course in statistics. A college-level biology course with content on human anatomical and physiological development is also required. Please contact the School of Social Work about possible changes to this requirement. One year of paid or volunteer experience in the social services is required of all applicants. Doctoral applicants must meet the requirements and standards set by the Graduate School and the School of Social Work. It is preferred that applicants have earned the master’s degree in social work from a school of social work accredited by the Council on Social Work Education; however, applicants with a master’s degree in a closely related discipline will be considered for admission. Preference is also given to candidates with at least two years of post-M.S.W. practice experience. Candidates for the Ph.D. program who do not have an M.S.W. may be required to take several master’s level foundation courses.

Special Application Requirements—Three letters of recommendation, a complete set of transcripts (in addition to that required by the Graduate School), an example of academic or scholarly writing, a personal statement, and a department application form are required of all applicants. GRE scores are not required for admission to the master’s program, but are required if the applicant wishes to be considered for a Graduate School Fellowship and from applicants who do not have an official grade point average from their undergraduate degree. GRE scores are required for admission to the doctoral program. The application deadline for both degrees is January 8. The Ph.D. program has a March 5 deadline for the second review. Beginning students in either program are admitted fall semester only.

Courses—Please refer to Social Work (SW) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted with director of graduate studies approval.

M.S.W. Coursework Only Degree Requirements
The M.S.W. requires 50 credits; a 34-credit advanced standing program is available to graduates of undergraduate social work programs accredited by the Council on Social Work Education. All credits for the M.S.W. must be completed within seven years of the date of the earliest coursework taken for the degree.

The 50-credit program includes a set of required foundation courses (25 credits), courses from a selected concentration, two field internships, and social work electives. A maximum of 24 credits may be transferred from the following sources with School of Social Work approval: up to 8 credits as a non-degree seeking student registered for graduate credit at the University of Minnesota; up to 24 credits from another regionally and professionally accredited school of social work if the student was registered as a graduate student in the program.

The 34-credit advanced standing program includes courses from a selected concentration, one field internship, and social work electives. A maximum of 16 credits may be transferred from the following sources with School of Social Work approval: 16 credits completed as a graduate student in another accredited M.S.W. program; up to 6 credits as a non-degree seeking student registered for graduate credit at the University of Minnesota.

Language Requirements—None.

Final Exam—None.

Ph.D. Degree Requirements
The Ph.D. program emphasizes mastery of student-determined and program-determined objectives rather than an accumulation of course credits. Degree requirements vary according to background and educational goals. Typically 40 credits plus 24 required thesis credits beyond the M.S.W. are required. Required courses include core seminars in social work research, social welfare history, social welfare policy, and theory and model development; a social work teaching course; a supervised research practicum and practicum seminar; supporting program courses; statistics courses. Students must also have teaching experience in the School of Social Work while in the program and fulfill the computer skills requirement.

Language Requirements—None.

Sociology
Contact Information—Graduate Program Assistant, Department of Sociology, University of Minnesota, 909 Social Sciences Building, 267 19th Avenue S., Minneapolis, MN 55455 (612-624-2093; fax 612-624-7020; socdept@atlas.socsci.umn.edu).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Regents Professor
Joanne B. Eicher, Design, Housing, and Apparel, AM2

Professor
Ronald R. Aminzade, SM
Ronald E. Anderson, SM
John Arthur, Sociology-Anthropology, Duluth, AM2
Barry C. Feld, Law School, AM2
David Knoke, SM
Candace M. Kruttschnitt, SM
Theodor J. Litman, Health Care Management, ASM
Carl P. Malmquist, SM
Dario Manenteau-Horta, Social Work, AM2
Phyllis Moen, SM
Jeylan T. Mortimer, SM
Joel I. Nelson, SM
Steven Ruggles, History, AM2
Joel B. Samaha, AM2
Karen R. Seashore, Educational Policy and Administration, AM2
Mark Snyder, Psychology, AM2
Robin S. Stryker, SM

Associate Professor
Elizabeth H. Boyle, M2
Rose M. Brewer, African American and African Studies, AM2
Jeffrey P. Broadbent, SM
Kathleen T. Call, Public Health, AM2
Penny A. Edgell, SM
Scott R. Eliason, SM
Michael David Finch, AM2
Douglas Hartmann, M2
Jennifer L. Pierce, ASM
Joachim J. Savelberg, SM
Christopher Uggen, SM

Assistant Professor
Joseph Gerteis, M2
Ann M. Hirohaka, M2
Kathleen E. Hull, M2
Walt Jacobs, AM2
Erlin L. Kelly, M2
Karo L. Lutley, M2
Ian R. Macmillan, M2
Jeffrey Robert Maahs, AM
Evan A. Schofer, M2
John R. Warren, M2

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

Curriculum—Sociology is concerned with the study of human societies, groups, and social life. The program offers substantive training in five areas of specialization: family and life course; inequality—race, class, and gender law; crime, and deviance; organizations, work, and markets; political sociology and social movements. Methodological training is available in historical and comparative research, survey
research, network analysis, advanced statistical analysis, and qualitative research. Training for students interested in both academic and applied employment is generally available.

**Prerequisites for Admission**—A background in basic sociology, usually consisting of the equivalent of 18 credits in undergraduate work, including 9 credits of social science statistical methods, or an M.A. degree in sociology or a closely related field is recommended. Individuals who have completed fewer than 18 credits may be admitted but are generally required to complete background coursework in theory and statistics during their first year of residence.

**Special Application Requirements**—Applicants are evaluated on their general academic potential, commitment to the field, creativity, and potential for contribution to the field. In addition to the Graduate School application, applicants must submit the following: GRE scores; a complete set of transcripts in addition to that required by the Graduate School; an application for departmental support (if desired); a sample of written work, usually a term paper, written in English; three letters of recommendation; and a statement of professional objectives. The department accepts new students for fall admission only. The final application deadline for admittance and financial aid is December 1. For maximum fellowship support, the final application deadline is January 1.

**Courses**—Please refer to Sociology (Soc) in the course section of this catalog for courses pertaining to the program.

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

**M.A. Degree Requirements**

Students are admitted only for the Ph.D.; the M.A. is an optional degree for students in the doctoral program.

Students take four required courses or their equivalent (13 credits) and two additional substantive courses in sociology (6 credits). Substantive courses are chosen in consultation with the adviser and program committee to meet the student’s educational and professional goals. Students must also complete a minimum of 6 credits in a minor or related field. Plan B students submit two papers, at least one of which is empirical. Plan A requires 10 thesis credits.

**Language Requirements**—None.

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

**Ph.D. Degree Requirements**
The doctoral program is for students planning to do research or teach.

Students take four required courses or their equivalent (13 credits), including a course on professional skills development. Beyond that, each student’s program is individually planned in consultation with the adviser and program committee to meet both the student’s goals and broad program requirements. Those requirements include four substantive courses in sociology (12-credit minimum) and at least one semester of training in advanced methods (3-credit minimum). Students must also complete a minimum of 12 credits in a minor or supporting program and 24 thesis credits. Students who enter the program with an M.A. in sociology must earn a minimum of 18 credits in the department regardless of the number of courses for which they have petitioned equivalents from other institutions.

**Language Requirements**—Coursework in a foreign language may be used as outside coursework for those students who plan research in comparative sociology.

**Minor Requirements for Students Majoring in Other Fields**—A doctoral minor requires four courses in sociology, at least one of which is 8xxx. Course choices are subject to the approval of the director of graduate studies.

**Software Engineering**

**Contact Information**—Software Engineering Graduate Program, Center for the Development of Technological Leadership, University of Minnesota, 510 West Bank Office Building, 1300 S. Second Street, Minneapolis, MN 55454-1082 (612-624-5747; fax 612-624-7510; degrees@cdtl.umn.edu; <www.cdtl.umn.edu>.)

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

**Professor**

Shashi Shekhar, M2
Jaideep Srivastava, M2

**Associate Professor**

John V. Carlis, M2
Mats P. E. Heimdahl, M2
Joseph A. Konstan, M2

**Assistant Professor**

John E. Collins, M2
Richard M. Voyles, AM2

**Instructor**

Neil A. Bitzenhofer, AM2
Michael Calvo, AM2
Jesse D. Freese, AM2
Richard Hedger, AM2
Stephen Kan, AM2
John Kruse, AM2
Kevin Larsen, AM2
Elizabeth M. Sisley, AM2
Michael W. Wold, AM2

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

**Curriculum**—The master of science in software engineering (M.S.S.E.) provides a thorough understanding of the fundamental issues related to software development and the software development process. It fosters an awareness of the problems and opportunities associated with software-intensive systems, and explains the methods for quickly evaluating, adopting, and taking advantage of emerging technologies. This program introduces emerging technologies and their applications and lays the foundation for lifelong learning and professional development in a rapidly changing field. The M.S.S.E. is an interdisciplinary program administered jointly by the Institute of Technology’s Center for the Development of Technological Leadership and the Department of Computer Science and Engineering.

The program is offered in a format designed for full-time working professionals. Students take courses one day per week (alternating Fridays and Saturdays) and move through the curriculum as a cohort, taking all classes together for the first three semesters.

**Prerequisites for Admission**—Prospective students should have an undergraduate degree in computer science or a closely related field and a minimum of one year of professional experience working in the software industry. Students with degrees in other fields may be considered for admission based on extensive industrial experience.

**Courses**—Please refer to Software Engineering (SEng) in the course section of this catalog for courses pertaining to the program.

**Use of 4xxx Courses**—Use of 4xxx courses toward degree requirements is subject to adviser and/or director of graduate studies approval.

**M.S.S.E. Plan B Degree Requirements**
The M.S.S.E. requires 30 credits, including 27 credits of regular coursework and 3 credits for the Plan B project. Students take seven core courses, two or three industrial seminar courses, two or three elective courses, and a capstone course (Plan B project) where students undertake a challenging project.

**Language Requirements**—None.

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

**Soil Science**

**Contact Information**—Director of Graduate Studies, Department of Soil, Water, and Climate, University of Minnesota, 439 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108 (612-625-1244; fax 612-625-2208; dxs@soils.umn.edu; <www.soils.umn.edu>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

**Professor**

Deborah L. Allan, SM
James L. Anderson, SM
Jay C. Bell, SM
Paul R. Bloom, SM
Terence H. Cooper, SM
Peter H. Graham, SM
Satis Ch. Gupta, SM
Thomas Halbach, SM
John A. Lamb, SM
Gary L. Malzer, SM
Jean-Alex E. Molina, SM
John F. Moncrief, SM
David J. Mull, SM
Edward A. Nater, SM
Gyles W. Randall, SM
Degree Programs and Faculty

George W. Rehm, SM  
Pierre C. Robert, SM  
Carl Rosen, SM  
Michael J. Sadowsky, SM  
Michael A. Schmitt, SM  
Mark W. Seeley, SM

**Adjunct Professor**  
John M. Baker, SM  
Charles E. Clapp, SM  
William C. Koskinen, SM  
Donald C. Reicosky, AM2  
Michael F. Russell, SM

**Associate Professor**  
Albert L. Sims, M2  
Dong Wang, SM

**Assistant Professor**  
Timothy J. Wiggs, M2  
Neil Hansen, SM  
Jennifer Y. King, M2  
Jeffrey S. Strock, M2

**Adjunct Assistant Professor**  
Jane Johnson, AM2  
Randall Kolka, AM2  
Robert Mahaga, AM2  
Pamela J. Rice, AM2  
Rodney T. Ventura, AM2

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

**Curriculum**—The program offers two concentrations: soil science and climatology. This multidisciplinary program encompasses aspects of chemistry, physics, biology, atmospheric sciences, and geology. The discipline is divided into five subdisciplines: climatology, soil chemistry/fertility, soil classification/genesis, soil microbiology/ biochemistry, and soil physics. The soil science concentration focuses on the study of soil as it applies to environmental and agricultural issues. The climatology concentration focuses on the interdisciplinary study of earth-atmosphere interactions as well as climate variability as it applies to environmental and agricultural issues. This concentration requires competence in both atmospheric sciences and related areas of soil science. The minor, supporting, or related fields area is usually selected from some allied field such as agronomy, botany, chemistry, microbiology, biochemistry, physics, geology, economics, forestry, agricultural engineering, or atmospheric science.

**Prerequisites for Admission**—The academic background normally required includes standard courses in college physics, chemistry, geology, microbiology, and mathematics, including one course in calculus, and an introductory course in soil science. For agricultural climatology, additional courses in mathematics, physics, meteorology, and engineering may be substituted. Candidates for the Ph.D. degree are normally required to have completed an acceptable master’s degree thesis.

**Special Application Requirements**—A statement of career goals and three letters of recommendation evaluating the applicant’s potential for graduate study should accompany applications to both the M.S. and Ph.D. programs. Submission of GRE scores is required of all native English speakers and is strongly recommended for nonnative speakers (in addition to the TOEFL requirement); students whose native language is not English are expected to have ranked in the top 20 percent of their class. Students may be admitted in any semester.

Program-specific requirements and procedures for electronic application for admittance to the soil science graduate program are listed and updated on the department’s Web site at <www.soils.umn.edu>.

**Courses**—Please refer to Soil Science (Soil) in the course section of this catalog for courses pertaining to the program or to the department Web site for an updated list of courses.

**Use of 4xxx Courses**—Use of 4xxx courses is permitted toward degree requirements with adviser and/or director of graduate studies approval.

**M.S. Degree Requirements**

All M.S. students must complete a minimum of 30 credits: 14 credits in the major area, one seminar (1 credit) teaching experience, and a minimum of 6 credits in a minor or related field. Plan A students must take a minimum of 10 thesis credits: Plan B students must complete a Plan B paper and fulfill the 30 credit minimum by taking 10 credits of coursework or a special project to replace the 10 thesis credits. Plan A students in the soil science concentration must take three or more courses in climatology or atmospheric sciences (approved by the student’s advisory committee) and two of the four core courses in soil science. Plan B students in the soil science concentration must take all four core courses in soil science. Plan B students in the climatology concentration must take three or more courses in climatology or atmospheric sciences (approved by the student’s advisory committee) and two of the four core courses in soil science.

**Language Requirements**—None.

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

**Minor Requirements for Students Majoring in Other Fields**—Students may minor in soil science with the approval of the director of graduate studies and under the direction of a soil science graduate faculty member serving as the minor adviser. The master’s minor requires completion of a minimum of three of the four core area courses in soil science, a seminar, and teaching experience.

**South Asian Languages**

See Asian Languages and Literatures.

**Spanish**

See Hispanic and Luso-Brazilian Literatures and Linguistics.

**Special Education**

See Educational Psychology.

**Statistics**

**Contact Information**—School of Statistics, University of Minnesota, 313 Ford Hall, 224 Church Street S.E., Minneapolis, MN 55455 (612-625-8046; fax 612-624-8868; info@stat.umn.edu).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

**Professor**  
Christopher Bingham, SM  
R. Dennis Cook, SM  
James M. Dickey, SM  
Morris L. Eaton, SM  
Seymour Geisser, SM  
Charles J. Geyer, SM  
Douglas M. Hawkins, SM  
Glen D. Meeden, SM  
Christopher J. Nachtsheim, Operations and Management Science, SM  
Gary W. Oehlert, SM  
Ronald R. Regal, Mathematics and Statistics, Duluth, SM  
William D. Sudderth, SM  
Sanford Weisberg, SM

**Associate Professor**  
Brigit Grund, SM  
Frank B. Martin, SM  
Peihsia Qiu, SM

**Assistant Professor**  
Singhanus Chatterjee, M2  
Tiefeng Jiang, M2  
Galin Jones, M2

Along with the program-specific requirements listed below, please read the General Information section of this catalog for Graduate School requirements that apply to all major fields.
Curriculum—The School of Statistics is the primary venue at the University for research, teaching, and dissemination of the theory, methodology, and applications of statistical procedures. Students may specialize in any area of statistics or probability. The core program for all students has strong components of both theoretical and applied statistics.

Prerequisites for Admission—Applicants to the master’s program must be familiar with basic statistical concepts and methods, and with mathematics through multivariable calculus and linear algebra. Applicants to the doctoral program must, in addition to the above, be familiar with the elements of real analysis.

Special Application Requirements—Two letters of recommendation are required. Applicants for financial support (assistantships) must submit scores from the GRE General Test; other applicants are encouraged to submit GRE scores. Applicants whose native language is not English must submit a TOEFL score of at least 223 (or equivalent IELTS or MELAB); those applying for assistantships must score at least 250. Applicants can be considered for admission at any time, but it is strongly recommended that all new students begin their coursework in the fall semester. Those applying for assistantships should have their applications completed by January 10. Financial support is usually available only to those beginning in the fall semester.

Courses—Please refer to Statistics (Stat) in the course section of this catalog for courses pertaining to the program.

Use of 4XXX Courses—Certain 4XXX courses from other departments may be used to meet degree requirements with the approval of the director of graduate studies.

M.S. Plan B Degree Requirements
The program prepares students for jobs in industry and the public sector and also for study at the doctoral level. During the first year, students take a two-semester theory sequence and a two-semester methods sequence. In addition, they usually take two courses from other departments. During the second year, students take an additional 9 credits of approved 5XXX or 8XXX statistics courses; some of this requirement can be satisfied by taking approved courses with heavy statistical content from other departments. Students also take a 3-credit statistical consulting course and complete their Plan B project. A total of 30 course credits is required. A written preliminary examination is usually taken at the beginning of the second year.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students

Majoring in Other Fields—A master’s minor requires at least 9 credits of 5XXX or 8XXX statistics courses. Stat 4101-4102 may be used to satisfy this requirement.

Ph.D. Degree Requirements
Students entering the program with a bachelor’s degree must take 60 course credits; students entering with a master’s degree must take 43 credits; 24 thesis credits are also required. Students take 41 credits in core courses (27 in statistics, 14 in mathematics), an additional 18 credits of approved 8XXX statistics courses (some of which can be satisfied by taking approved courses with heavy statistical content from other departments), and a 3-credit statistical consulting course.

Language Requirements—None.

Minor Requirements for Students

Majoring in Other Fields—A doctoral minor requires a theory sequence (Stat 4101-4102 or Stat 5101-5102) and familiarity with various statistical methods. Typical programs include 14 to 18 credits of graduate-level statistical courses. Please note: Stat 4101 and 4102 are available to graduate students from other programs, but not to statistics majors.

Studies in Africa and the African Diaspora

Minor Only

Contact Information—Department of African American and African Studies, University of Minnesota, 808 Social Sciences Building, 267 19th Avenue S., Minneapolis, MN 55455 (612-624-9847; fax 612-624-9383).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Adjunct Regents Professor
Joanne B. Echer, Design, Housing, and Apparel, AM

Adjunct Professor
August H. Nimtz, Jr., Political Science, AM
Earl P. Scott, Geography, M
Samuel Myers, Public Affairs, AM

Associate Professor
Keleto E. Akins, African American and African Studies, M
Rose M. Brewer, African American and African Studies, M
John S. Wright, African American and African Studies, M

Adjunct Associate Professor
Louis R. Bellamy, Theatre Arts, AM
Gloria Williams, Design Housing, and Apparel, AM
Kirt H. Wilson, Communication Studies, AM

Assistant Professor
Pearl Barner II, African American and African Studies, M
Victoria B. Coifman, African American and African Studies, M
Charles Ben Pikes, African American and African Studies, M
Keith A. Mayes, African American and African Studies, M

Adjunct Assistant Professor
Roderick Ferguson, American Studies, AM
Ptscilla Gibson, Women’s Studies, AM
Gwendolyn Pough, Women’s Studies, AM
Michele Wagner, History, AM

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

Curriculum—This interdisciplinary graduate minor is administered through the Department of African American and African Studies. The minor program gives students from a variety of disciplines a structured graduate curriculum that offers a systematic understanding of the contemporary and historical experiences of peoples of Africa and of African descent. It is organized around a group of core seminars and focuses on two broad areas: the humanities and the arts, and the social and behavioral sciences.

Prerequisites for Admission—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School.

Special Application Requirements—Students must complete an application form by the end of spring semester to be considered for acceptance for the following academic year. It is expected that no more than 15 students will be admitted to this minor each year. An undergraduate major or minor in African American and/or African studies is not required for admission to the program, but students are expected to have had sufficient background to begin graduate level study.

Courses—Please refer to African American and African Studies (Afro) in the course section of this catalog for courses pertaining to the program.

Use of 4XXX Courses—Use of 4XXX courses towards degree requirements is subject to adviser and/or director of graduate studies approval.

Minor Only Requirements
Students develop their program in consultation with the director of graduate studies in studies in Africa and the African diaspora and in their major. All courses must be outside the student’s major field of study.

The master’s minor requires a minimum of 9 graduate credits, including the seminar Afro 5101—Studies in Africa and the African Diaspora. Remaining courses are selected from one of the following two areas: 1) humanities and the arts or 2) behavioral and social sciences.

The doctoral minor requires a minimum of 15 graduate credits, including the seminar Afro 5101—Studies in Africa and the African Diaspora. Students take one additional seminar that focuses on the study of Africa and peoples of African descent. Remaining courses are selected from one of the two areas listed above.
## Studies of Science and Technology

### Minor Only

**Contact Information**—Director of Graduate Studies, Studies of Science and Technology, University of Minnesota, 746 Heller Hall, 271 19th Ave. S., Minneapolis, MN 55455; (612-625-6635; fax 612-626-8380; mcps@umn.edu; <www.sst.umn.edu>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

**Professor**

John H. Beatty, Ecology, Evolution, and Behavior, M
John M. Eylar, History of Medicine, M
Ronald N. Giere, Philosophy, M
Alan G. Gross, Rhetoric, M
Keith Gunderson, Philosophy, M
William H. Hanson, Philosophy, M
Geoffrey Hellman, Philosophy, M
Jeffrey P. Kahn, Bioethics, M
Kenneth H. Keller, Center for Science, Technology, Public Affairs, M
Sally G. Kohlstedt, Geology and Geophysics, M
Helen E. Longino, Women’s Studies, Philosophy, M
Arthur L. Norberg, Computer Science, M
C. Wade Savage, Philosophy, M
Naomi Scheman, Philosophy, M
Robert W. Seidel, Charles Babbage Institute, M
Alan E. Shapiro, Physics, M

**Visiting Professor**

Evelyn Fox Keller, Center for Philosophy of Science, M

**Associate Professor**

Bruce P. Braun, Geography, M
Carl Elliott, Bioethics, M
Fred N. Finley, Curriculum and Instruction, M
Laura J. Gurak, Rhetoric, M
Michael D. Root, Philosophy, M
C. Kenneth Waters, Philosophy, M

**Assistant Professor**

Jennifer K. Alexander, Mechanical Engineering, M
Jennifer Lee Gunn, History of Medicine, M
Michel H. Janssen, History of Science and Technology, M
Jean M. Langford, Anthropology, M
Hiromi Mizuno, History, M
Daniel J. Philippin, Rhetoric, M
John B. Shank, History, M
Karen Sue Taussig, Anthropology, M

**Curriculum**—Studies of science and technology (SST) deals with a rapidly expanding field that seeks to understand the conceptual foundations, historical development, and social context of science and technology. SST faculty are drawn from a number of research and teaching units dedicated in whole or in part to the history and philosophy of science and technology. The SST minor is for students from any major who want to gain a deeper understanding of the nature and development of science and technology.

The SST minor provides introductory core courses in historiography and philosophy of science, followed by research seminars and other elective courses in four main research areas: models, theories, and reality; physical science; biological and biomedical sciences; and science, technology, and society. Seminar topics vary yearly depending on faculty and student interest.

### Prerequisites for Admission

Admission is contingent upon prior admission to a master's or doctoral degree-granting program within the Graduate School and is by permission of the director of graduate studies in SST.

**Special Application Requirements**—Prospective students should contact director of graduate studies.

**Courses**—Please refer to Studies of Science and Technology (SST) in the course section of this catalog for courses pertaining to the program.

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

### Minor Only Requirements

A master’s minor requires 7 graduate credits and a doctoral minor requires 12 graduate credits. Both minors must include HSci 8111; one of either Phil 8601, 8602, or 8605; and SST 8000 Colloquium (one semester for master’s, two for doctoral students). Doctoral students must also take one of the SST seminars (SST 8100, 8200, 8300, 8400, or 8420) in an area primarily outside the student’s major.

**Language Requirements**—None.

### Studio Arts

See Art.

### Surgery

**Contact Information**—Department of Surgery, University of Minnesota, 420 Delaware Street S.E., MMC 195, Minneapolis, MN 55455 (612-626-2590; surgwww@umn.edu).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

**Professor**

Rodrick A. Barke, SM
R. Morton Botnen, SM
Henry Buchwald, SM
Frank B. Cerra, SM
Bruce L. Cunningham, M2
Agustin P. Dalmasso, SM
David L. Dunn, SM
William C. Engeland, SM
John E. Foker, SM
Rainer W. G. Gruessner, M2
Mark Lyte, ASM
Michael A. Maddaus, M2
Arthur J. Matas, SM
J. Ernesto Molina, M2
William D. Payne, M2
David A. Rothenberger, M2
Sara J. Shumway, M2
William C. Engeland, SM
Herbert B. Ward, M2

**Clinical Professor**

Arnold S. Leonard, SM
John S. Najarian, SM

**Associate Professor**

Jerome H. Abrams, M2
Gregory J. Beilman, M2
David N. Cornfield, M2
Angelika C. Gruessner, M2
Steven M. Santilli, M2

**Assistant Professor**

Bernhard J. Herzig, M2
Brett K. Lavay-Young, M2
Timothy D. Siefert, SM
Karen R. Wasiluk, SM

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

**Curriculum**—The general surgery program trains medical doctors for the practice of surgery and for academic positions. See the Medical School for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in laboratory research, either in a basic science or in surgery, after which they begin their senior residency and chief residency training. The Medical School’s laboratory departments offer many graduate courses closely related to surgery (see the graduate programs in anatomy; biochemistry, molecular biology and biophysics; cellular and integrative physiology: microbiology, immunology, and molecular pathobiology; and pharmacology). These fields also offer opportunities for research work. The Department of Surgery offers supervised work in its experimental research laboratories, as well as in its hospital and outpatient departments, in the areas of surgical diagnosis and operative surgery and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery).

### Prerequisites for Admission

Prospective students must be in the general surgery training program and have 2-3 clinical years of training completed.

**Courses**—Please refer to Surgery (Surg) in the course section of this catalog for courses pertaining to the program.

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

**M.S. Surg. Plan A Degree Requirements**

The M.S. Surg. is offered Plan A only. Students spend two to three years in the Medical School’s general surgery program. A minimum of 53 course credits (47 in the major plus 6 in the minor or related fields) plus 10 thesis credits are required for a total of 63 credits.

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

**Language Requirements**—None.

**Ph.D. Surg. Degree Requirements**

Students spend two to three years in the Medical School’s general surgery program. A minimum of 79 course credits (67 in the major plus 12 to 16 in the minor or supporting program) is required; 24 thesis credits are also required.

**Language Requirements**—None.
Sustainable Agriculture Systems
Minor Only

Contact Information—Director of Graduate Studies, Sustainable Agriculture Systems Minor, Minnesota Institute for Sustainable Agriculture, University of Minnesota, 411 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108 (612-625-8235; fax 612-625-1268; jordao200@umn.edu).

For up-to-date graduate faculty listings, see www.umn.edu/faculty_rosters/step1.asp. For additional information, contact Professor Paul Mielke, M.S., Ph.D., 612-625-8235; fax 612-625-1268; mielke0500@umn.edu.

Professor
David A. Andow, Entomology, M
David D. Biesboer, Plant Biology, M
Vernon B. Cardwell, Agronomy and Plant Genetics, M
Iris D. Charvat, Plant Biology, M
Sharon M. Danes, Family Social Science, M
Ruth Dill-Macky, M
Peter H. Graham, Soil, Water, and Climate, M
Jeffrey Lynn Gunnsolus, Agronomy and Plant Genetics, M
Emily E. Hoover, Horticultural Science, M
Nicholas R. Jordan, Agronomy and Plant Genetics, M
Robert Philip King, Applied Economics, M
Richard A. Levens, Applied Economics, M
Albert H. Markhart III, Horticultural Science, M
Jean-Alex E. Molina, Soil, Water, and Climate, M
Roger D. Moon, Agriculture Extension, M
Kent D. Olson, Applied Economics, M
James H. Orf, Agronomy and Plant Genetics, M
Edward B. Radcliffe, Entomology, M
Paul C. Robertson, Forest Resources, M
Michael P. Russelle, M
Craig C. Sheaffer, Agronomy and Plant Genetics, M
John M. Shuttske, Biosystems and Agricultural Engineering, M
Steve R. Simmons, Agronomy and Plant Genetics, M
William F. Wilcke, Biosystems and Agricultural Engineering, M
Donald Wyse, Agronomy and Plant Genetics, M

Associate Professor
Deborah L. Allant, Soil, Water, and Climate, M
John Deen, Clinical and Population Science, M
Craig A. Hassel, Food Science and Nutrition, M
Paul Porter, Agronomy and Plant Genetics, M

Assistant Professor
Susan M. Galatowitsch, Horticultural Science, M
Jeffrey H. Gillman, Horticultural Science, M
Kristen C. Nelson, Forest Resources, M

Adjunct Assistant Professor
Helene Murray, Agronomy and Plant Genetics, M

Fellow
Carl Vincent Phillips, M

Curriculum—The minor in sustainable agriculture systems offers master’s (M.A. and M.S.) and doctoral students an interdisciplinary curriculum that considers the biological, sociological, and economic aspects of agriculture. The minor emphasizes a holistic perspective to designing farming and food systems and solving problems in agriculture. The importance of yield and profitability are balanced by considerations of the environment and the health and social well-being of producers, consumers, and communities. The minor complements major programs in ecology, conservation biology, forestry, sociology, geography, political science, and public affairs, as well as majors in the College of Agricultural, Food and Environmental Sciences.

Prerequisites for Admission—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School.

Special Application Requirements—Contact the director of graduate studies in sustainable agriculture systems for an Intent to Enroll form. Students are admitted each semester.

Courses—Please refer to Sustainable Agriculture Systems (SAgr) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—4xxx courses are permitted toward minor requirements based on director of graduate studies approval.

Minor Only Requirements
The master’s minor requires 6 graduate credits from the core curriculum; the doctoral minor requires 12 graduate credits. All students must take SAgr 8010 and 8020. The other core course is Agri 5321—Ecology of Agricultural Systems (cross listed with Ent 5321). A unique component of the minor is an on-site internship with growers, grassroots organizations, or public agencies working in sustainable agriculture.

Theatre Arts

Contact Information—Department of Theatre Arts and Dance, University of Minnesota, 580 Rarig Center, 330 21st Avenue S., Minneapolis, MN 55455 (612-625-5029; fax 612-625-6334; theatre@umn.edu; http://claw.umn.edu/theatre/).

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

Professor
C. Lance Brockman, M2
Michal Kobialka, SM

Associate Professor
Louis R. Bellamy, M2
Maria Cheng, M2
Martin B. Gwinnup, M2
Stephen C. Kane, M2
Sonja Kafisic, M2
Mathew J. LeFebvre, M2
Margaret L. Maddux, M2
Jean A. Montgomery, M2
Elizabeth H. Nash, M2
Joan A. Smith, M2

Assistant Professor
Ananya Chatterjeea, M2
Aleksandra Wolska, M2

Adjunct Assistant Professor
Matthew D. Wagner, M2

Education Specialist
Brent "Mickey" Henry, M
Pearl Rea, M
Sherry L. Wagner, M

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

Curriculum—Theatre arts programs provide practical and theoretical education for the performer, artist, educator, scholar, and audience member. Training the historian, theorist, artist, and craftsperson is linked to and centered in the laboratory experience of live performance as well as in the academic classroom. The programs serve the dual roles of examining the various historical and contextual relationships of past and present theatre while educating audiences and theatre artists/educators of tomorrow. The programs prepare students for careers in professional or academic theatre and related artistic fields.

Prerequisites for Admission—Students are admitted for full semester only. The M.A./Ph.D. program and the M.F.A. design/technology program admit every year. The M.F.A. directing program currently admits every three years. Prerequisites for the initial screening phase of admission include a U.S. bachelor’s degree or comparable foreign degree from a recognized college or university, a minimum of 18 undergraduate credits or the equivalent in theatre arts, and a 3.00 GPA. Applicants for all degree programs must submit scores from the GRE by February 1. International students’ TOEFL scores must be submitted by January 15 (a paper score of 550 is considered the minimum for acceptance or 213 on the computer test).

The master’s degree is a prerequisite for admission to the Ph.D. program. Students without a master’s degree are admitted to the Ph.D. with the intention that the M.A. will be attained in route to the Ph.D. For admission to the M.A./Ph.D. or Ph.D. program, students must have a working knowledge/reading proficiency of at least one foreign language (or a sign language). A computer language will not satisfy this requirement.

Special Application Requirements—The application deadline for all degree programs is January 15. Applications received after that date will be considered only if there is an opening in the particular program. M.A./Ph.D. students wishing to have materials reviewed for the Graduate School Fellowship (for support of first-year students) must have materials submitted by January 5. All programs require a current résumé, statement of purpose/intent, and three letters of recommendation to accompany the departmental application.

The M.F.A. directing program requires an audition by invitation in Minneapolis in early March after an initial screening of application files. The directing program does not interview with URTA.

The M.F.A. design and technology program requires a portfolio review either through the Chicago URTA or by submitting materials to be received by February 1. The program also interviews by pre-arrangement during the annual USITT conference.

The M.A./Ph.D. program requires a submitted sample of research writing.
Courses—Please refer to Theatre Arts (Th) and Dance (Dnce) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Inclusion of 4xxx theatre and dance courses on degree program forms is subject to approval by the director of graduate studies. Such courses must be taught by a member of the graduate faculty. Students from other programs may include these courses with their own program’s approval.

M.A. Degree Requirements
The M.A. degree emphasizes academic pursuits and is considered a prerequisite for the Ph.D. The areas of study for the M.A./Ph.D. are theatre historiography, design and technical production, and directing (including management). Any of these may serve as a concentration of study, although the Ph.D. ordinarily focuses on the first. Candidates must complete coursework in both academic and performance areas.

For both Plan A and B, 30 credits are required from the following: three of the six sequence courses (8111-8116) plus 8102, totaling 12 credits; 3 credits from a course in performance conventions; 3 credits in independent seminar; 6 elective credits from inside or outside the department; 6 credits at the graduate level from outside the department (outside courses must be at least 3 credits each). For Plan A, 10 additional thesis credits (Th 8777) and an oral defense of the thesis are required. For Plan B, three papers are required.

Language Requirements—See the requirements for the Ph.D.

Final Exam—For Plan A, the final exam is written and oral. For Plan B, the final exam is written; an oral exam typically is not required, but one may be requested by the M.A. committee.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires a minimum of 9 credits as approved by the director of graduate studies.

M.F.A. Degree Requirements
The three-year, performance-oriented M.F.A. degree offers two areas of specialization: directing, and design and technical production. The M.F.A. in directing focuses on developing intellectual and artistic skills and leadership talent through an intensive course of study with an emphasis on performance. For the M.F.A. in design and technology, all areas of design are studied in order to increase understanding in specialization areas, and technology is studied as an essential part of design. Students are expected to achieve proficiency in at least two areas of any combination of design and technology (scenery/properties, costume, lighting, sound) and a level of expertise in at least one of these areas. Program faculty will work with students to identify the final areas for the degree. The M.F.A. degree is considered a terminal degree in these areas of theatre arts.

The M.F.A. requires 60 graduate credits, although a particular program’s requirements may exceed this minimum. The degree requires 6 credits of dramatic literature or theatre history, which may be fulfilled by Th 4177 and 4178; and a minimum of 6 credits from outside the department (at least 3 credits of which must be a University course that contributes substantially to the degree program). Each program requires a final performance practicum and written record of it. For specific program requirements, contact the director of graduate studies.

Language Requirements—None.

Final Exam—Students must take a final oral exam related to the final creative project and must submit a written record of the project and the research related to it.

Ph.D. Degree Requirements
The Ph.D. certifies that a degree recipient has a knowledge and understanding of theatre historiography and practice as well as pedagogical and professional strategies for communicating and applying that knowledge. The areas of study for the M.A./Ph.D. are theatre historiography, design and technical production, and directing (including management). Any of these may serve as a concentration of study, although the Ph.D. ordinarily focuses on the first. Candidates must complete coursework in both academic and performance areas.

The core curriculum, designed to help students finish the program within five years, consists of two parts: part I—coursework (three years); and part II—research and dissertation writing. The three years of coursework are tailored so that the first two years are structured, and the third year is more open, allowing students to pursue their individual areas of interest in more depth. Students are required to successfully complete six required courses over the three-year sequence: three courses must be in specific areas of theatre historiography, to be chosen from six seminars (Th 8111-6 sequence); historiography (Th 8102); a course in performance conventions; and an independent seminar in which students refine and materialize their work. This seminar, which can take the form of an independent study, directed reading/production, or a regular course format designed by the student and the adviser, usually takes place at the beginning of the third year. Students must also take coursework in a supporting program or a minor (12 credits); and 24 thesis credits, for a minimum total of 54 credits beyond the B.A. Topics courses and seminars supplement the core curriculum. Students must demonstrate a research technique appropriate to the thesis. This could take the form of a foreign language or a discipline research methodology which might increase the total number of credits required for the degree.

Language Requirements—Ph.D. students are expected to demonstrate proficiency in at least one foreign language as certified by the adviser or program faculty in the language.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires a minimum of 12 credits as approved by the director of graduate studies.

Theriogenology
See Veterinary Medicine.

Toxicology
Contact Information—Ken Wallace, Director of Graduate Studies, Toxicology Graduate Program, School of Medicine Duluth, 109 SMed, 1035 University Drive, Duluth, MN 55812 (218-726-7581; fax 218-726-6235; toxgrad@d.umn.edu) or V. F. Garry, Associate Director, Stone Laboratory, 421 29th Avenue S.E., Minneapolis, MN 55414 (612-627-4235; fax 612-627-4241).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor
Yusuf J. Abul-Hajj, Medicinal Chemistry, Pharmacognosy, SM
David R. Brown, Veterinary Pathobiology, SM
Robert M. Carlson, Chemistry, Duluth, SM
Lester R. Drewes, School of Medicine, Duluth, SM
Vincent F. Garry, Laboratory Medicine and Pathology, SM
Patrick E. Hanna, Medicinal Chemistry, Pharmacognosy, SM
Michael J. Murphy, Veterinary Diagnostic Medicine, SM
Herbert T. Nagasawa, Medicinal Chemistry, Pharmacognosy, SM
Gerald J. Niemi, Biology, Duluth, SM
Joseph R. Prohaska, School of Medicine, Duluth, SM
Jean F. L. Regal, School of Medicine, Duluth, SM
W. Thomas Sherer, Medicinal Chemistry, Pharmacognosy, SM
Sheldon B. Sparber, Pharmacology, SM
Kendall B. Wallace, School of Medicine, Duluth, SM

Associate Professor
Cecilia Giuliani, Chemistry, Duluth, SM
Lisa A. Peterson, School of Public Health, SM
Ashok K. Singh, Veterinary Diagnostic Medicine, SM

Adjunct Associate Professor
Gerald T. Ankley, Duluth, AM2
John L. Butenhoff, Duluth, AM2
Glenn G. Hardin, Veterinary Diagnostic Medicine, AM2
Herve N. Lebrec, Veterinary Diagnostic Medicine, AM2
John W. Nichols, Duluth, AM2
Robert R. Roy, Veterinary Diagnostic Medicine, AM2
Andrew M. Seacat, Veterinary Diagnostic Medicine, AM2
Robert S. Skoglund, Veterinary Diagnostic Medicine, AM2
Lawrence P. Wackett, Veterinary Diagnostic Medicine, AM2

Assistant Professor
Subhash C. Basak, School of Medicine, Duluth, AM2

Along with the program-specific requirements listed below, please read the General Information section of this catalog for Graduate School requirements that apply to all major fields.
Curriculum—This University-wide program provides comprehensive training in the broad scope of toxicology. Toxicology, the science of poisons, is devoted to identifying and quantifying potential noxious agents in our environment. Although most chemical agents at sufficiently large doses may be toxic, not all present a significant risk to human health, environmental organisms, or ecosystems. Accordingly, the essence of the science of toxicology is defining the line that distinguishes a risk from a residue. This requires scientific expertise in analytical and environmental chemistry, biology, and mathematics. Advanced courses and research are also available in subdisciplines such as human health risk assessment; epidemiology; environmental chemistry and engineering; ecotoxicology; food additives and nutritional toxicology; biochemical and physiological mechanisms; molecular toxicology and toxicogenomics; histopathology; diagnostic and analytical toxicology; drug metabolism; chemical carcinogenesis and reproductive toxicology; behavioral toxicology; veterinary toxicology; and the toxicity of noxious agents to various organ systems (e.g., nervous, heart, liver, kidneys).

Prerequisites for Admission—A B.S. in basic science is required. All applicants should have completed a full year of biology, chemistry, and physics, and have completed mathematics through calculus. The M.S. is not a terminal degree and students are not usually admitted to it. Applicants are evaluated for admission to the Ph.D. program.

Special Application Requirements—Applicants must submit scores from the General (Aptitude) Test of the GRE, three letters of recommendation from college-level faculty or equivalent persons who are familiar with the applicant’s scholarship and research potential, a complete set of official transcripts, and a clearly written statement of career interests, goals, and objectives. Graduate study in the program begins in fall semester. The application deadline is January 1. All applications are evaluated once each year in early February.

Courses—Please refer to Toxicology (Txcl) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted with director of graduate studies approval.

M.S. Degree Requirements
The M.S. is offered under plan A and Plan B. Plan A requires 20 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 written and oral.

Ph.D. Degree Requirements
The Ph.D. requires core courses in physiology, biochemistry, statistics, and toxicology. 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 course numbers 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.

Language Requirements—None.

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

Transportation Studies Postbaccalaureate Certificate
Contact Information—Center for Transportation Studies, University of Minnesota, 511 Washington Ave. S.E., Minneapolis, MN 55455 (612-626-1023; fax 612-625-6381; cts@umn.edu; <www.cts.umn.edu>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor
John Adams, Geography, M

Associate Professor
Gerard McCullough, Applied Economics, M

Assistant Professor
David Levinson, Civil Engineering, M
Kevin Krizek, Public Affairs, M

Curriculum—The transportation studies program allows students to gain advanced interdisciplinary knowledge of transportation by taking a set of core courses along with a series of focused electives. Students must complete two courses in transportation policy and planning and a one-credit intelligent transportation technology seminar. In addition to this foundation, students acquire further expertise in a specific area related to transportation by taking at least 9 graduate credits in a field chosen by the student and approved by the director of graduate studies. These credits may consist of any combination of courses that will further the student’s knowledge of a specific transportation-related subject area or areas. A broad array of topical areas and course offerings are available including advanced traffic engineering and related mathematical disciplines; transportation pavements or structures; management, logistics, regional planning, or human factors; historical, political, or economic analysis.

Prerequisites for Admission—Admission requires a B.S. or B.A. from an accredited U.S. institution or its foreign counterpart. The degree must be in a field related to transportation. Applicants who hold a degree in an unrelated field must demonstrate familiarity with the transportation-related issues through work experience, community involvement, political leadership, or other activity.

A 3.00 minimum GPA is required for admission. International students must score 550 on the TOEFL exam. Exceptions may be made in cases where applicants have slightly lower than the minimum requirements but have demonstrated their abilities through substantial professional experience. The GRE is not required.

Special Application Requirements—Prospective students must submit a statement explaining how their work experience, community involvement, political leadership, or other activity has prepared them for the program. Prospective students may supplement this statement with letters of recommendation from employers, community leaders, etc., if appropriate.

Courses—The four core courses are PA 5202/Geog 5372, PA 8212, CE 5212, and 5214. CE 5214 covers the systems approach and its application to transportation engineering and planning. Topics include prediction of flows and level of service, production functions and cost optimization, utility theory and demand modeling, transportation network analysis and equilibrium assignment, decision analysis, and multidimensional evaluation of transportation projects.

Use of 4xxx Courses—Use of 4xxx courses toward requirements is subject to director of graduate studies approval.

Postbaccalaureate Certificate Requirements
Completion of two of the four core courses along with the Transportation Technology Seminar, three or more cognate elective courses chosen by the student in consultation with the director of graduate studies, and at least 16 graduate level credits are required. In addition to completing two of the above courses, students are required to complete ME 8772/CE 8213.

Urban and Regional Planning
Contact Information—Director of Admissions, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax 612-626-0002; admissions@hhh.umn.edu; <www.hhh.umn.edu>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Regents Professor
G. Edward Schuh, M2

Professor
Dean E. Abrahamson (emeritus), AM
John S. Adams, M2
Sandra Archibald, M2
Ragui A. Assaad, M2
J. Brian Atwood, M2
Richard S. Bolan (emeritus), AM
Degree Programs and Faculty

John E. Brandl, M2
John M. Bryson, M2
Nancy N. Eustis, M2
Katherine Fennelly, M2
Edward G. Goetz, M2
Stephen A. Hoernack, M2
C. David Hollister, AM2
Ethan B. Kapstein, M2
Anne R. D. Kapuscinski, Fisheries, Wildlife, and Conservation Biology, AM
Kenneth H. Keller, M2
Sally J. Kenney, M2
Morris M. Kleiner, M2
Robert T. Kudle, M2
Ann R. Markuses, M2
Judith A. Martin, Geography, AM
Samuel L. Myers, M2
Lance M. Necker, Landscape Architecture, AM
David G. Pitt, Landscape Architecture, AM2
Carlisle F. Runge, Applied Economics, AM
Esther Wattenberg, Social Work, AM

Associate Professor
Maria J. Hannaty, M2
Deborah Levinson, M2
Melissa M. Stone, M2

Assistant Professor
Kevin J. Krizek, M2
David M. Levinson, Civil Engineering, AM2

Other
Zbigniew M. Bochniarz, AM
Harry C. Boyte, AM2
Candace Campbell, AM
William Craig, AM
Barbara C. Crosby, AM2
Marsha A. Freeman, AM
Ali K. Galaydh, AM2
Thomas F. Luce, AM
Barbara L. Lukermann, AM
Lee W. Munnich, AM
Joseph A. Ritter, AM
Jodi R. Sandfort, AM2
Paul C. Stone, AM

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

Curriculum—The master of urban and regional planning (M.U.R.P.) degree is an interdisciplinary program that prepares students to analyze, forecast, design, and implement plans for regions, communities, and neighborhoods. Students develop a comprehensive understanding of the built environment (land use, transportation, housing, regional economies) and the ability to mediate among competing interests. They are prepared for jobs in public, nonprofit, and private sectors. Students can generally complete the M.U.R.P. degree in two years of full-time study. Dual degrees include M.U.R.P./juris doctor, M.U.R.P./master of landscape architecture, M.U.R.P./master of science in civil engineering, and M.U.R.P./master of social work.

Prerequisites for Admission—Students are expected to have completed the equivalent of an introductory course in microeconomics and have a U.S. bachelor’s degree or foreign equivalent.

Special Application Requirements—In addition to the materials submitted to the Graduate School, applicants must submit to the Humphrey Institute a photocopy of their Graduate School application, the Humphrey Institute Applicant Data Form, copies of all academic transcripts, a statement of purpose, at least three letters of recommendation, and a GRE official score report. Students who wish to be considered for financial aid should apply no later than January 2 of the preceding academic year. Deadline for admission only is April 1. Entry is for fall semester.

Courses—Please refer to Public Affairs (PA) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted with instructor’s and adviser’s permission.

M.U.R.P. Degree Requirements
The M.U.R.P., which is offered under Coursework Only and Plan A, requires 48 credits including core courses (26 credits), specialization electives (9 credits), and 10 credits of electives. Each student completes an internship in a public or private planning agency usually during the summer after the first year of the program. All students also take a capstone workshop (3 credits) that constitutes a final professional-level project. Students in the Coursework Only option complete a professional paper. Students selecting the Plan A option register for 10 thesis credits and complete a thesis. Specializations for the degree include housing and community development; regional, economic, and workforce development; transportation planning; land use/urban design planning; and environmental planning.

Language Requirements—None.

Final Exam—The final exam is oral for Plan A. No final exam required for Coursework Only.

Veterinary Medicine

Contact Information—Director of Graduate Studies, Veterinary Medicine, 385 Animal Science/Veterinary Medicine, 1988 Fitch Avenue, St. Paul, MN 55108 (612-624-0750; fax 612-624-3233; vmvedgrad@umn.edu; <www.cvm.umn.edu/graduate_vmed>). For up-to-date faculty listing, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor
Trevor R. Ames, Clinical and Population Sciences, SM
P. Jane Armstrong, Small Animal Clinical Sciences, SM
Russell F. Bey, Veterinary Pathobiology, SM
David R. Brown, Veterinary Pathobiology, SM
Cathy S. Carlson, Veterinary Diagnostic Medicine, SM
James E. Collins, Veterinary Diagnostic Medicine, SM
Melyn L. Fahning, Clinical and Population Sciences, SM
Ralph J. Farnsworth, Clinical and Population Sciences, M
Daniel A. Feeney, Small Animal Clinical Sciences, SM
John Fetrow, Clinical and Population Sciences, SM
Douglas N. Foster, Animal Science, ASM
Sandra M. Godden, Clinical and Population Sciences, SM
Jodi P. Luich, Small Animal Clinical Sciences, SM
Samuel K. Maheswaran, Veterinary Pathobiology, SM
Robert B. Morrison, Clinical and Population Sciences, SM

Associate Professor
Scott A. Dee, Clinical and Population Sciences, SM
John Deen, Clinical and Population Sciences, SM
Mark S. Rutherford, Veterinary Pathobiology, SM
Ava M. Trent, Clinical and Population Sciences, M
Stephenie J. Valberg, Clinical and Population Sciences, SM

Assistant Professor
Jeff B. Bender, Clinical and Population Sciences, SM
Don L. Borjesson, Veterinary Diagnostic Medicine, M2
Kay S. Faaberg, Veterinary Pathobiology, M2
James R. Lokensgard, Medicine, AM2
Petra A. Mertens, Small Animal Clinical Sciences, M
Kurt D. Rossov, Veterinary Diagnostic Medicine, SM
Sheila M. Torres, Small Animal Clinical Sciences, M

Assistant Clinical Specialist
Bettina K. Kure, Small Animal Clinical Sciences, M2

Abby M. Sage, Clinical and Population Sciences, M2

Assistant Clinical Specialist
Erin D. Malone, Clinical and Population Sciences, M2
Jane E. Quandt, Small Animal Clinical Sciences, M2
Margaret V. Root Kustritz, Small Animal Clinical Sciences, M2

Research Associate
Connie J. Gabrielson, Veterinary Pathobiology, SM
Lisa M. Schrott, Pharmacology, AM2

Along with the program-specific requirements listed below, please read the General Information section of this catalog for Graduate School requirements that apply to all major fields.
Curriculum—Emphases in the major are large, small, comparative, and food animal medicine. Emphasis can further be directed toward specific systems or population medicine.

The veterinary medicine graduate program encompasses all the clinical and applied graduate education of the College of Veterinary Medicine. The program is divided into five specialty tracks: comparative medicine and pathology; population medicine; infectious disease; surgery, radiology, and anesthesiology; and theriogenology. Program faculty are drawn from all the departments of the college as well as from other colleges within the University.

The program emphasizes quality clinical training with state-of-the-art research in areas of animal disease at the individual and population levels. All species of domestic animals are the subject of both teaching and research, the program being particularly strong in population-based medicine and epidemiology. Other areas of strength include feline and canine urology, radiology, pain, molecular epidemiology in food animals, microbiology, and immunology. The program also has quality research and teaching in the area of theriogenology.

Prerequisites for Admission—Applicants must meet the stated requirements of the Graduate School, including a minimum undergraduate GPA of 3.00 and a minimum TOEFL score of 550 or a minimum computer-based TOEFL score of 213. The majority of applicants have a D.V.M. degree or its equivalent. Applicants lacking a D.V.M. degree, including those currently enrolled in a D.V.M. degree program, can be accepted upon approval by the director of graduate studies.

Applicants are requested but not required to take the GRE prior to consideration for admission.

Special Application Requirements—Applicants must submit a letter of intent stating career goals and defining the specialty of graduate study selected (e.g., subdiscipline or animal species). Also required are three letters of recommendation from individuals knowledgeable about the applicant’s academic performance. These letters must be sent directly to the director of graduate studies or the program coordinator.

Research Facilities—Research facilities available to the veterinary medicine graduate student include the Advanced Genetic Analysis Center, the Clinical Investigation Center, the Raptor Center, the Swine Center, the Swine Disease Eradication Center, and the Avian Disease Research Center.

Courses—Please refer to Veterinary Medicine (VMed) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Use of selected 4xxx courses to meet degree requirements is acceptable.

M.S. Degree Requirements
The M.S. is offered under Plan A and Plan B. Plan A requires 20 credits; a minimum of 14 credits in the major, 6 credits in a minor or related field, and in addition 10 thesis credits. Plan B requires 30 course credits, 14 of which must be in the major and 16 in a minor or related field, chosen in consultation with the adviser. Three papers are also required (e.g., a case report, a research project, and a literature review).

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires 6 course credits taken from recommended courses in the veterinary medicine major.

Ph. D. Degree Requirements
There are no minimum requirements but students usually take 24 to 30 credits in the major field and 12 credits minimum for official minor or supporting program. In addition, 24 thesis credits are required.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires 12 course credits taken from recommended courses in the veterinary medicine major.

Vocational Education
See Work, Community, and Family Education.

Water Resources Science
Contact Information—Director of Graduate Studies—Twin Cities, Water Resources Science, University of Minnesota, 173 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108 (612-624-9282; fax 612-625-1263; juerg001@umn.edu); and Associate Director of Graduate Studies—Duluth, Water Resources Science, 213RLB, University of Minnesota, Duluth, MN 55812 (218-726-8891; fax 218-726-6979).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor
E. Calvin Alexander, Jr., Geology and Geophysics, SM
Dorothy Anderson, Forest Resources, SM
James L. Anderson, Soil, Water, and Climate, SM
Sandra O. Archibald, Public Affairs, SM
Roger E. A. Arnott, Civil Engineering, SM
Marvin Bauer, Forest Resources, SM
David D. Biessboer, Plant Biology, SM
Paul R. Bloom, Soil, Water, and Climate, SM
Patrick L. Breznik, Civil Engineering, SM
Kenneth N. Brooks, Forest Resources, SM
Dwight A. Brown, Geography, SM
Charles J. Clanton, Biosystems and Agricultural Engineering, SM
K. William Easter, Applied Economics, SM
Ehsan Feroz, Accounting, Duluth, AM2
Leonard Ferrington, Entomology, SM
Edif Poufoula, Civil Engineering, SM
Philip J. Gersmehl, Geography, SM
Florence K. Gleason, Plant Biology, SM
Sagar M. Goyal, Veterinary Diagnostic Medicine, SM
John S. Gulliver, Civil Engineering, SM
Satsis C. Gupta, Soil, Water, and Climate, SM
Eni Ito, Geology and Geophysics, SM
Thomas C. Johnson, Geological Sciences, Duluth, SM
Andrew R. Klemper, Biology, Duluth, SM
Robert O. Megard, Ecology, Evolution, and Behavior, SM
John F. Moncrief, Soil, Water, and Climate, SM
David J. Mullia, Soil, Water, and Climate, SM
Edward A. Nater, Soil, Water, and Climate, SM
John L. Nieber, Biosystems and Agricultural Engineering, SM
John Pastor, Biology, Duluth, SM
James A. Perry, Fisheries, Wildlife, and Conservation Biology, SM
Hans-Olaf Pfannkuch, Geology and Geophysics, SM
Charles J. Pfister, Minerals, Duluth, SM
Michael Sadowsky, Soil, Water, and Climate, SM
Mark W. Seeley, Soil, Water, and Climate, SM
Michael J. Semmens, Civil Engineering, SM
Heinz G. Stefan, Civil Engineering, SM
Robert W. Sterner, Ecology, Evolution, and Behavior, SM
Deborah L. Swackhammer, Environmental and Occupational Health, SM
Michael Sydor, Physics, Duluth, SM
Bruce N. Wilson, Biosystems and Agricultural Engineering, SM

Adjunct Professor
John Baker, Soil, Water, and Climate, SM
Carol A. Johnston, Geological Sciences, Duluth, SM

Associate Professor
Randall J. Barnes, Civil Engineering, SM
James C. Bell, Soil, Water, and Climate, SM
Erik T. Brown, Geological Sciences, Duluth, SM
James B. Cotner, Ecology, Evolution, and Behavior, SM
Susan M. Galatowitsch, Horticultural Science, SM
Randall E. Hicks, Biology, Duluth, SM
Frances R. Homans, Applied Economics, M2
Raymond N. Horalski, Civil Engineering, SM
Katherine Klink, Geography, SM
Timothy LaPura, Civil Engineering, SM
Howard D. Mooers, Geological Sciences, Duluth, SM
Raymond M. Newman, Fisheries, Wildlife, and Conservation Biology, SM
Paige J. Novak, Civil Engineering, SM
Steven J. Taff, Applied Economics, SM
Dong Wang, Soil, Water, and Climate, SM

Adjunct Associate Professor
Paul D. Capel, Civil Engineering, ASM
Bruce C. Vondracek, Fisheries, Wildlife, and Conservation Biology, SM

Assistant Professor
William Arnold, Civil Engineering, SM
Donn Braistrick, Biological Sciences, Duluth, SM
Neil C. Hansen, Soil, Water, and Climate, M2
Brian May, Physics, Duluth, M2
Kristopher McNeill, Chemistry, SM
Kristen C. Nelson, Forest Resources, SM
Elise A. Ralph, Physics, Duluth, M2
Gary R. Sands, Biosystems and Agricultural Engineering, M2
Matt Sunciak, Environmental and Occupational Health, SM
Jeff Strock, Soil, Water, and Climate, M2
John Swenson, Geological Sciences, Duluth, M2
Josef Werne, Chemistry, SM
Tongxin Zhu, Geography, Duluth, M2

Adjunct Assistant Professor
Mary Renwick, Applied Economics, M2
James Almendinger, Fisheries, Wildlife, and Conservation Biology, AM2

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Research Associate
Richard P. Axler, Natural Resources Research Institute, Duluth, SM
Prasanna Gowda, Soil, Water, and Climate, SM
Lucinda B. Johnson, Natural Resources Research Institute, Duluth, M2
Carol Johnston, Natural Resources Research Institute, Duluth, SM
John C. Kingston, Natural Resources Research Institute, Duluth, SM
Ingrid Schneider, Forest Resources, SM
Senior Fellow
Lawrence Baker, Water Resources Center, SM
Other
Lorin Hatch, Macalaster College, AM2
Elon S. Very, USDA Forest Service, ASM

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

Curriculum—This cross-campus interdisciplinary program provides comprehensive training in water resources science, with integration across scientific disciplines. A structured interdisciplinary graduate curriculum is offered. The program includes a set of core courses plus electives in the following areas of specialization at the M.S. and Ph.D. levels: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. Approximately 80 courses offered within 15 other graduate programs are available to students majoring in water resources science.

The goal of the program is to produce scientists with strong technical skills in disciplines relevant to water resources and a broad understanding of 1) the hydrologic cycle and associated ecosystems, 2) the interconnectedness of the sciences involved in managing aquatic resources, and 3) the interplay between the biophysical sciences and social sciences in developing and implementing public policies related to water.

The program involves faculty from the following departments on the Twin Cities campus: Applied Economics; 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; Microbiology, Plant Biology; Soil, Water, and Climate; and the Humphrey Institute of Public Affairs. It also involves faculty from the following departments on the Duluth campus: Biology, Chemical Engineering, Chemistry, Geography, Geological Sciences, Physics, and Political Science, as well as the Large Lakes Observatory and the Natural Resources Research Institute in Duluth.

Prerequisites for Admission—The program is flexible enough to accommodate students from a variety of backgrounds. Normally students have a bachelor’s degree in physical or biological science or engineering. Recommended academic preparation includes one year (or two semesters) each of calculus, physics, and chemistry and one biology course. Further preparation may be expected from students wishing to specialize in certain areas of the program.

Special Application Requirements—Applicants must submit three letters of recommendation to the director of graduate studies. These letters should be from professors qualified to estimate applicants’ class rank and evaluate their ability to complete a program of graduate study, or from persons who can assess their professional potential. These letters also may be used in applying for financial aid. Applicants must also submit a résumé of their academic history and professional experience and a statement of purpose, including the proposed area of emphasis. Applicants are strongly encouraged to submit results of the GRE. Those who have not taken the GRE are at a disadvantage in competing for financial aid. Students may be admitted any semester but are strongly encouraged to begin fall semester and to submit their application by January 1 in the year they expect to begin their studies.

Courses—Please refer to Water Resources Science (WRS) in the course section of this catalog for courses pertaining to the program. Check the department Web site at <http://wrs.coafes.umn.edu> for additional course information.

Use of 4xxx Courses—Use of 4xxx courses is permitted for degree requirements based on approval by the director of graduate studies.

M.S. Degree Requirements
Students may choose Plan A, which requires a thesis, or Plan B, which requires additional coursework and a major project. Both plans incorporate courses offered on the Twin Cities and Duluth campuses.

Students must complete courses in four core areas: 1) hydrology (surface and/or hydrogeology); 2) environmental/water chemistry; 3) limnology; and 4) water resources policy, economics, and management, and at least three electives in such areas of emphasis as aquatic biology, hydrologic science, watershed science and management, and water management technology. One elective must be from an approved list of technical courses dealing with water quality science/management; two electives must be in the student’s focus area. A minimum of two supporting courses (at least 6 credits) outside of aquatic science also are required.

A minimum of 20 course credits (plus 10 thesis credits) are required for Plan A and a minimum of 30 credits are required for Plan B (up to 3 credits of independent study may be used for the Plan B project). Students who had classes equivalent to those in the WRS core as undergraduates may substitute other classes to meet the Graduate School minimum requirement of 20 credits.

Language Requirements—None.

Final Exam—The final exam is oral.

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

Ph.D. Degree Requirements
Coursework is tailored to student interests, and many areas of specialization are possible. Core courses are offered on both the Twin Cities and Duluth campuses.

Students complete coursework equivalent to that of an M.S. in water resources science, with additional coursework in an area of specialization. There are no specific credit requirements in the major, but Ph.D. programs normally include at least 40 course credits beyond the B.S. level, including relevant coursework taken for a master’s degree and a required minimum of 12 credits in a minor or supporting program.

Language Requirements—None.

Minor Requirements for Students
Majoring in Other Fields—Doctoral students must complete 12 credits, including WRS 5101 (3 credits), two other core courses described under the M.S. degree requirements, and an elective from one of the fields of specialization.

Wildlife Conservation
Contact Information—Kathleen Walter, College of Natural Resources, University of Minnesota, 135 Skok Hall, 2003 Upper Buford Circle, St. Paul, MN 55108-6146 (612-624-2748; fax 612-624-6282; kwalter@forestry.umn.edu; <www.wf.umn.edu>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/step1.asp>.

Professor
Yosef Cohen, SM
Francesca J. Cuthbert, SM
Ralph J. Gutiérrez, SM
John Pastor, Biology, Duluth, SM
Donald B. Sniff, Ecology, Evolution, and Behavior, SM
J. L. David Smith, SM
Anthony M. Starfield, Ecology, Evolution, and Behavior, SM

Adjunct Professor
David E. Andersen, SM
L. David Mech, SM

Associate Professor
James A. Cooper, SM
Peter A. Jordan, SM

Adjunct Associate Professor
Glenn D. DelGiudice, SM
David C. Fulton, SM
David L. Garshelis, SM
Richard O. Kimmel, M

Assistant Professor
Todd Arnold
Robert B. Blair, SM
John P. Loegering, M2
Kristen C. Nelson, SM
Along with the program-specific requirements listed below, please read the General Information section of this catalog for Graduate School requirements that apply to all major fields.

Curriculum—This program, administered within the Department of Fisheries, Wildlife, and Conservation Biology, is an applied program emphasizing resource-management applications. For the M.S. degree, emphasis is on wildlife biology and related areas in ecology, animal behavior, physiology, and human dimensions as these relate to resource management and conservation problem solving. For many students, the M.S. is a terminal degree leading to employment with government resource-management agencies.

For the Ph.D. program emphasis is on basic biology and ecology with concentrated work in independent, original research generally relating basic social science to management/conservation challenges. This program combines basic biology and ecology with other academic areas and with applied problem solving in natural resource management and conservation areas such as animal behavior, population modeling, habitat management, integrated resource management, and animal physiology.

Prerequisites for Admission—For the M.S., a bachelor’s degree with a biological sciences background is required, preferably with emphasis on terrestrial or wetland vertebrates, and with a natural-resource management orientation. A strong background in physical sciences and mathematics is expected; familiarity with statistics and computer use is desirable. For the Ph.D., a master’s degree in wildlife science or a closely related field is normally required.

Special Application Requirements—Three letters of recommendation are required from persons able to evaluate the applicant’s scholarship and professional experience. Also required are scores from the GRE General Test. Applicants taking the examination should list the wildlife management major field code (0115). Applications are accepted at any time; however, because the faculty reviews most applications in late January for admission the following fall, applications should be sent before January 1.

Courses—Please refer to Fisheries and Wildlife (FW) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is subject to adviser and director of graduate studies approval. Students from other majors may include such courses subject to their own program’s approval.

M.S. Degree Requirements
Plan A is recommended; Plan B is available under special circumstances. Students must become familiar with factors underlying wildlife population and habitat ecology, management techniques, and how management agencies function. Academic work includes coursework in animal ecology, wildlife management, and statistics. The Plan A thesis should involve at least one field season, but generally two. Plan B students complete one to three projects involving field laboratory, or planning work.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students
Majoring in Other Fields—A master’s minor requires a minimum of 6 credits as approved by the director of graduate studies.

Ph.D. Degree Requirements
Degree programs include basic wildlife biology, development of analytical skills, and one or more areas of specialization.

Language Requirements—A foreign language is required only when the advisory committee determines that a language is needed to support the student’s research objectives. Symbolic language (computer programming) is recommended for all students.

Minor Requirements for Students
Majoring in Other Fields—A doctoral minor requires a minimum of 12 credits as approved by the director of graduate studies.

Work, Community, and Family Education

Contact Information—Jerry McClelland, Director of Graduate Studies, Department of Work, Community, and Family Education, University of Minnesota, R-350 Vocational and Technical Education Building, 1954 Buford Avenue, St. Paul, MN 55108 (612-624-1221; fax 612-625-8140; wcfe@umn.edu; <http://www.education.umn.edu/wcfe/>).

For up-to-date graduate faculty listings, see <www.grad.umn.edu/faculty_rosters/stpl1.asp>.

Professor
Thomas Brothen, General College, AM
James M. Brown, SM
Terence George Collins, General College, AM
Jeanne Louise Higbee, General College, AM
Judith J. Lambrecht, SM
Theodore Lewis, SM
Gary N. McLean, SM
Roland L. Peterson, SM
David J. Pucel, SM
Richard A. Swanson, SM
Ruth G. Thomas, SM

Adjunct Professor
Richard A. Krueger, Extension, SM

Associate Professor
Laura Coffin Koch, General College, AM
Gary W. Leske, SM
Jerry H. McClelland, SM
Rosamaria J. Park, SM
Jane E. Pihlaj, SM
Marilyn A. Mossman, SM
Sheila K. Ruhold, SM
James R. Stone III, SM
Catherine A Wambach, General College, AM
Baiyun Yang, SM

Assistant Professor
Kenneth R. Bartlett, SM
Richard M. Joeger, M2
Shari L. Peterson, SM
Thomas Joseph Reynolds, General College, AM

Lecturer
John R. Vreyens, International Agricultural Programs, AM2

Other
Jeanette R. Daines, AM2
Barry Craig Johansen, Rochester, AM2
James C. Kielsmeier, AM2
Marie J. Maher, Rochester, AM2
Tom Peacock, Education, Duluth, AM2
Jerome Stein, Extension 4H Center for Youth Development, AM2
Joyce Walker, Extension 4H Center for Youth Development, AM2

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

Curriculum—The Ed.D. offers specializations in adult education; agriculture, food, and environmental education; business and industry education; family education; human resource development; and comprehensive work, community, and family education. Students combine study and related experiences to develop, apply, analyze, synthesize, and evaluate knowledge of the purposes, practices, issues, and problems of work, community, and family education; social, economic, historical, political, cultural, educational, technological, and psychological contexts within which work, community, and family education exist; and types of research that contribute to or apply that knowledge to the specialization.

See also Education—Work, Community, and Family Education for information about the M.A. and Ph.D. degrees.

Prerequisites for Admission—Prospective master’s degree students generally have completed an undergraduate degree or extensive coursework in the specialization area. Prospective doctoral degree students should have academic background and experience in at least one specialization area.

Special Application Requirements—Scores from the GRE general test are required for applicants with a bachelor’s degree from a U.S. institution. Applicants should designate the specific specialization to which they seek admission in their goal statement. A current resume is required. Students are admitted each term.

Courses—Please refer to Adult Education (AdEd), Agricultural, Food, and Environmental Education (AFEE), Business and Industry Education (BIE), Family Education (FE), Human Resource Development (HRD), and Work, Community, and Family Education (WCPE) in the course section of this catalog for courses pertaining to the program.
Degree Programs and Faculty

Use of 4xxx Courses—A maximum of 15 credits from 4xxx courses may be used in the supporting program. Students are responsible for determining that the course was available for graduate credit and the offering department criteria for graduate credit were satisfied. Degree programs must include rationale for the use of 4xxx course credits.

Ed.D. Degree Requirements
The Ed.D. requires 60 course credits and 24 field study credits (thesis credits). Course credits include a minimum of 12 credits in general aspects, a minimum of 11 credits in research, and a minimum of 28 credits in the specialization, 4 of which must be internship credits. Course credits must also include 12 credits from outside the department, which may overlap with those in general aspects, research, and the specialization.

Language Requirements—None.

Final Exam—A written preliminary exam in each of the program areas (general aspects, research, and specialization) and a final oral exam are required.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires a minimum of 12 credits in one of the specializations, approved by the director of graduate studies.

Chicano Studies

Professor
Dennis Valdes, E

Associate Professor
Guillermo Rojas, E

Dermatology

Professor
Mark V. Dahl (emeritus), E

Assistant Professor
James C. Vance, E

Neurosurgery

Professor
Walter A. Hall, E
Walter C. Low, E
Robert E. Maxwell, E
Gaylan L. Rockswold, E

Pediatrics

Regents Professor
Alfred F. Michael, E
James G. White, E

Professor
David M. Brown, E
Carlyle C. Clawson, E
Patricia Ferrari, E
G. Scott Giebink, E
Edward L. Kaplan, Epidemiology, E
James H. Moller, E
Harvey Sharp, E
Warren J. Warwick, E

Associate Professor
Amos S. Deinard, E

Assistant Professor
Pi-Nian Chang, E
Elizabeth E. Giles, E

Psychiatry (AdPy and CAPy)

Professor
Gerald J. August, E
Marilyn E. Carroll, E
Elke D. Eckert, E
William H. Frey, Pharmacy, E
Judith G. Garrard, Health Services Research, Policy and Administration, E
Dorothy Hatsukami, Epidemiology, E
Jerome L. KROLL, E
Thomas B. Mackenzie, E
Michael K. Popkin, E

Associate Professor
Michael L. Bloomquist, E
Carrie M. Borchardt, E
Scott J. Crow, E
George Realmuto, E

Assistant Professor
Daniel R. Hanson, E

Therapeutic Radiology

Professor
John J. Kersey, Pediatrics, E
Faz M. Khan, E
Chang W. Song, E

Associate Professor
Bruce J. Gerba, E
Patrick D. Higgins, E

Assistant Professor
Parham Alaei, E