This is the Degree Program and Faculty section (Addictions Studies—Educational Policy and Administration) of the 2005-2007 Graduate School Catalog for the University of Minnesota.

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Addictions Studies

Postbaccalaureate Certificate

Contact Information—Addictions Studies Certificate, College of Continuing Education, Student Support Services, 150 Wesbrook Hall, 77 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4000; jlv@ce.umn.edu; www.cce.umn.edu/certificate).

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

Professor
David C. Hollister, Social Work, AM
Ken C. Winters, Psychiatry, M

Associate Professor
Traci Louise Toomey, Epidemiology, M

Assistant Professor
Jodi Dworkin, Family Social Sciences, M

Teaching Specialist
Peter Dimock, Social Work, M

Curriculum—The postbaccalaureate addictions studies certificate gives students expertise in the prevention and treatment of addictive disorders relevant to a wide variety of human service, health care, and public health settings. Two tracks are available: public health and service provider. The public health track focuses on specialization in the epidemiology of addictive disorders and promising prevention approaches. The service provider track allows students to study advanced counseling and therapy skills, models, and intervention techniques related to the treatment of addictive disorders. Students can use the curriculum in this track to qualify for the Alcohol and Drug Counselor license from the Minnesota Department of Health.

Admission Requirements—Applicants for either track must have a bachelor's degree from an accredited postsecondary U.S. institution or its foreign equivalent. A GPA of 3.00 is required. There are additional admissions requirements for the service provider track. Admissions information is available at www.cce.umn.edu/certificates.

Certificate Requirements—The public health track consists of 17 core credits and 2 elective credits. To earn a service provider track certificate, students must take 9 core credits and 10 elective credits. However, to sit for the licensure exam, students must also complete additional coursework (15 credits).

Aerospace Engineering and Mechanics

Contact Information—Chair, Graduate Admissions Committee, Department of Aerospace Engineering and Mechanics, University of Minnesota, 107 Akerman Hall, 110 Union Street S.E., Minneapolis, MN 55455 (612-625-8000; fax 612-626-1558; dept@aem.umn.edu; www.aem.umn.edu).

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

Regents Professor
Daniel D. Joseph, SM

Professor
Roger E. A. Arndt, Civil Engineering, SM
Gary J. Balas, SM
Gordon S. Beavers, SM
Graham V. Candler, SM
Roger Fosdick, SM
William L. Garrard, SM
Richard D. James, SM
Perry H. Leo, SM
Ellen K. Longmire, SM
John S. Lowengrub, Mechanics, SM
Mitchell B. Luskin, Mechanics, SM

Admission to the Graduate Faculty

Authorization to assume the same responsibilities as member/advising, but not to participate in governance.

Affiliate Member/Advising (AM2)—Authorization to advise students at the master's level; to serve as a thesis reviewer and examining committee member for doctoral students, but not as chair.

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

Affiliate Member/Advising (AM2)—Authorization to advise students at the master's level; to serve as a thesis reviewer and as an examiner on student examining committees at the master’s and postbaccalaureate certificate levels; to teach courses for graduate credit; and to participate in governance. At the discretion of the appointing program, may also include authorization to co-advice doctoral students with a senior member or affiliate senior member of the graduate faculty, and to serve as a thesis reviewer and examining committee member for doctoral students, but not as chair.

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

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

Affiliate Member/Advising (AM2)—Authorization to advise students at the master's level; to serve as a thesis reviewer and as an examiner on student examining committees at the master’s and postbaccalaureate certificate levels; to teach courses for graduate credit; and to participate in governance. At the discretion of the appointing program, may also include authorization to co-advice doctoral students with a senior member or affiliate senior member of the graduate faculty, and to serve as a thesis reviewer and examining committee member for doctoral students, but not as chair.

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

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

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

Tests
The following test abbreviations appear throughout graduate program listings.

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

For more information about these individual tests, see page 9 in the General Information section.
systems, and continuum and solid mechanics.

Project Degree Requirements

Engineering and Mechanics (AEM)

Courses—Please refer to Aerospace Engineering and Mechanics (AEM) in the course section of this catalog for courses pertaining to the program.

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

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

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

Language Requirements—None.

Final Exam—The final exam is oral.

M.S.Aero.E. Degree Requirements

This program emphasizes coursework in engineering sciences that are basic to this field: fluid mechanics, aerospace systems, and continuum and solid mechanics. Plan A requires 30 graduate credits, a minimum of 20 course credits and 10 thesis credits. No seminar credits can be used to satisfy the 20-course credit requirement. Plan B requires 30 credits including the 3-credit Plan B project course. Of the remaining 27 credits, a minimum of 24 credits of coursework is required and no seminar credits can be used to satisfy this requirement. If seminar credits are used to meet the 30 credit requirement, they must be in one-credit modules.

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

Language Requirements—None.

Final Exam—The final exam is oral.

M.S. Degree Requirements—Mechanics

The M.S. program in mechanics emphasizes coursework in fluid mechanics, aerospace systems, and continuum and solid mechanics. Theoretical, analytical, experimental, and computational aspects of these fields are covered by the courses and research opportunities offered by the department.

Note: The department is working towards the merger of the aerospace engineering degrees and the mechanics degrees, into one degree program. This means that the M.S. and Ph.D. degrees would be in aerospace engineering and mechanics. The master of aerospace engineering (M.Aero.E.) will be unaffected. Upon final approval of the merger, it is anticipated that the change would take effect by fall 2005. For further updates, please visit the department Web site at www.aem.umn.edu. The information below is current as of the printing of this catalog.

Prerequisites for Admission—A four-year B.S. degree in an engineering, basic science, or mathematics program is required. Admission depends primarily on the applicant’s undergraduate record and letters of recommendation.

Special Application Requirements—GRE scores are not required but are strongly recommended for students applying for graduate fellowships. In all cases, these test scores are taken into account if provided. Students are admitted fall semester only. Only under unusual circumstances are students allowed to begin their studies at another time during the academic year.

Courses—Please refer to Aerospace Engineering and Mechanics (AEM) in the course section of this catalog for courses pertaining to the program.

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

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

The M.Aero.E. program emphasizes applications of fluid mechanics, aerospace systems, and continuum and solid mechanics.
Degree Programs and Faculty

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

Agricultural and Applied Economics


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

Regents Professor
Vernon W. Rutan (emeritus), ASM
G. Edward Schuh, SM

Professor
Jeffrey D. Apland, SM
Brian L. Buhr, SM
K. William Easter, SM
Vernon R. Eidman, SM
William C. Gartner, SM
Robert P. King, SM
Jean D. Kinsey, SM
William F. Lazarus, SM
George W. Morse, SM
Kent D. Olson, SM
Philip G. Pardey, SM
Claudia A. Parliment, SM
Glenn D. Pederson, SM
Stephen Polasky, SM
Terry L. Roe, SM
C. Ford Runge, SM
Benjamin H. Senauer, SM

Associate Professor
Jay S. Coggins, SM
Elizabeth E. Davis, SM
Jeremiah E. Fruin, SM
Paul W. Glewwe, SM
Frances R. Homans, SM
Terrance M. Hurley, SM
Donald J. Liu, SM
Gerard Mccullough, SM
Pamela J. Smith, SM
Rodney B. Smith, SM
Thomas F. Stinson, SM
Steven J. Taff, SM

Assistant Professor
Laura T. J. Klamkobid, SM
Margaretha V. Runstrom, SM

Research Associate
Naomi Zeitouni, 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—Graduate study requires an operational knowledge of economic theory and modern methods of quantitative analysis as well as practical application in specialized fields of inquiry, which include consumer behavior and household economics; development, trade, and policy; natural resource and environmental economics; production and marketing economics; and community development.

Prerequisites for Admission—A GPA of 3.00 in an undergraduate program and in graduate level work is the preferred standard for admission. Applicants with out a master’s degree are, except in a few special cases, considered only for admission to the M.S. program. The following coursework is considered the minimum preparation for admission to the M.S. program: intermediate-level microeconomic and macroeconomic theory, statistics, calculus, and linear algebra.

Applicants to the Ph.D. program should also have completed courses in microeconomic and macroeconomic theory at the master’s level. Students lacking background in economics or quantitative methods may be required to complete deficiencies before being accepted into the program.

Special Application Requirements—GRE scores are required for all students, domestic and foreign. A TOEFL score of 550 (paper) or 213 (computer) is also required for all international applicants whose native language is not English. The TOEFL requirement will be waived for applicants who have completed a degree within the last three years from an institution at which English is the primary language of instruction. Applicants should provide evidence of superior scholarship, professional experience, and general aptitude for graduate study. Students are admitted any semester but should keep in mind that most assistantships are allocated by the end of February for the following fall semester.

Applicants seeking fellowships should submit all application materials by December 15.

Courses—Please refer to Applied Economics (ApEc) 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 not permitted, with the exception of Stat 4101-02 for the M.S. degree only.

M.S. Degree Requirements

The M.S. prepares students for employment opportunities in the public and private sector and for further graduate study. M.S. students are required to complete graduate level courses in microeconomic theory, macroeconomic theory, and econometrics or statistics, or to have completed equivalent courses prior to entry into the program. Students are also required to participate in a 1 credit M.S. seminar. Both Plan A and B require at least 30 credits, of which at least 14 credits must be in the major field and at least 6 credits must be in a related field or minor. The major field must include a minimum of 7 credits in applied economics (excluding thesis and special topics, independent study, and the M.S. seminar). Plan A requires 10 thesis credits. Plan B requires a 4- to 6-credit project. A preferred minimum GPA of 3.00 in program courses is preferred for graduation.

Language Requirements—None.

Final Exam—The final exam is oral.

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

Ph.D. Degree Requirements

The Ph.D. program prepares students for research, teaching, and extension positions in public and private sector organizations.

The only specific credit or course requirements for the Ph.D. is a 1-credit seminar, the Graduate School requirement of a supporting field or minor of 12 to 18 credits, and registration for 24 doctoral thesis credits. Ph.D. students follow a program of study that includes coursework in microeconomic theory, macroeconomic theory, econometrics, and two fields of specialization.

A typical program involves at least ten semester courses totaling at least 35 credits. Courses in economics may be counted in the major field or as part of the supporting field. A preferred minimum GPA of 3.00 in program coursework is required for graduation. Preliminary written exams cover microeconomic theory and fields in agricultural and applied economics. Oral exams are required for approval of the dissertation proposal and for its defense.

Language Requirements—None.

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

Agricultural Engineering

See Biosystems and Agricultural Engineering.

American Studies

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

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

Regents Professor
Sara M. Evans, History, SM
Professor
Patricia C. Albrecht, American Indian Studies, SM
Ronald R. Aminzade, Sociology, SM
W. John Archer, Cultural Studies and Comparative Literature, SM
David O. Born, Preventive Sciences, SM
Timothy Andres Brennan, Cultural Studies and Comparative Literature, SM
Hazel Dicken-Garcia, Journalism and Mass Communication, SM
Mary G. Dietz, Political Science, SM
Lisa J. Disch, Political Science, SM
James Farr, Political Science, SM
Philip J. Genschel, Geography, SM
Edward M. Griffin, English, SM
Karen N. Hoyle, Library Collection, and Preservation (Children’s Literature Research Collections), AM
Mary Jo Kane, Kinesiology, SM
Sally J. Kenney, Public Affairs, SM
Sally G. Kohlstedt, Geology and Geophysics (Science/Technology, History of) SM
Richard D. Leppert, Cultural Studies and Comparative Literature, SM
Alex J. Luetb, Music, SM
Koral Ann R. Marling, Art History, SM
Judith A. Martin, Geography-Urban and Regional Planning, SM
Elaine Tyler May, SM
Lary L. May, SM
Russell R. Menard, History, SM
Ellen Messer-Davidow, English, SM
John D. Nichols, American Indian Studies, SM
David W. Noble, SM
Riv-Ellen Prell, SM
Paula Rabinowitz, English, SM
Nancy L. Roberts, Journalism and Mass Communication, SM
Steven Ruggles, History, SM
Harvey B. Sarles, Cultural Studies and Comparative Literature, SM
Eric Sheppard, Geography, SM
Rudolph J. Vecoli, History, SM
David E. Wilkins, American Indian Studies, SM
Jack D. Zipes, German, Scandinavian, and Dutch, SM
Associate Professor
Lisa Albrecht, Social Work, School of, SM
Thomas Augst, English, SM
Bruce P. Braun, Geography, SM
Rose M. Brewer, African American and African Studies, SM
Robert “Robin” Brown, Cultural Studies and Comparative Literature, SM
Brenda J. Child, SM
Catherine C. Choy, SM
Patricia Crain, AM
Jeffrey R. Crump, Design, Housing, and Apparel, SM
Maria Damon, English, Language and Literature, SM
John M. Dolan, Philosophy, SM
Penny A. Edgell, Sociology, SM
Roderick Ferguson, SM
Kirsten Fischer, History, SM
George D. Green, History, SM
Douglas Hartmann, Sociology, SM
Erika Lee, History, SM
Josephine D. Lee, English, SM
Louis G. Mendoza, Chicano Studies, SM
Carol A. Miller, SM
Roger P. Miller, Geography, SM
Lisa A. Norling, History, SM
Jean M. O’Brien-Kehoe, History, SM
Joanna O’Connell, Spanish and Portuguese Studies, SM
Daniel J. Philippon, Rhetoric, SM
Jennifer L. Pierce, SM
Guillermo Rojas, Chicano Studies, SM
Jani Scandura, English, M2
Thomas M. Scanlan, Rhetoric, SM
Robert B. Silberman, Art History, SM
Katherine M. Solomonson, Architecture, SM
Eden Torres, Women’s Studies, SM
Barbara Welke, History, SM
John S. Wright, English, African American and African Studies, SM
Jacquelyn N. Zita, Women’s Studies, SM
Assistant Professor
David Chang, History, M2
Tracey Ann Deutsch, History, M2
Vinay Gidwani, Geography, M2
Karen Zouwen Ho, M2
David Martínez, American Indian Studies, M2
Keith A. Mayes, African American and African Studies, M2
Patrick McNamara, History, M2
Kevin P. Murphy, History, M2
Brian G. Sonthwell, Journalism and Mass Communications, M2
Dara Z. Strovlovich, Political Science, M2
David Treuer, English, M2
David Valentine, Anthropology, M2
Haidee S. Wasson, Cultural Studies and Comparative Literature, M2
Senior Fellow
Harry C. Boyte, Public Affairs, AM
Other
Colleen J. Sheehy, Weisman Art Museum, 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—American studies is an interdisciplinary, interdepartmental program. The American studies graduate faculty consists of American studies core faculty members and graduate faculty members drawn from a wide number of departments. Students create a field of concentration and also pursue broad training consistent with or complementary to their major. Students should complete either AmSt 8201 or 8202 and two more courses in the field of concentration including one focused on cultural pluralism within the United States (6 credits).
Plan A requires 10 thesis credits for a total of 31 credits and a written thesis. Plan B requires three additional adviser-approved courses in the field of concentration, (9 credits) for a total of 30 credits. The student is required to write three Plan B papers, each approved by a member of the graduate faculty. The papers are usually expanded seminar papers.
Language Requirements—Reading knowledge of one foreign language is required.
Minor Requirements for Students Majoring in Other Fields—For a master’s minor, students are expected to choose courses consistent with or complementary to their major. Students should complete either AmSt 8201 or 8202 and two more courses in American studies.
Ph.D. Degree Requirements
A minimum of 45 credits (15 courses) is required, distributed as follows: introductory seminars AmSt 8201 and 8202 (6 credits); practicum in American studies 8401; dissertation seminar 8801; three one-semester courses from the American studies specialty seminars or from other units approved by the director of graduate studies, one of which must be original research (9 credits); one comparative culture course covering international or non-U.S. topics (3 credits); and two adviser-approved field of concentration courses, including cultural pluralism courses (21 credits). Twenty-four thesis credits are also required. Ph.D. students may register for 0999 no more than two semesters total without approval from their adviser and the director of graduate studies.
Degree Programs and Faculty

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

Minor Requirements for Students Majoring in Other Fields—For a doctoral minor, students must complete at least 12 credits of courses consistent with or complementary to their major, including four 5xxx or 8xxx courses in American studies, one of which must be AmSt 8201 or AmSt 8202.

Anatomy
Contact the Graduate School for information about the status of this program.

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

Animal Sciences
Contact Information—Department of Animal Science, University of Minnesota, 305 Haecker Hall, 1364 Eckles Avenue, St. Paul, MN 55108 (612-624-3491; fax 612-625-5799; emoxx001@umn.edu). For up-to-date graduate faculty listings, see www.ansci.umn.edu/faculty_rosters/step1.aspx.

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

Adjunct Professor
Hans-Joachim G. Jung, Agronomy and Plant Genetics, SM

Associate Professor
Sam K. Baidoo, SM
Yang Da, SM
Hugh Chester-Jones, M2
Alfredo DiCostanzo, SM
Scott C. Fahrenkrug, SM
Graham C. Lamb, SM

Assistant Professor
Marcia Endres, SM
Jacqueline F. Jacob, SM
Laura J. Mauro, SM
Deborah L. Roeber, 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 concentrate on one of the animal sciences subdisciplines: genetics, growth biology, nutrition, physiology, or production systems. Students have the option of tailoring their program to include study in more than one subdiscipline and to emphasize basic or applied science.

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

Special Application Requirements—A complete set of transcripts in addition to that required by the Graduate School, three letters of recommendation evaluating the applicant’s potential, and a statement of career goals are required. The preferred GPA generally required for admission is 3.00 for the M.S. and 3.20 for the Ph.D. GRE scores are required. Applicants are admitted every semester.

Courses—Please refer to Animal Science (AnSc) in the course section of this catalog for courses pertaining to the program.

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

M.S. Degree Requirements
Plan A requires a minimum of 14 semester credits in the major and 6 credits in a designated minor, or related field outside the major. Selection of courses to fulfill this requirement and development of the thesis project are primarily the responsibility of the student and faculty adviser. Students also must register for a minimum of 10 thesis credits. An official program of study, listing coursework to be completed and a thesis title, is submitted to a Graduate Faculty Program Committee and the director of the animal sciences graduate program for review and then forwarded to the Graduate School for approval.

Plan B requires a minimum of 30 credits. These must include 14 or more credits in the major area and at least 6 credits in one or more related fields outside the major. The balance of credits is chosen by agreement between the adviser and student. In addition to coursework, a project is to be conducted that requires approximately 120 hours to complete. The nature and extent of the project is agreed upon in advance by the student and faculty adviser.

Language Requirements—None.

Final Exam—The final exam consists of a public seminar followed by an oral examination.

Minor Requirements for Students Majoring in Other Fields—Requirements are designed to fit the student’s needs. A master’s minor requires 6 credits in areas not closely related to the major; no more than 2 of these credits may be in research or special problems.

Ph.D. Degree Requirements
The Ph.D. degree is granted chiefly in recognition of the candidate’s achievements and knowledge in a specific field. Although there is no minimum number of credits required, students typically complete 40-50 credits to develop competency in their field of interest. Students must register for a minimum of 24 thesis credits. Appropriate graduate level courses taken at another university may be approved for transfer. Coursework completed under an M.S. program can be counted towards the Ph.D. degree. The student is expected to maintain a B average or better in all coursework.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Requirements are designed to fit the student’s needs. A doctoral minor requires 12 credits in areas not closely related to the major; no more than 3 of these credits may be in research or special problems.

Anthropology
Contact Information—Department of Anthropology, University of Minnesota, 395 Hubert H. Humphrey Center, 301-19th Avenue S., Minneapolis, MN 55455 (612-625-3400; fax 612-625-3095; anth@umn.edu). For up-to-date graduate faculty listings, see www.umn.edu/Anthropology.

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

Associate Professor
Daphne Berdahl, SM
Timothy Dunnigan, SM
David M. Lipset, SM
Jean Langford, SM
David Valentine, SM
Language Requirements—None.
Final Exam—The final exam is oral.
Minor Requirements for Students Majoring in Other Fields—The minor program is individually designed by the student and the director of graduate studies. Minimally, students must take 6 credits in anthropology (5xxx courses or above).
Ph.D. Degree Requirements
Requirements include 36 credits of coursework; 24 in anthropology and 12 in a minor or supporting program. Students should consult the department Web site at www.cla.umn.edu/anthropology for special requirements for sociocultural anthropology and for archaeology and biological anthropology.

Applied Developmental Psychology

Postbaccalaureate Certificate

Contact Information—Applied Developmental Psychology Certification Program, Institute of Child Development, 51 East River Road, Minneapolis, MN 55455 (612-624-2576; fax 612-624-6373).

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

Curriculum—CPsy 8360 (2 cr, section 7) gives an overview of applied developmental science and provides a framework for the second two components of the program. CPsy 8301 (4 cr) and 8302 (4 cr) are the core courses in developmental psychology covering biological, cognitive, and social aspects of development. They are fundamental to understanding the developmental perspective. CPsy 8996 (5 cr) integrates and applies information learned in coursework. The course is individually designed based on each student’s prior experience and interests. Students focus on practical and/or public policy applications of developmental research in settings such as the Search Institute, the Minnesota Children’s Museum, the guardian ad litem program in the local courts, the Center for 4-H Youth Development, and the National Institute on Media and the Family. The field experience may be taken in one to three semesters or a summer session, but must be at least 5 credits and total 188 hours. A major paper describing the field experience and integrating relevant basic research literature with practical availability taking place in the field setting is expected. Electives (6 cr) may include 5xxx or 8xxx courses approved by the training directors and chosen to complement the student’s area of interest.

Applied Plant Sciences

Regents Professor
Ronald L. Phillips, SM
Professor
Roger L. Becker, SM
Rex N. Bernardo, SM
Deborah L. Brown, M2
Vernon B. Cardwell, SM
Iris Charvat, SM
Jerry D. Cohen, SM
Gregory J. Cuomo, SM
Beverly R. Durgan, SM
Nancy J. Ehlike, SM

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

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

Degree Programs and Faculty
Degree Programs and Faculty

Vincent A. Fritz, SM
Gary M. Gardiner, SM
Barle G. Gegenbach, SM
John W. Gronwald, SM
Jeffrey L. Gunsolus, SM
Leland L. Hardman, SM
Dale R. Hicks, SM
Emily E. Hoover, SM
Robert J. Jones, SM
Nicholas R. Jordan, SM
Hans-Joachim G. Jung, SM
Pen Hsiang Li, SM
James J. Luby, SM
Albert H. Markhart III, SM
Thomas E. Michaels, SM
Peter J. Olin, M2
James H. Ori, SM
David G. Pitt, Landscape Architecture, M2
Carl J. Rosen, Soil, Water, and Climate, SM
Ruth G. Shaw, SW
Craig C. Sheaffer, SM
Steve R. Simmons, SM
David A. Somers, SM
Joseph R. Sowokinos, SM
Deon D. Stuthman, SM
Donald B. White, SM
David K. Wildung, SM
Donald L. Wyse, SM
Nevin D. Young, Plant Pathology, SM
Howard W. Rines, SM
Carroll P. Vance, SM
James A. Anderson, SM
Neil O. Anderson, SM
John E. Erwin, SM
Frank Forcella, SM
Susan M. Galatowitsch, SM
Jeffrey H. Gillman, SM
Gregg A. Johnson, SM
JoAnn F. Lamb, SM
Mary H. Meyer, SM
Gary J. Muelhlbauer, SM
Bradley W. Pedersen, M2
Paul M. Porter, SM
Lori K. Scott, SM
Alan G. Smith, SM
Kevin P. Smith, SM
Christian A. Thill, SM
Cindy B. Tong, SM
John Y. Wiersma, M2
David Francis Garvin, SM
Stan C. Hokanson, SM
Brian P. Horgan, SM
Helene Murray, SM
Seth L. Naeve, SM
Paul Peterson, SM
Eric Watkins, SM
Jochum J. Wiersma, SM
Karen E. Hokanson, AM
Raymie A. Porter, M2

Curriculum—Applied plant sciences is an interdisciplinary program for educating students to become professional scientists well grounded in the applied disciplines of agronomy/agroecology, horticulture, and plant breeding. Graduates of the program are able to provide innovative leadership and contribute to problem solving in their discipline in the public or private sector and within society at large. The program develops the quantitative and qualitative research skills necessary to conduct high quality research and scholarship. Students gain a broad familiarity with all the disciplines within the program and gain in-depth knowledge within their area of expertise. The program’s graduate faculty is drawn primarily from the Department of Agronomy and Plant Genetics and the Department of Horticultural Science, but also from the Departments of Plant Pathology; Soil, Water, and Climate; and Landscape Architecture and related departments. Students choose from among four specialization tracks—agronomy/agroecology, applied plant sciences, horticulture, or plant breeding/plant molecular genetics.

Agroecology/Agronomy Specialization—Students conduct research to increase their knowledge of cropping systems and weed science, including alternative approaches and management strategies. Emphasis is on improving production efficiency and profitability in an environmentally sound approach that benefits society. Mechanisms of crop physiology and ecology underlying plant responses to the environment are a particular emphasis of this track.

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

Horticulture Specialization—Students conduct research related to fruits, vegetables, potatoes, flowers, ornamental trees and shrubs or turf; and on the physiology, production, environmental impact of cropping systems, and use of horticultural crops. Research areas include the effect of horticultural commodities on human health, hormonal, and stress physiology; flower development and flowering physiology; integrated pest management; postharvest physiology; and cropping system strategies. Students get a broad range of experiences in the field, greenhouse, and/or laboratory using genetic, molecular, biochemical, and ecological tools to answer research questions.

Plant Breeding/Plant Molecular Genetics Specialization—This track allows students to select from genetic research projects ranging from applied plant breeding projects emphasizing breeding procedures and methodologies to molecular genetic projects doing biotechnology, genetic engineering, and genomic research in agronomic and horticultural crops. These research projects give students the opportunity to integrate the latest developments in the laboratory with applied applications in the field to reach the overarching goal of developing new germplasm that will improve the sustainability of our food and fiber systems.

Prerequisites for Admission—Students entering the program should have a foundation in the physical and biological sciences, preferably with some emphasis in plant science. A minimum of 10 credits of math and physics, 12 credits of chemistry and biochemistry, and 15 credits of biological and/or agricultural sciences are recommended for admission. In addition, students should have completed a B.S. or B.A. degree in agriculture, biology, or other related life sciences. Students with a B.S. or B.A. degree outside these areas may be admitted with the requirement that they take the prerequisite courses noted above at the undergraduate level in addition to their graduate coursework.

Special Application Requirements—Applicants must submit scores from the General (Aptitude) Test of the GRE, three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts, and a clearly written statement of career interests, goals, and objectives. Students may apply at any time; however, submission of all application materials by December 1 is strongly encouraged to ensure priority consideration for fellowships and teaching and research assistantships awarded for the next academic year. Students can be admitted any term.

Courses—Please refer to Agronomy and Plant Genetics (Agro), Applied Plant Sciences (APSc), Horticultural Science (Hort) and Sustainable Agricultural Systems (SAgr) in the course section of this catalog for courses pertaining to the program.

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

M.S. Degree Requirements

The M.S. is offered under Plan A (with thesis) and Plan B (with project). Plan A requires a minimum of 20 course credits and 10 thesis credits; Plan B requires a minimum of 30 course credits. Students are encouraged to complete the courses in the common curriculum and the requirements for their specialization, and to present one graduate seminar. Additional course requirements are flexible and are determined in consultation with the student’s adviser(s) and advisory committee.

Language Requirements—None.

Final Exam—The final exam is oral.
Ph.D. Degree Requirements
Ph.D. students are required to complete the courses in the common curriculum, the requirements for their respective specialization, and present one graduate seminar; 24 thesis credits are also required. Additional course requirements are flexible and are determined in consultation with the student’s advisor(s) and advisory committee.

Language Requirements—None.

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

Arabic
No new students are currently being accepted to this program. Contact the Graduate School for information on the status of the program.

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

For up-to-date graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/step1.html](http://www.grad.umn.edu/faculty_rosters/step1.html)

Professor
Caesar E. Farah, 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 program focuses on the Arabic language and the literature and culture of the Arabic-speaking world.

M.A. Plan B Degree Requirements
The M.A. is offered under Plan B only. The minimum requirement is 33 credits, including 27 course credits and 6 credits for the Plan B research paper. The coursework must include 15 credits in Arabic literature or culture, including Arab 5001 (3 credits) and one 8xxx seminar (3 credits). Students also take 6 credits (2 courses) in related fields outside Arabic, depending on the student’s academic goals and subject to the approval of the director of graduate studies.

Language Requirements—Students must complete Arab 5102 (Advanced Arabic) or its equivalent, and must demonstrate reading knowledge of a classical or modern language appropriate to the field.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 graduate credits for a master’s minor is required. Students must possess an acceptable knowledge of Arabic, but may not apply language-specific courses toward the minor. A program of study must be arranged with the director of graduate studies at Arabic. No written exam is required for the minor.

Architecture

Contact Information—Department of Architecture, University of Minnesota, 145 Rapson Hall, 89 Church Street S.E., Minneapolis, MN 55455 (612-624-7866; fax 612-624-5743; [umainfo@umn.edu](mailto:umainfo@umn.edu)).

For up-to-date graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/step1.html](http://www.grad.umn.edu/faculty_rosters/step1.html)

Professor
Thomas Fisher, M2
Ann Forsyth, M2
Lance A. LaVine, M2
Julia Robinson, M2
Leon G. Satkowski, M2

Adjunct Professor
Robert Mack, FAIA, AM2
Dale M. Mulflinger, AM2
Duanie Thortebek, FAIA, AM2

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

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

Assistant Professor
Ritu Bhatt, M2
Mark Swackhammer, M2

Adjunct Assistant Professor
Steven K. Beutow, AIA, AM
William Anthony Blanski, AM
Richard A. Carter, AIA, AM
Dave Dimond, AIA, AM
Wald H. El-Hindi, AIA, AM
Timothy Fuller, AIA, AM
Jay Isenberg, AIA, AM
Tracey S. Jacques, AIA, AM
Mic Johnson, AIA, AM
Charles L. Lazor, AIA, AM
Douglas Lew, AM
Martha McQuade, AIA, AM
Ralph Nelson, AM
Mark Partridge, AIA, AM
Tim Quigley, AIA, AM
Ernesto García Ruiz, AM
Marcy Schulte, AIA, AM
Mary Springer, AM
Mark Tambornino, AM
Josh Weinstein, AIA, AM
Thomas Westbrook, AM
Mark Wentzell, AIA, AM
Jennifer A. Yoon, AIA, AM

Senior Lecturer
Sharon Roe, AM2

Lecturer
Martha Abbott, AM
Jim Dozier, AM
Robert Ferguson, AM2
Nancy Miller, AM2

Adjunct Teaching Instructor
Lucas Alm, AM
Mike Christenson, AM
Mary deLaittre, AM
Malini Srivistava, AM
Suzi Strothman, AM
Mark Tambornino, AM
Marcelo Valdes, AM

Research Associate
Louise Goldberg, AM
Kathleen Harder, AM

Research Fellow
Dan Marcckel, AM
Viraajit Singh, M
William Weber, M

Other
Janet Abrams, M
Jone K. Brigham, M
John C. Carmody, AM2
Richard Milgrom, 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—Architecture encompasses the making and study of the buildings and environments that we inhabit. The concerns of architecture involve a wide variety of areas of study, including the art of representing built projects through drawings and computer graphics; the technology of building structure, building materials, and natural and mechanical systems; the history, theory, and art of making, using, and understanding buildings as cultural artifacts for human use; and the practice of architecture in the context of urban form and business economics. The department offers an accredited professional degree, the M.Arch., and an academic degree, the M.S. in architecture with a sustainable design track.

The master’s of architecture degree is a three-year professional program that prepares students for the practice and discipline of architecture as a speculative, analytic, and investigative endeavor. Through rigorous methods of inquiry developed in the design studio, lectures and seminars, students acquire the breadth of knowledge required of the professional architect: the techniques and processes of representation, communication and analysis; the history and theory of making architecture and urban form for human use; and the technology, systems, processes, and economics of construction and practice. The 90-credit M. Arch. professional degree program is fully accredited by the National Architectural Accrediting Board (NAAB). A portfolio is required.

The master’s of science in architecture is a non-professional degree offering advanced studies and research methods in a sustainable design track commencing in 2005 and four concentrations in metropolitan design, digital design, heritage preservation and history-
theory of criticism available in 2006. The M.S. seeks students from architecture, landscape architecture, environmental design or related disciplines to pursue multidisciplinary graduate study and research in sustainable practices and careers in sustainable design. The M.S. offers students a wide range of topics and research methods within sustainable and green building practices, including energy and indoor air quality; site, water, and climate design; waste and environmental factors; innovative materials technology; and high performance building design applications.

**Prerequisites for Admission**—All applicants to the M.Arch or M.S. programs are expected to have basic computer skills before beginning the program, including familiarity either with Macintosh or Windows operating systems, word processing, basic drawing or painting programs, and use of e-mail.

Students entering the three-year M.Arch. program have varied educational backgrounds that add to a diverse student body. There are several different paths into and through the M.Arch. program. Students who have a B.A. or B.S. degree in architecture or environmental design, enter the three-year M.Arch. program. Students who have earned a bachelor degree in a field other than architecture and little or no background in architecture apply for the 3+ Option, enrolling in a summer semester to establish the foundation needed to succeed in the professional program. A limited number of students with an extensive background in architecture studies may be granted advanced standing (see below) in the master’s program, usually completing two years of studies. And those with a professional degree bachelor degree in architecture, who are seeking additional education, apply for a one-and-half year post-professional course of studies. Information about each of these paths and the requirements for admission appears below.

**The 3+ Option**—This option is designed for students with a broad range of academic backgrounds in undergraduate fields other than architecture. Students who are admitted to the 3+ program receive graduate level preparation through an rigorous summer semester of studies in drawing, architectural history-theory and design studio. The ensuing fall semester, 3+ students join other M.Arch. 3-year program candidates for the remaining complement of design studios and courses. Physics and pre-calculus are required; drawing and architectural/art history are preferred.

**Advanced standing**—Though the core program is three years in length, students who have completed a pre-professional degree in architecture may apply for advanced standing, which enables them to enter directly into the second year of the 3-year program. Admission with advanced standing is infrequent, and is evaluated on a case-by-case basis. In addition to the prerequisites indicated for the 3-year program, advanced standing applicants must have completed at least one course in structures and building systems, and advanced design studios.

**Post-professional**—A small group of students who already hold a professional degree (B.Arch. or M.Arch) participate in the master of architecture program as a special category of advanced standing student. The director of graduate studies tailors the program to post-professional students’ specific needs, insuring that they have met all NAAB requirements prior to graduation. The reduced course requirements allows completion of advanced electives or cross-disciplinary courses in studio, technology, representation, digital design, history, theory or metropolitan design, or undertake coursework towards a master of science degree or a certificate in metropolitan design. They must be in residence a minimum of 3 semesters and complete 21 semester credits plus a thesis (an additional 12 credits).

Master of science in architecture sustainable design track applicants must have a Bachelor degree in architecture or a related field. Application requirements include a written statement, transcripts of all coursework, three faculty recommendations and the department financial aid form. The 2-3 page statement should outline a probable research agenda, topics or themes that the applicant wishes to pursue, including information about the applicant’s preparation for the field and career goals by January 15 directly to the Department. A portfolio and GRE results are recommended but optional.

**Special Application Requirements**—Admission to the M.Arch. program is highly competitive. In addition to meeting Graduate School application requirements, all M.Arch. students applying to the program must demonstrate design talent in a portfolio and must submit all of the following: a one-page statement of interest, transcripts of all coursework, three faculty recommendations, a recent paper written in English, GRE scores and the optional department financial aid form. The portfolio should be no larger than 8.5” x 11”. International students must submit scores from the TOEFL or the MELAB. For all applicants, the department may waive requirements for required courses when they are equivalent to those offered by the department.

**Accreditation and Licensing**—In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes two types of degrees: the bachelor of architecture and the master of architecture. A program may be granted a six-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards.

Master’s degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree.

The master of architecture degree program at the University of Minnesota College of Architecture and Landscape Architecture is fully accredited by the NAAB.

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

**Use of 4xxx Courses**—4xxx courses cannot be included on degree program forms without the permission of the adviser and director of graduate studies.

**M.Arch. Degree Requirements**

The professional M. Arch. curriculum requires completion of 78 course credits and a 12 credit design studio Plan A Thesis. M.Arch. students can expect to complete the program in six semesters (three years), including the pre-thesis research phase and the thesis studio thesis. The first three semesters include an integrated core curriculum in studio, building and environmental technologies, history-theory and digital methods. The core curriculum is followed by three semesters of “options” studios and elective courses in urbanism, practice, representation and the integrated studio.

**Language Requirements**—None.

**Final Exam**—An oral presentation, a visual presentation of the thesis and the submission of the written thesis document are required for the M.Arch.

**M.S. Degree Requirements**

Students are admitted to the M.S. Sustainable Design Track under either Plan A or Plan B. Both programs are 34-credits, including 18 course credits in sustainable design core and elective courses, 6 course credits outside the department in disciplinary studies and either a ten credit Plan A thesis or Plan B masters projects. Architecture graduate students may complete the M.Arch. and the M.S. in sustainable design with concurrent enrollment over an additional year.

**Language Requirements**—None.

**Final Exam**—An oral presentation, a visual presentation of the thesis and the submission of the written thesis document are required for the MS Plan A. The Plan B MS requires an oral examination.
Degree Programs and Faculty

Art

Contact Information—Department of Art, University of Minnesota, E201 Regis Center for Art, 405 21st Avenue S., Minneapolis, MN 55455; 612-625-8096; fax 612-625-7881; artdept@umn.edu; http://artdept.umn.edu.

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

Professor
Karl E. Bethke, (emeritus), AM2
Curtis C. Hoard, M2
M. Diane Katsiafas, M2
Clarence E. Morgan, M2
Mark Pharis, M2
Wayne E. Potratz, M2
Thomas A. Rose, M2

Associate Professor
Guy A. Baldwin, M2
Thomas R. Cowette, M2
David Feinberg, M2
Lynn A. Gray, M2
Gary L. Hallman, M2
James V. Henkel, M2
Jerald A. Krepps, M2
Alexis Kuh, M2
Thomas J. Lane, M2
Lynn T. Lukkas, M2
Joyce Lyon, M2

Assistant Professor
Christine A. Baeumler, M2
Jan Estep, M2
Andrea Stanislav, M2
Diane Willow, M2
Tetsuya Yamada, 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 master of fine arts program places major emphasis on creative studio work of high quality. It promotes not only the conceptual and technical education of the professional artist in the context of the studio environment, encouraging critical inquiry, excellence, and an understanding of the history of art, but also an experimental approach toward each media. The following areas of concentration are available: ceramics, drawing and painting, photography, printmaking, sculpture, and time and interactivity. The M.F.A. is considered the terminal degree in the field of fine arts and is typically the degree required to teach at the college or university level.

Prerequisites for Admission—An undergraduate degree is required.

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

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

Use of 4XXX Courses—Inclusion of 4XXX courses in the related field (other than art history) on the degree program form is subject to the adviser and director of graduate studies approval.

M.F.A. Degree Requirements
The M.F.A. program requires a total of 60 credits. It is typically a three-year program and studio space is provided for a maximum of three consecutive years for the pursuit of appropriate visual research. The program requires that coursework be completed prior to the final year of creative thesis registration. Candidates must plan programs with their advisers to include the graduate seminars ArtS 8400 (taken in the first term) and ArtS 8410 (taken in the second year) and up to 18 credits of creative thesis coursework. The related field requirement of 9 credits includes three courses in the history of art (or two courses in the history of art and one course from another academic department pertinent to the student’s program). Candidates must be reviewed annually for progress through the program. At the end of the thesis year, candidates demonstrate their visual research accomplishments through a solo, creative thesis exhibition on campus, a supporting paper, and a final oral exam.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A minor in art may be obtained by candidates in a master’s program by completing 9 credits of graduate level coursework chosen in consultation with the director of graduate studies in art. Candidates in a Ph.D. program must complete 12 credits. The minor must include ArtS 8400—Theoretical Constructions in Contemporary Art.

Art Education

See Education, Curriculum, and Instruction.

Art History

Contact Information—Department of Art History, University of Minnesota, 338 Heller Hall, 217 19th Avenue South, Minneapolis, MN 55455; 612-625-4400; fax 612-625-8679; arthist@umn.edu; www.arthist.umn.edu.

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

Professor
Frederick M. Asher, SM
Frederick A. Cooper, SM
Kara Ann R. Marling, SM
Evan M. Maurer, AM
Sheila J. McNally, SM
Robert J. Poor, SM
Leon G. Satkowski, ASM
Gabriel P. Weisberg, SM

Associate Professor
W. John Archer, ASM
Catherine B. Asher, SM
Jane M. Blocker, SM
Lyndel I. King, AM
Robert B. Silberman, SM
Katherine M. Solomonson, ASM
John W. Steyean, SM

Assistant Professor
Ritu Bhatt, AM
Michael Gaudio, SM
Branislav Jakovljevic, AM
Elizabeth Kurz, AM
Diane Mullin, 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—Areas of specialization:
American art, architecture, and popular culture; early modern art; East Asian art and Bronze Age archaeology; Greek and Roman art and archaeology; Islamic art and architecture; Late Gothic and northern Renaissance art; modern art and theory, including film and photography studies as well as nineteenth through twenty-first century art; and South Asian art and architecture.

Prerequisites for Admission—For the M.A. program, a bachelor’s degree is required, preferably in art history or a closely related field. Ability and scholarly promise must be demonstrated by a past record of academic excellence. For the Ph.D. program, an M.A. degree in art history or in a field closely related to the chosen area of specialization is required, as well as coursework or other experience indicating substantial background in art historical methods and knowledge.
Degree Programs and Faculty

Special Application Requirements—For the M.A. program, results from the GRE General Test, at least one substantial research paper in art history, and three letters of recommendation from persons well acquainted with the applicant’s research and writing skills are required. In addition, M.A. applicants must provide a detailed statement describing previous experience and academic training as related to the projected course of study and academic goals.

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

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

Art History Visual Resources Center—The Art History Visual Resources Center (VRC) is located at 460 Heller Hall. The center has holdings of approximately 250,000 slides, ten percent of which are in digital format and accessible online, and 100,000 photo archives, with content ranging from the prehistoric to the contemporary, in architecture, sculpture, painting, and other media, from all areas of the world. In addition, there is a collection of over 300 films.

Courses—Please refer to Art History (ArtH) in the course section of this catalog for courses pertaining to the program.

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

M.A. Plan B Degree Requirements

A minimum of 36 course credits (about 12 courses) is required, including at least two 8xxx seminars in art history. A minimum of 21 credits must be art historical in content and drawn from courses in at least three of the following areas: American, ancient, early modern, East Asian, Islamic, medieval, modern and contemporary, South Asian. Of these, three courses must be in an area of primary concentration, two courses in an area of secondary concentration, and one course in a third area. Students focusing on Asian/Islamic art must take at least one course in western art. Students focusing on western art must take at least one course in Asian/Islamic art. In addition, students must take 6 credits in courses that are not art historical in content. The remaining 9 credits may be either in art history or outside the discipline; this is decided in consultation with the adviser and the director of graduate studies. Two Plan B papers are required, the first of which should be completed by the end of the first year of full-time study.

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

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

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

Ph.D. Degree Requirements

A minimum of 54 course credits (about 18 courses) is required. At least 18 credits (about six courses) must be in an area of primary concentration within art history, while a minimum of 9 credits (about three courses) must be in an area of secondary concentration in art history. In addition, at least 6 credits (about two courses) must be outside the field of art history in the minor or supporting program beyond work done at the M.A. level; a minimum of 12 credits in a minor or supporting field is required.

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

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

Asian Literatures, Cultures, and Media

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

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

Professor

Joseph R. Allen, SM
Arlene A. Teraoka, German, Scandinavian, and Dutch, ASM
Ann B. Walther, History, SM

Associate Professor

Catherine Asher, Art History, ASM
Daniel Brewer, French and Italian, ASM
Jeffrey Broadbent, Sociology, ASM
Keya Ganguly, Cultural Studies and Comparative Literature, ASM
Michael Molasky, SM
Richa Nagar, Women's Studies, ASM
Paul Rouzer, SM
Ajay Skaria, History, ASM

Assistant Professor

Mark Anderson, SM
Jigna Desai, Women's Studies, ASM
Jason McGrath, SM
Hiromi Mizuno, History, ASM
Maki Isaka Morinaga, SM
Simona Sawhney, 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 Asian Literatures, Cultures, and Media (ALCM) program is organized around three intersecting categories of knowledge: 1) language of concentration, 2) focus of study, 3) theory or problematic. Students must designate a language of concentration on their ALCM Program Application Form. Currently, students may select Chinese, Japanese, or Hindi/Urdu for their language of concentration. However, it is possible to select another South Asian language with permission of the director of graduate studies. For details, see the graduate program Web site at www.all.umn.edu.

Prerequisites for Admission—Only applications from students seeking the Ph.D. degree are considered, although applicants are not required to have taken graduate coursework before entering the program.

The M.A. is offered as an exit degree or full-time study. For up-to-date graduate faculty listings, see www.all.umn.edu.

Information section of this catalog for courses pertaining to the program.

Special Application Requirements—The following are required by the department: completed ALCM application form, official transcripts, three letters of recommendation, an intellectual profile, a writing sample, GRE scores, and for international applicants, IELTS or TOEFL scores. Applications (including all supporting materials) must reach the ALCM Graduate Studies Committee and the Graduate School by January 15.

Courses—Please refer to www.all.umn.edu for courses pertaining to the program.
Use of 4xxx Courses—4xxx courses may not normally be included on degree program forms for the ALCM graduate major or minor.

M.A. Degree Requirements
The M.A. is offered under Plan B only, which requires 30 credits (including at least 12 from other departments). A Ph.D. qualifying exam, normally given at the end of the student’s second year in the program, also serves as the M.A. exam. Students entering the program with an M.A. in a related field can take this qualifying exam after one year of study, with approval of the director of graduate studies.

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

Final Exam—consists of the following: (1) Written language exam(s): typically an in-room reading/translation exam on materials directly related to study and research interests; (2) Oral presentation and interview (conducted in the language of concentration), discussing the materials that were part of the written exam; (3) Submission of two Plan B research papers for evaluation (normally papers from two different classes, revised for submission); (4) Oral exam (in English) by the above committee, based on the submitted papers.

Ph.D. Degree Requirements

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

Minor Requirements for Students Majoring in Other Fields—For the doctoral minor, students are expected to take a minimum of 15 credits in graduate courses offered in the Department of Asian Languages and Literatures, 8 of which must be at the 8xxx level; the student must also pass the reading language exam that is part of the Ph.D. qualifying exam for ALCM (see above). The director of graduate studies acts as the student’s adviser and approves a course of study.

Astrophysics
Contact Information—Department of Astronomy, University of Minnesota, 356 Tate Laboratory of Physics, 116 Church Street S.E., Minneapolis, MN 55455 (612-624-0211; fax 612-626-2029; grad-req@astro.umn.edu; www.astro.umn.edu/).

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

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

Associate Professor
Shaul Hanany, Physics, ASM
Yong-zhong Qian, Physics, ASM
Lilya L. R. Williams, SM
John R. Wygant, Physics, ASM

Assistant Professor
Michael DuVernois, Physics, ASM
Kim A. Venn, ASM

Senior Research Associate
David H. Porter, 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—Astrophysics is the study of the universe and its constituent parts. The program offers emphases in observational, theoretical, and computational astrophysics and in instrument development. The main research areas include properties and dynamics of normal and active galaxies, quasars, stellar evolution, interaction of stars with their environments, the interstellar medium, astrophysical magnetohydro-dynamics, and galactic and cosmological structure. Observational research includes activities that cover X-ray, ultraviolet, optical, infrared, and radio wavelengths. Extensive research programs in space physics and the elementary particle-cosmology interface are also carried out in interdisciplinary connections with the graduate program in physics.

Prerequisites for Admission—For major work, an undergraduate degree in astronomy or physics or the equivalent is required. Contact the director of graduate studies for exceptions.

Special Application Requirements—A statement of career goals, scores from the GRE General (Aptitude) Test and Subject (Advanced) Test in physics, and three letters of recommendation are required. Applications for financial aid are due January 15. Applications are accepted for entry into fall semester only.

Facilities—The Department of Astronomy has purchased a 5 percent share in the Large Binocular Telescope (LBT) on Mount Graham in southeastern Arizona. The LBT is currently under construction through a consortium of universities and research institutes led by the University of Arizona and has an expected completion date of 2005. This purchase will also allow the department to trade time on the LBT for time on several other telescopes—including the 6.5 meter upgraded Multiple Mirror Telescope, the two 6.5 meter Magellan telescopes in the southern hemisphere, and the 10 meter Heinrich Hertz millimeter radio telescope—as well as other smaller telescopes in Arizona, providing guaranteed access to multi-wavelength capabilities.

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

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

The astronomy department maintains a large network of Linux-based computers used for the reduction and analysis of X-ray, ultraviolet, optical, and radio observations. The department is connected through an Ethernet backbone to clusters of supercomputers and superworkstations at the University’s Digital Technology Center and the Laboratory for Computational Science and Engineering. These facilities are available to faculty and students for their research.

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

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

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

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

Language Requirements—None.
Final Exam—The final exam is oral.

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

Ph.D. Degree Requirements
The Ph.D. degree requires a minimum of 40 course credits, including a year of classical physics (Phys 5011-5012) and 12 credits in a minor or supporting program; 24 thesis credits are also required. The graduate written examination, offered during the spring, must be passed on the second “real” attempt (first-year students are given a free trial). A second-year project must be defended by the end of the fall semester of the third year. The preliminary oral exam must be passed by the end of the third year.

Language Requirements—None.

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

Biochemistry, Molecular Biology, and Biophysics

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

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

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

Professor
Matthew T. Andrews, Biology, Duluth, SM
Ian M. Armbrug, SM
Leonard J. Banaszak, SM
George Barany, Chemistry, SM
David A. Bernlohr, SM
Victor A. Bloomfield, SM
Robert J. Brooker, Genetics, Cell Biology, and Development, SM
Bianca M. Conti-Fine, SM
Anath Das, SM
Lester R. Drewes, Biochemistry and Molecular Biology, Duluth, SM
Michael C. Flickinger, SM
James A. Fuchs, SM
Thomas S. Hays, Genetics, Cell Biology, and Development, SM
Alan B. Hooper, SM
David C. LaPorte, SM
John D. Lipscomb, SM
Dennis M. Livingston, SM
Kevin H. Mayo, SM
Matthew F. Mescher, Laboratory Medicine and Pathology, SM
Karim Muser-Forsyth, Chemistry, SM
Gary L. Nelsen, SM
Michael B. O’Connor, Genetics, Cell Biology, and Development, SM
Douglas H. Ohlendorf, SM
Harry T. Orr, Laboratory Medicine and Pathology, SM
Joseph R. Prohaska, Biochemistry and Molecular Biology, Duluth, SM
Lawrence Que, Chemistry, SM
Michael J. Sadowsky, Soil, Water, and Climate, SM
Michel M. Sanders, SM
Claudia Schmidt-Dannert, SM
Janet L. Schottel, SM
David D. Thomas, SM
Howard C. Towle, SM
Brian G. Van Ness, SM
Lawrence P. Wackett, SM
Kendall B. Wallace, Biochemistry and Molecular Biology, Duluth, SM

Associate Professor
Kenneth W. Adolph, SM
Vivian J. Bardwell, Genetics, Cell Biology, and Development, SM
Benjamin L. Clarke, Medical Microbiology and Immunology, Duluth, SM
Antony Michael Dean, BioTechnology Institute, SM
Stephen C. Ekker, Genetics, Cell Biology, and Development, SM
Eric A. Hendrickson, SM
Romas J. Kazlauskas, SM
Alex J. Lange, SM
Sharon E. Murphy, SM
Merry Jo Oursler, Biology, Duluth, SM
Lincoln R. Potter, SM
Robert J. Roos, SM
Ann E. Rougvie, Genetics, Cell Biology and Development, SM
Claudia Schmidt-Dannert, SM
Paul G. Siliciano, SM
Jeffrey A. Simon, Genetics, Cell Biology, and Development, SM
Jennifer J. Westendorf, Cancer Center, SM
David A. Zarkower, Genetics, Cell Biology, and Development, SM

Assistant Professor
Anja K. Bielinsky, SM
Robert Cormier, Biochemistry, Duluth, SM
Deborah A. Ferrington, Ophthalmology, SM
Arun Goyal, Biology, Duluth, SM
Timothy J. Griffin, SM
Reuben S. Harris, SM
Julio E. Herrera, SM
Arkady B. Khodursky, SM
Do-Hyung Kim, SM
Hiroshi Matsuvo, SM
Laura J. Mauro, Animal Science, SM
Edward Perkins, Biochemistry, Duluth, SM
Robert J. Sheaff, SM
Gianluigi Veglia, Chemistry, SM
Kylie J. Walters, SM
Carrie M. Wilmot, 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 biochemistry, molecular biology, and biophysics program focuses on an explanation at the molecular level of the structures and processes that occur in living organisms. In the broadest sense, the program encompasses the chemistry, physics, and biology of living systems. Included is the study of the structure and function of biomolecules (proteins, nucleic acids, lipids, and carbohydrates), enzyme catalysis, metabolic pathways, bioenergetics, and the biochemical nature of genetic information storage and transmission, as well as the control, regulation, and integration of these processes. The program has four areas of emphasis: regulatory biochemistry, molecular biology, microbial biotechnology, and molecular biophysics. All students are expected to demonstrate a minimum level of competence in these areas but emphasize that area most related to their thesis project. The program involves faculty from the Department of Biochemistry, Molecular Biology, and Biophysics, as well as many faculty members from several other departments in the College of Biological Sciences, Medical School, Institute of Technology, and College of Veterinary Medicine.

Prerequisites for Admission—The program is flexible enough to accommodate students with a wide variety of educational backgrounds. Applications from students with undergraduate or master’s degrees in the biological, chemical, or physical sciences are encouraged. Recommended academic preparation includes one year each of calculus, organic chemistry, and basic biology, including biochemistry and genetics. For students of demonstrated ability, background deficiencies can be made up during the first year of graduate study. Students are admitted only to the Ph.D. program.

Special Application Requirements—Applicants must submit three letters of recommendation from persons familiar with their academic and research capabilities. A statement of interests and goals, a complete set of transcripts, and official scores from the General Test of the GRE are required. The GRE Subject Test in biochemistry, cell and molecular biology, biology, or chemistry is strongly recommended, but not required. The
recommended date for receipt of completed applications is January 2. Completed files are reviewed between January and February. Graduate studies typically begin fall semester. Information about an early start program involving participation in laboratory research beginning on July 1 may be obtained from the director of graduate studies.

Courses—Please refer to Biochemistry (BioC) 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 written approval from a director of graduate studies.

M.S. Plan A Degree Requirements

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

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires 6 credits of general graduate level coursework which may be selected (with approval by the director of graduate studies) from the 5xxx and 8xxx courses offered by the program. BioC 4331 and 4332 may also be considered if approved by the directors of graduate studies of both the major and minor programs.

Ph.D. Degree Requirements

Requirements for the doctoral degree include core coursework and laboratory experiences taken by all students, followed by one or more courses in one of the areas of specialization. In addition, all students are expected to participate in two continuing series of seminars: one involving student reports on current literature and research and the other involving prominent national and international scientists.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires BioC 8002 (4 credits) plus additional courses (8 credits), approved by the director of graduate studies, to meet the minimum requirement of 12 total credits. In extenuating cases, students may petition the director of graduate studies for substitution of a required course.

Bioethics

Minor Only

Contact Information—Graduate Minor in Bioethics, Center for Bioethics, University of Minnesota, N504 Boynton, 410 Church St. SE, Minneapolis MN 55455 (612-624-9410; fax 612-624-9108; bioethix@umn.edu; www.bioethics.umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step1.asp.

Professor

Muriel Bebeau, Preventive Sciences, M
Dan Burk, Law, M
Ronald Cranford, Neurology, M
Norman Dahl, Philosophy, M
Raymond DeVries, AM
Carl Elliott, Pediatrics, M
John Eyler, History of Medicine, M
Jasper Hopkins, Philosophy, M
Jeffrey Kahn, Medicine, M
Rosalie Kane, Public Health, M
David Mayo, Philosophy, Dulfuth, M
Steven Miles, Medicine, M
Naomi Scheman, Philosophy, M
Susan M. Wolf, Law School, M

Associate Professor

John Dolan, Philosophy, M
Joan Liaschenko, Nursing, M
Gregory Plotnikoff, Medicine, M
Michael Root, Philosophy, M

Assistant Professor

Debra DeBruin, Medicine, M
Edward Ratner, Medicine, M
John Song, Medicine, M
Karen-Sue Taussig, Medicine, M
Maryam Valapour, Medicine, M
Beth Virnig, Health Services Research and Policy, M

Other

Dianne Bartels, Center for Bioethics, M

Curriculum—The Center for Bioethics, in close cooperation with the Department of Philosophy, offers a minor in bioethics for master’s (M.A. and M.S.) and doctoral students with approval of the director of graduate studies in bioethics. The minor provides a structured program of study as well as formal recognition for academic accomplishments in the field.

While recognizing that philosophy is the focal discipline for the study of bioethics, the minor offers numerous opportunities for multidisciplinary study, including in history and philosophy of medicine, health law and public policy, health-care economics, professional ethics, clinical ethics, medical humanities, and moral development.

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

Special Application Requirements—Contact the director of graduate studies in bioethics for an Intent to Enroll form, which should be submitted by the middle of the spring semester the year before initiating coursework in the minor. The form is also available in a PDF of the Graduate Minor in Bioethics Brochure at www.bioethics.umn.edu/education/grad_minor.pdf. Enrollment is contingent upon approval by the director of graduate studies for bioethics.

Courses—Please contact the minor program office or the Center for Bioethics Web site at www.bioethics.umn.edu/education for information on relevant coursework.

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

Minor Only Requirements

Students Majoring in Philosophy—Master’s students (M.A. and M.S.) must complete a minimum of 8 graduate credits in bioethics consisting of 6 credits of required courses and 2 credits of electives outside the Department of Philosophy.

Doctoral students must complete a minimum of 14 graduate credits in bioethics consisting of 8 credits of required courses and 6 credits of electives outside the Department of Philosophy.

Students Majoring in a Field Other Than Philosophy—Master’s students (M.A. and M.S.) must complete a minimum of 8 graduate credits in bioethics outside the student’s major consisting of 6 credits of required courses and 2 credits of electives. Master’s students are not required to take electives in bioethics and cognate areas, but are encouraged to do so.

Doctoral students must complete a minimum of 14 graduate credits in bioethics outside the student’s major consisting of 8 credits of required courses and 6 credits of electives.

Bioinformatics

Minor Only

Contact Information—Graduate Minor Program in Bioinformatics, Department of Laboratory Medicine and Pathology, University of Minnesota, MMC 511, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-625-8440; fax 612-625-7166; www.binf.umn.edu).

For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step2.asp.

Professor

Daniel Boley, Computer Science, M
John Carlis, Computer Science, M
Lynda B. M. Ellis, Laboratory Medicine and Pathology, M
Alexander Grosberg, Physics, M
Vivek Kapur, Microbiology, M
Claudia Neuhouser, Ecology, Evolution, and Behavior, M
Hans Othmer, Mathematics, M
Degree Programs and Faculty

Lawrence P. Wackett, Biochemistry, Molecular Biology, and Biophysics, M
Nevin Dale Young, Plant Pathology, M

**Associate Professor**
Colin Campbell, Pharmacology, M
Yang Da, Animal Science, M
Scott Fahrenkrug, Animal Science, M
George Karypis, Computer Science, M
Georgiana May, Ecology, Evolution, and Behavior, M
Wei Pan, Biostatistics, M

**Assistant Professor**
Yiannis Kaznessis, Chemical Engineering and Materials Science, M
Arkady Khodursky, Biochemistry, Molecular Biology, and Biophysics, M
Cavan Reilly, Biostatistics, M

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

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

**Courses**—Courses are taken from a designated course list available online at [www.binf.umn.edu/courses.htm](http://www.binf.umn.edu/courses.htm)

**Use of 4xxx Courses**—Biol 4003—Genetics and CSci 4707—Practice of Database Systems are the only 4xxx course that may be included on degree program forms.

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

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

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### Biological Science

**Contact Information**—Master of Biological Science, Professional Program, College of Biological Sciences, 127 Snyder Hall, 1475 Gortner Avenue, St. Paul, MN 55108 (612-625-3133; fax 612-624-2785; biolink@umn.edu) [www.cbs.umn.edu/biolink/bioinfo/](http://www.cbs.umn.edu/biolink/bioinfo/)

For up-to-date faculty listings, see [www.grad.umn.edu/faculty_rosters/step](http://www.grad.umn.edu/faculty_rosters/step)

**Professor**
John S. Anderson, Biochemistry, Molecular Biology, and Biophysics, M2
Jay Bell, Soil, Water, and Climate, AM2
Judith G. Berman, Molecular, Cellular, Developmental Biology and Genetics, M2
David A. Bernlohr, Biochemistry, Molecular Biology, and Biophysics, M2
Linda J. Brady, Food Science and Nutrition, AM2
Robert M. Brambl, Plant Biology, M2
Paul P. Cleary, Microbiology, AM2
Gary M. Dunny, Microbiology, AM2
Leonard C. Ferrington, Entomology, AM2
James A. Fuchs, Biochemistry, Molecular Biology, and Biophysics, M2
Daniel D. Gallaher, Food Science and Nutrition, AM2
Ralph W. Holzental, Entomology, AM2
Paul A. Iaizzo, Surgery, AM2
Ronald R. Jemmerson, Microbiology, AM2
Ross G. Johnson, Molecular, Cellular, Developmental Biology and Genetics, AM2
John H. Kersey, Laboratory Medicine and Pathology, AM2
Youngki Kim, Pediatrics, AM2
Richard King, Pediatrics, AM2
Mindy S. Kurzer, Food Science and Nutrition, AM2
Paul T. Magee, Microbiology, M2
Michael Mauer, Pediatrics, M2
Gary L. Nelsestuen, Biochemistry, Molecular Biology, and Biophysics, AM2
Harry T. Orr, Laboratory Medicine and Pathology, M2
Laura P. W. Raman, Genetics, Cell Biology, and Development, M2
Gary A. Reineccius, Food Science and Nutrition, AM2
Michael J. Sadowsky, Soil, Water, and Climate, AM2
Leslie A. Schiff, Microbiology, AM2
Patrick M. Schlievert, Microbiology, AM2
Michael J. Simmons, Molecular, Cellular, Developmental Biology and Genetics, M2
Donald B. Sniff, Ecology, Evolution, Behavior, ASM
Joanne L. Slavin, Food Science and Nutrition, AM2
D. Peter Snustad, Plant Biology, M2
George R. Spangler, Fisheries, Wildlife, and Conservation Biology, AM2
Clifford J. Steer, Medicine, SM
Howard Towle, Biochemistry, Molecular Biology, and Biophysics, M2
Daniel A. Varella, Therapeutic Radiology, AM2
Brian G. Van Ness, Laboratory Medicine and Pathology, M2
Lawrence P. Wackett, BioTechnology Institute, M2
Clifford M. Wetmore, Plant Biology, M2
Chester B. Whitley, Pediatrics, AM2

**Adjunct Professor**
Bruce Vondracek, Fisheries, Wildlife, and Conservation Biology, AM2

**Associate Professor**
Vivian J. Bardwell, Genetics, Cell Biology, and Development, M2
Gregory J. Beilman, Surgery, AM2
Wei Chen, Pediatrics, AM2
Kathleen F. Conklin, M2
Joelten Feitig, Food Science and Nutrition, AM2
Susan M. Galatowsitch, Horticultural Science, AM2
Craig A. Hassel, Food Science and Nutrition, AM2
Marc A. Hillmyer, Chemistry, AM2
Stephen Jameson, Laboratory Medicine and Pathology, AM2
David A. Largespada, Genetics, Cell Biology and Development, AM2
Christopher A. Pennell, Laboratory Medicine and Pathology, AM2
Lisa A. Peterson, Environmental Health Sciences, AM2

**Assistant Professor**
Vincent A. Barnett, Physiology, AM2
Richard W. Bianco, Surgery, AM2
Frank H. Burton, Pharmacology, ASM
David C. Fulton, Fisheries, Wildlife, and Conservation Biology, AM2
Cheryl A. Gale, Pediatrics, AM2
Nicole Kirchhoff, Surgery, AM2
Susan E. Marino, Pharmacy, AM2
Karen S. Oberhauser, Fisheries, Wildlife, and Conservation Biology, AM2
Anna Petryk, Pediatrics, AM2
Robert J. Sheaff, Cancer Center, AM2
Robert C. Venette, Entomology, AM2

**Research Associate**
Kevin A. Silverstein, Plant Biology, M2
Laura J. Suggs, Biomedical Engineering, 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**—A professional master of biological science (M.B.S.) degree is offered with concentrations in areas such as biochemistry, basic biology (animal, plant, cell, applied, and general), biotechnology, biophysics, ecology, environment, evolution, food science and nutrition, genetics, microbiology, molecular biology, and neuroscience. It is a multicollege, cooperative degree program among the Colleges of Biological Sciences; Veterinary Medicine; and Agricultural, Food and Environmental Sciences. The program is administered by the College of Biological Sciences and the degree is conferred by the Graduate School.

The M.B.S. is a highly flexible graduate-level practitioner-based program offered to meet the needs of a substantial portion of the working community who wish or need to increase their knowledge in areas related to modern biology. The program provides educational opportunities beyond those that aim at...
Degree Programs and Faculty

Biomedical Engineering

Contact Information—Department of Biomedical Engineering, University of Minnesota, 7-105 BSBE, 312 Church Street S.E., Minneapolis, MN 55455 (612-624-8396; fax 612-626-6583; bmengpp@umn.edu; www1.umn.edu/bmeng);

For up-to-date graduate faculty listings, see www1.umn.edu/faculty_rosters/step1.html.

Regents Professor
Robert P. Hebbel, Medicine, SM

Professor
James Ashe, Neural Engineering, SM
Robert J. Bache, Medicine, SM
David G. Benditt, Medicine, SM
John C. Bischof, Mechanical Engineering, SM
Frank B. Cerra, Surgery, SM
Wei Chen, Radiology, SM
Jay N. Cohn, Medicine, SM
Max Donath, Mechanical Engineering, SM
William K. Durfee, Mechanical Engineering, SM
Timothy J. Ebner, Neuroscience, SM
Arthur G. Erdman, Mechanical Engineering, SM
Stanley M. Finkelstein, Laboratory Medicine and Pathology, SM
Martha Flanders, Neuroscience, SM
John E. Foker, Surgery, SM
Lorraine F. Francis, Chemical Engineering and Materials Science, SM
Leo T. Furcht, Laboratory Medicine and Pathology, SM
James R. Gage, Orthopaedic Surgery, M2
Michael G. Garwood, Radiology, M2
Bin He, Biomedical Engineering, SM
Wei-Shou Hu, Chemical Engineering and Materials Science, SM
Paul A. Laizzo, Anesthesiology, SM
Kenneth H. Keller, Public Affairs, SM
Taral D. Kvalseth, Mechanical Engineering, SM
Paul C. Letourneau, Cell Biology and Neuroanatomy, SM
David G. Levitt, Physiology, SM
Jack L. Lewis, Orthopaedic Surgery, SM
Keith G. Lurie, Medicine, M2
James B. McCarthy, Laboratory Medicine and Pathology, SM
Jeffrey McCullough, Laboratory Medicine and Pathology, M2
Robert P. Patterson, Physical Medicine and Rehabilitation, SM
Dennis L. Polla, SM
Richard E. Poppele, Neuroscience, SM
Gundu H. R. Rao, Laboratory Medicine and Pathology, SM
William P. Robbins, Electrical and Computer Engineering, M2
Ronald A. Siegel, Pharmaceutics, SM
Ephraim M. Sparrow, Mechanical Engineering, SM
Doris Taylor, Physiology, SM
Ahmed H. Tewik, Electrical Engineering, SM
Gerald Timm, Urological Surgery, ASM
Robert T. Tranquillo, Biomedical Engineering, SM
Charles L. Truwit, Neurology, M2
J. Thomas Vaughan, Radiology, SM
Neil F. Vienneister, Psychology, SM
Timothy S. Wiedmann, Pharmaceutics, SM
Robert F. Wilson, Medicine, M2
Jay Zhang, Medicine, SM

Associate Professor
Jerome H. Abrams, Surgery, SM
Edgar A. Arriaga, Chemistry, SM
Alan J. Bank, Medicine, M2
Victor H. Barocas, Biomedical Engineering, SM
J. David Brown, Ophthalmology, M
Gladwin S. Das, Medicine, SM
Emad S. Ebbini, Electrical and Computer Engineering, SM
William B. Gleason, Laboratory Medicine and Pathology, SM
Bruce E. Hammer, Radiology, SM
Ramesh Harjani, Electrical and Computer Engineering, M2
James E. Holte, Electrical and Computer Engineering, SM
Allison Hubel, Laboratory Medicine and Pathology, SM
Robert LaPrade, Orthopaedic Surgery, M
Ronald C. McGlennen, Laboratory Medicine and Pathology, M2
Tom Novackeck, Orthopaedic Surgery, AM
David J. Odde, SM
Kenneth P. Roberts, Urological Surgery, SM
Clark M. Smith II, Pediatrics, SM
Babak Ziaie, Electrical and Computer Engineering, M2

Assistant Professor
Joan E. Bechtold, Orthopaedic Surgery, M2
Michael Bowser, Chemistry, SM
Linda K. Hansen, Laboratory Medicine and Pathology, SM
Goran Hellekant, Physiology and Pharmacology, SM
Efrosini Kokkoli, Chemical Engineering and Materials Science, M
Haiying Liu, Radiology, M2
Jennifer Maynard, Chemical Engineering and Materials Science, SM
A. David Redish, Neuroscience, M2
Osha Roopnarine, Biochemistry, Molecular Biology and Biophysics, SM
Michael H. Schwartz, Orthopaedic Surgery, SM
Carl S. Smith, Urologic Surgery, M2
Chun Wang, Biomedical Engineering, SM

Instructor
Michel Cramer Bornemann, MD, Neurology, 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—Biomedical engineering is the application of engineering principles and methods to problems in biology and medicine. The discipline includes the study of fundamental processes in biology and physiology, the study of the diagnosis and treatment of disease and injury, and the design and development of medical devices and techniques. Students take courses in mathematics, biology, biomedical engineering, and areas of science and engineering that are relevant for the degree objectives.

Prerequisites for Admission—A baccalaureate degree in engineering or in a physical or biological science is required. Successful applicants without an engineering degree are required to complete appropriate coursework (including linear algebra and differential equations) before being admitted as a candidate for the degree. In most cases, this coursework is not considered part of the degree program.

Special Application Requirements—Three letters of recommendation and GRE scores are required of all applicants. For international students, the preferred performance minimum for the TOEFL is 575 (paper) or 230 (computer).

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

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

maintaining and improving productivity within the professions. It fills a gap in the present educational system for those who have neither the time nor the flexibility to earn a graduate degree through more traditional channels. It also provides this population with the most current information and advanced skills in their areas of professional interest, and gives them acknowledgment for their achievement. The degree enables recipients to learn new job skills, change professional emphasis, or provide added value to their present job.

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

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

M.B.S. Coursework Only Degree Requirements

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

Language Requirements—None.

Final Exam—A capstone project is required.
M.S. Degree Requirements
The M.S. is offered under two plans: Plan A (with thesis) and Plan B (with project). Each program requires courses in mathematics, biology, biomedical engineering, and relevant areas of science and engineering, and a minor or related field. Plan A requires completion of 25 course credits. Plan B requires completion of 35 course credits, including the research project. Coursework in a minor or supporting field must include a minimum of 6 credits for both Plan A and Plan B.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—The master’s minor requires at least 6 course credits, including one BMEn core course (5001, 5101, 5201, 5311, 5351or Biomedical Imaging—5920 currently) and one other BMEn course at 5xx or higher.

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

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—The doctoral minor requires at least 12 credits, including two BMEn core courses (5001, 5101, 5201, 5311, 5351or Biomedical Imaging—5920 currently), one course with a biological sciences emphasis (may be BMEn 5501), and one course with an engineering emphasis. All courses must be at 5xx or higher.

Biophysical Sciences and Medical Physics
Contact Information—Biophysical Sciences and Medical Physics Program, Department of Radiology, University of Minnesota, MMC 292, Room B272 Mayo Building, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-6638, sceu032@umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step.

Professor
Dwight L. Anderson, Oral Sciences, SM
Victor A. Blochfield, Biochemistry, SM
Bianca M. Conlin-Fine, Biochemistry, SM
Ralph DeLong, Oral Sciences, M2
William H. Douglas, Oral Sciences, SM
Stanley M. Finkelstein, Laboratory Medicine and Pathology, SM
John E. Foker, Surgery, SM
Michael G. Garwood, Radiology, SM
Rolf Gruetter, Radiology, SM
Russell K. Hobbie (emeritus), Physics and Astronomy, ASM
Xiaoping Hu, Radiology, ASM
Faiz M. Khan (emeritus), Therapeutic Radiology, ASM
Merle K. Loken (emeritus), Radiology, ASM
Robert H. Margolis, Otolaryngology, SM
Scott M. O’Grady, Animal Science, SM
Robert P. Patterson, Physical Medicine and Rehabilitation, SM
Richard E. Poppele, Physiology, SM
E. Russell Ritenour, Radiology, SM
Chang W. Song, Therapeutic Radiology, SM
David D. Thomas, Biochemistry, SM
Kamil Urgibi, Radiology, SM
Warren J. Warwick, Pediatrics, SM

Associate Professor
Alan J. Bank, Medicine, M2
Richard A. Geise, Radiology, ASM
Bruce J. Gerbi, Therapeutic Radiology, SM
Bruce E. Hammer, Radiology, SM
Patrick Higgins, Therapeutic Radiology, M2
James E. Holte, Electrical Engineering, SM
Michael Jerosch-Herold, Radiology, M2

Assistant Professor
Vincent A. Barnett, Physiology, M2
Mark J. Conroy, Radiology, M2
Bruce E. Hasselquist, Radiology, AM2
Haiying Liu, Radiology, M2
Kelly Rehm, Radiology, AM2

Senior Research Associate
Ching-Change Ko, Oral Science, M2
David H. Live, Biochemistry, Molecular Biology, and Biophysics, M2

Other
Kevin G. Waddick, 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 interdisciplinary program includes faculty members who have primary appointments in fields such as radiobiology, physics, engineering, computer science, physiology, dentistry, genetics, and biochemistry. Students concentrate in research areas such as molecular biophysics, medical imaging, magnetic resonance imaging and spectroscopy, radiobiology, radiation therapy physics, and mathematical biophysics and computation. A limited number of students prepare for employment as hospital-based medical physicists through a program that includes opportunities for coursework, laboratory work, and directed study to provide experience in areas such as purchase specification, acceptance testing, quality assurance, and radiation safety.

Prerequisites for Admission—All students should have some familiarity with physical chemistry, intermediate physics, intermediate mathematics, biostatistics, computer programming, biology, physiology, and biochemistry. This may be demonstrated by coursework completed at the undergraduate level or as part of the graduate program; by reading or practical experience; or by informal competency examinations.

Special Application Requirements—Three letters of recommendation and scores from the General Test of the GRE are required. Applicants are considered for admission in both semesters.

Courses—Please refer to Biophysical Sciences (BMEn) 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. Degree Requirements
The M.S. is offered under two plans: Plan A, with thesis, and Plan B, with project. Plan A is considered suitable for students with full-time employment whose thesis can be related to their work assignments. Plan B is more suitable for students planning to work in government or hospital settings where technical knowledge is more germane than research experience. Plan B students complete a project under the direction of a faculty member and present the work to their faculty committee in an oral exam. A total of 30 credits is required, including 14 in the major and 6 in a related field or minor.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—Programs are arranged on an individual basis and must consist of courses that represent a subfield of the discipline, e.g., radiobiology or medical physics. At least 6 credits of BMEn courses are required.

Ph.D. Degree Requirements
Ph.D. students take preliminary written exams at the end of the first year of study or as soon as possible after completing the core course sequence in topics in physics for medicine and biology. An oral preliminary exam focuses on the plan for thesis research and the student’s grasp of related information and is taken by the fall of the third year of full-time registration or its equivalent. At least 12 credits are required in a minor or supporting program. Additionally, 24 thesis credits are required.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Programs are arranged on an individual basis and must consist of courses that represent a subfield of the discipline, e.g., radiobiology or medical physics.

Biostatistics
Contact Information—Student Services Center, School of Public Health, University of Minnesota, MMC 819, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-3500 or 1-800-774-8636; fax 612-626-6921; spbh-scs@umn.edu, www.sph.umn.edu or www.biostat.umn.edu).
Three letters of recommendation and the GRE are required. Applicants should have an overall GPA of 3.10. Applicants to the M.S. program should have a GPA of 3.40 in quantitative courses, 450 on the verbal GRE, and 550 on the quantitative and analytical GRE. Applicants to the Ph.D. program should have a GPA of 3.70 in quantitative courses, 550 on the verbal GRE, and 650 on the quantitative and analytical GRE. Applicants to other programs who are not native speakers of English should have a TOEFL score of 600 (paper version) or 250 (computer version) or a score of 7.0 on IELTS.

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

Courses—Please refer to Public Health (PubH), where most biostatistics courses are numbered 64xx, 74xx or 84xx, or online at http://onestop2.umn.edu/courses/index.html.

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

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

Language Requirements—None.

Final Exam—The final exam is oral.

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

Ph.D. Degree Requirements
The Ph.D. program requires five core courses (including mathematical statistics, linear models, probability models, and Bayesian methodology) and four elective courses in biostatistical theory and methods, a preliminary written examination on the material from some of the required courses, a preliminary oral examination, a written dissertation, and dissertation defense in a final oral examination. This usually requires three years of full-time study after the M.S. degree.
Degree Programs and Faculty

include study in at least one other engineering discipline as well as study or research in a biological or agricultural discipline. Students have flexibility in planning individualized programs to support their research interests, and courses from other disciplines may be included for credit in the major area.

The program offers the following degrees: M.B.A.E., M.S.B.A.E., Plan A or Plan B, and Ph.D.

The master of biosystems and agricultural engineering (M.B.A.E.) is primarily a design-oriented professional degree intended for students who are already employed in engineering design positions, but the degree is also open to students who are not currently employed and students may select a coursework only option. The M.B.A.E. is normally considered to be a terminal degree; students who think they might pursue a Ph.D. would usually take the M.S., Plan A.

Graduate education in biosystems and agricultural engineering develops a strong foundation in engineering principles that are applied to problems involving biological and agricultural systems. The master of science in biosystems and agricultural engineering (M.S.B.A.E.) degree is for students with a bachelor’s degree in a biological, biosystems, agricultural, or related engineering field. Emphases are outlined above. Programs usually include study in at least one other engineering discipline as well as study or research in a biological or agricultural discipline. Students can select a Plan A, or thesis program, or Plan B without a thesis.

The Ph.D. degree is for students with exceptional research and problem-solving capabilities. It should build upon a strong undergraduate program in engineering, biology, and agricultural systems, and progress in rigor to prepare the student to research advanced biosystems and agricultural engineering problems. Emphases are outlined above. Programs usually include study in at least one other engineering discipline as well as study or research in a biological or agricultural discipline.

Prerequisites for Admission—Students having lower grade point averages or having non-engineering degrees may be admitted subject to conditions agreed upon by the adviser and the Biosystems and Agricultural Engineering Graduate Program Committee.

Special Application Requirements—The GRE is not required, but GRE scores are highly recommended for students who do not have engineering degrees, have degrees from institutions outside the United States, or have a low GPA. Students are admitted each semester.

Courses—Please refer to Biosystems and Agricultural Engineering (BAE) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Degree programs are expected to include mostly 5xxx and 8xxx courses. If the program contains more than three 4xxx courses in the M.S. program, or more than two 4xxx courses beyond the courses taken for the master’s degree in the doctoral program, students and their advisers are asked to include a letter of explanation when the degree program is submitted for approval.

M.B.A.E Degree Requirements
Students are required to complete a minimum of 14 course credits in the major field, 6 course credits in a related field or a minor, and a design project of a minimum of 10 credits. The design project is expected to be of professional caliber. As an alternative, students may opt for a coursework (30 credits) only program. The coursework program must be approved by the biosystems and agricultural engineering director of graduate studies and the chair of the graduate program committee.

Language Requirements—None.

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

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

M.S.B.A.E. Degree Requirements
The M.S.B.A.E. may be completed as either a Plan A (thesis) or Plan B (project). Plan A students must complete a minimum of 14 course credits in the major field, 6 course credits in a related field or a minor, and 10 thesis credits. Plan B students must complete a minimum of 14 course credits in the major field, 6 course credits in a related field or a minor, 10 other credits, and at least one Plan B project. All coursework programs must be approved by the biosystems and agricultural engineering director of graduate studies and the chair of the graduate program committee.

Language Requirements—None.

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

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

Ph.D. Degree Requirements
This degree is intended to move students to the cutting edge of research in their subject matter area. Students develop skills that enable them to define problems or research questions, plan research, conduct research and/or lead research efforts, analyze data, and communicate research results to a variety of audiences. All Ph.D. degree programs must include a minimum of 45 graduate course credits beyond the B.S. and a minimum of 24 doctoral thesis credits (BAE 8888). A minimum of 12 course credits must be in a minor field or in a supporting program. Ph.D. degree programs should contain a minimum of 9 course credits in a concentrated area of scientific or mathematical theoretical development that is related to the student’s research.

Language Requirements—None.

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

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

Business Administration
Contact Information—Ph.D. Program in Business Administration, Carlson School of Management, Suite 4-201, 321 19th Avenue S., University of Minnesota, Minneapolis, MN 55455 (612-624-8216 or 612-624-5065; fax 612-624-8211; bronson@csom.umn.edu; www.carlsonschool.umn.edu/Page798.asp).

Master of Business Administration—Graduate School students who wish to take MBA courses must contact the Carlson School of Management MBA Office, 2-210 Carlson School of Management, Minneapolis, MN 55455 (612-625-5555; fax 612-624-7785). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/steps/.

Professor
Carl R. Adams, Information and Decision Sciences, SM
Dennis A. Ahlburg, Human Resources and Industrial Relations, AM2
Gordon J. Alexander, Finance, SM
John C. Anderson, Operations and Management Science, SM
Richard D. Arvey, Human Resources and Industrial Relations, ASM
Frederick J. Beier, Marketing and Logistics Management, SM
Lawrence M. Benveniste, Finance, SM
Mark E. Bergen, Marketing and Logistics Management, SM
Norman E. Bowie, Strategic Management and Organization, SM
John H. Boyd, Finance, SM
Philip Bromiley, Strategic Management and Organization, SM
John M. Bryson, Public Affairs, Strategic Management and Organization, AM2
Chun Chang, Finance, SM
Norman L. Chervany, Information and Decision Sciences, SM
Shawn P. Curley, Information and Decision Sciences, SM
Gordon B. Davis, Information and Decision Sciences, SM
Prerequisites for Admission

Applicants must have completed an undergraduate degree, in any field. Scores from the GMAT or GRE test taken no more than five years prior to admission must be submitted.

Special Application Requirements—Applicants must submit a copy of the Graduate School application, GMAT or GRE scores, TOEFL or IELTS scores (international applicants), three letters of recommendation, complete official transcripts from each college or university attended, and a clearly written statement of purpose. These materials are to be sent directly to the program office to ensure proper processing. Graduate study begins in fall semester only.

Courses—Please refer to Accounting (Acct); Business Administration (BA); Business Law (BLaw); Finance (Fina); Information and Decision Sciences (IDS); Insurance and Risk Management (Ins); Logistics Management (LM); Management (Mgmt); Marketing (Mktg); and Operations and Management Science (OMS) 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 the approval of the adviser and director of graduate studies.
Degree Programs and Faculty

Ph.D. Degree Requirements
Degree requirements vary by area of concentration. Each student’s coursework is determined in consultation with an adviser, but in general a degree program includes courses in the field of specialization, in research methodology, and in a minor or supporting program. Students in all areas must complete at minimum 40 semester credits of graduate coursework.

Accounting—This area of concentration requires a minimum of 12 credits from accounting Ph.D. seminars. In addition, students take a minimum of 16 credits in a minor area outside the Carlson School of Management, or at least 16 credits in supporting programs taken across relevant fields (minimum of two courses from any one area). Students are expected to supplement these required credits with coursework in fields related to their research interests, e.g., finance, economics, statistics, or psychology. There is no minimum requirement.

Finance—Students must take all three finance classes (Fina 8801, 8811, 8821), for 12 credits, plus the microeconomics sequence (Econ 8001-8004 or Econ 8101-8104) for 8 credits, and an econometrics sequence. It is also highly recommended that students complete the microeconomics sequence. In addition, students should complete a minimum of 8 additional elective credits in economics, statistics, accounting, or a related field.

Information and Decision Sciences—Students are required to complete at least 46 semester credits of degree program coursework, including 14 credits of IDSc Ph.D. seminars, 8 credits of research methodology, and 16 credits of supporting or minor field coursework. Students are required to take IDSc 8511, 8521, 8711, and 8801 sections 1 and 2. Research methods courses that students can take include regression, experimental design, multivariate statistics, and econometric modeling. Students who lack in technical and business experience in IDSc may need to take MBA courses to increase their knowledge base.

Marketing and Logistics Management—The department requires students to take its five seminars (20 credits total) plus a minimum of 12 credits of research methodology courses outside the department. Minor or supporting program coursework is determined by the student and adviser, and must total at least 16 credits (these credits could overlap with the research methods coursework requirements).

Operations and Management Science—Students must complete 6 OMS Ph.D. seminars (OMS 8651, 8652, 8711, 8721, 8735, and 8745), and one graduate-level course in linear programming. Students supplement this with at least 16 credits from outside the department for a minor or supporting program. The department also recommends that students take Mgmt 8302—Seminar in Organizations Theory.

Strategic Management and Organization—Students are required to take at least five core SMO Ph.D. seminars (20 credits), which must include one course from each of three areas (strategy, organization studies, ethics—international management-entrepreneurship), plus all remaining Ph.D. seminars in the student’s area of specialization (strategy, organization studies). Alternatively, students may choose to combine two areas as their major area of concentration (e.g., strategy/international management, organization studies/entrepreneurship). It is highly recommended that students take the department’s theory building seminar. As part of the supporting field requirement (16 credits), students must take a strong methods sequence, which can be tailored to individual student needs, as well as coursework that leads to a good understanding of the fundamentals of a specific external discipline (e.g., economics, sociology).

Language Requirements—None.

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

Business Taxation
Contact Information—Master of Business Taxation Degree Program, Department of Accounting, University of Minnesota, 3-108 Carlson School of Management, Minneapolis, MN 55455 (612-624-7511; fax 612-626-7795; mbt@tc.umn.edu; www.mbt.carlson.umn.edu).

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

Professor
R. Glen Berryman (emeritus), Accounting, Business Law, M2
W. Bruce Erickson, Strategic Management and Organization, M2

Lecturer
Charles Caliendo, M2
Gary W. Carter, M2
Paul G. Guterman, M2
Frederick R. Jacobs, 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 helps students acquire a conceptual understanding of taxation and develop technical competence in the practical application of the rules of taxation in business and personal decision making.

Offered only in the evenings, the program accommodates both part-time and full-time students. Historically, more than 80 percent of students are employed in the business community and take courses on a part-time basis. Graduates of the program possess a common body of knowledge in traditional business areas such as accounting, finance, and marketing. In addition, courses in business, government, and economic tax policy provide breadth to complement the technical tax courses that make up the majority of credits. Students enrolled part-time can expect to complete the program in approximately two to three years. Students enrolled full-time can complete the program in a shorter period.

Special Application Requirements—Results of the GMAT or the Law School Admission Test (LSAT) are required. Applicants are considered for admission for fall, spring, and summer terms.

Courses—Please refer to Accounting (Acct); Business Law (BLaw); Finance (Fina); Information and Decision Sciences (IDSc); Insurance (Ins); Logistics Management (LM); Management (Mgmt); Marketing (Mktg); Master of Business Taxation (MBT); and Operations and Management Science (OMS) 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.B.T. Plan B Degree Requirements
The M.B.T. requires 30 credits, including 6 credits in specified courses dealing with accounting and business and economic tax policy, 10 credits in specified tax courses, and 14 credits of elective tax courses. All students must have completed coursework in finance, marketing, accounting, economics, statistics, management, business law, operations management, information and decision sciences, and strategic management. Although not prerequisites for admission to the MBT program, these courses must be completed before the degree is granted. They can be taken concurrently with MBT program courses. Usually students who enter the program with business degrees have completed most, if not all, of this coursework.

Final Exam—None.

Language Requirements—None.

Cell and Developmental Biology
See Molecular, Cellular, Developmental Biology and Genetics.
Cellular and Integrative Physiology

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

Additional information concerning the Duluth campus (master’s program) is available by contacting the Associate Director of Graduate Studies, Department of Physiology and Pharmacology, School of Medicine, University of Minnesota, 1035 University Drive, Duluth, MN 55812 (218) 726-7933; phsl@d.umn.edu; www.d.umn.edu/medweb/phsl/physiology.

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

Regents Professor
Robert P. Hebbel, Medicine, ASM

Professor
David A. Bernlohr, Biochemistry, Molecular Biology and Biophysics, ASM
Peter B. Bitterman, Medicine, ASM
Frank B. Cerra, Surgery, ASM
William C. Engeland, Surgery, ASM
John E. Foker, Surgery, ASM
Lois J. Heller, Medical School Duluth, SM
Paul A. Iaizzo, Surgery, SM
David H. Ingbart, Medicine, SM
Hon Cheung Lee, Pharmacology, ASM
Arthur S. Leon, Kinesiology, ASM
David G. Levitt, Physiology, SM
Walter C. Low, Neurosurgery, SM
Doris A. Taylor, Physiology, SM
Scott M. O'Grady, Animal Science, SM
John W. Osborn, Physiology, SM
O. Douglas Wangensteen, Physiology, SM

Associate Professor
Mustafa N. Al'Absi, Medical School Duluth, AM2
W. Dale Branton, Neuroscience, ASM
Janet L. Fitzakerley, Medical School Duluth, M2
Jurgen F. Fohlmeister, Physiology, SM
Stephen A. Katz, Physiology, SM
David E. Mohrman, Medical School Duluth, M2
Edward K. Stauffer, Medical School Duluth, M2
LaDora V. Thompson, Physical Medicine and Rehabilitation, SM
Lorentz E. Wittmers, Jr., Medical School Duluth, SM
Kathleen R. Zahs, Physiology, M2

Assistant Professor
Vincent A. Barnett, Physiology, M2

Lecturer
Lisa Carney Anderson, Physiology, 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—Physiology may be defined as the application of mathematics, physics, and chemistry to the study of structure and function in living systems. As such, physiology is a “hybrid” field in which expertise from many other disciplines is ordinarily required and combined.

The program emphasizes a quantitative approach to understanding the functions of cells, organs, and systems in living animals. Ph.D. students take a core concentration that provides a broad background in the physiology of membranes, cells, transport, and organ systems. Individualized programs are structured to build on the student’s strengths and to fill in gaps that would otherwise be an impediment to specific problem solving. Teaching experience is also available to all students.

Areas of specialization include cardiovascular, respiratory, membrane and transport processes, cell physiology, and to a limited extent, exercise, gastrointestinal physiology, and endocrinology.

Students enter the M.S. program from one of two sites. On the Duluth campus, students can enroll in coursework and participate in research in several basic areas. Students may pursue studies in muscle, cardiovascular, respiratory, and endocrine physiology, as well as in membrane transport, temperature regulation, and several areas of neuroscience.

In addition, the Twin Cities campus has a special masters program that focuses on training people in local private industries who are engaged in relevant physiological projects. People working in various biotechnology, biomedical, and bioengineering companies in the Twin Cities area and doing work in physiology may benefit from formal training. The curriculum can be blended into a part-time graduate program, allowing continued employment while working for the M.S. degree.

Students enter the Ph.D. program only from the Twin Cities campus; although a Ph.D. may be pursued on the Duluth campus in some circumstances. Highly qualified individuals with solid quantitative backgrounds are encouraged to apply. Additionally, people with previous medical training who are already at the University of Minnesota or are considering the University of Minnesota Medical School for residency or fellowship training may apply. Also, people already affiliated with physiology graduate faculty such as appropriate undergraduate students, lab techs, or others already working in a graduate faculty laboratory are encouraged to apply for admission.

Entering Ph.D. students are expected to take a series of laboratory rotations to familiarize themselves with areas of research active within the degree program. The program offers faculty and corresponding research laboratories from the Department of Physiology and from the Departments of Medicine, Surgery, Neuroscience, Neurosurgery, Biochemistry, Molecular Biology and Biophysics, Pharmacology, Physical Medicine and Rehabilitation, Kinesiology, and Animal Science.

Prerequisites for Admission—For the major, an undergraduate degree with at least one year (three quarters or two semesters) of calculus, one year of physics, one year of biology, and two years of chemistry is required. For the minor, a background in mathematics, physics, chemistry, and biology acceptable to the graduate faculty, is required.

Special Application Requirements—For the M.S. and Ph.D., applicants must take either the General Test of the GRE or the Medical College Admission Test. In addition, all applicants need three letters of recommendation. Admission can be in either fall or spring semester.

Courses—Please refer to Physiology (Phsl) 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 both 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

Duluth campus—All course requirements for the M.S. degree can be completed on the Duluth campus. Students are expected to fulfill all degree requirements over a period of two to three calendar years. The program includes at least 20 credits in physiology and 6 credits in a minor or related field of study. Incoming students are encouraged to undertake at least two laboratory rotations in faculty research laboratories of their choice. Fulfillment of degree requirements also includes the presentation and defense of a thesis (Plan A). The final written examination and oral defense of the thesis takes place with participation of faculty from both campuses.

Twin Cities campus—A degree for individuals involved in research and employed at local companies requires 14 credits in physiology and 6 credits outside of physiology. The degree is based on laboratory research or on campus, and requires a written thesis or written project and an oral presentation of the work for the final exam. The M.S. degree is Plan A, unless there are special circumstances requiring a Plan B. For Plan B, the final exam is oral.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A minimum of 6 graduate credits in cellular and integrative physiology is required.

Ph.D. Degree Requirements

The Ph.D. program requires courses in medical physiology and human neuroscience. No other specific courses are required, although some graduate level courses in cellular or molecular biology must be completed. The coursework is tailored to the student’s interests with input from the director of graduate studies and the adviser. During the first year, students rotate
through three laboratories, pick an adviser, and begin a research project. A preliminary written exam in physiology and neuroscience is taken before the preliminary oral exam. The preliminary oral exam is given to test the student’s ability to apply principles of both physiology and the minor or supporting program to a proposed research based thesis. A minimum of 12 credits must be completed in the minor field or supporting program.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Ph.D. students are expected to take Phsl 5101 or the equivalent plus additional courses for a total of 10 credits.

Chemical Engineering and Materials Science and Engineering

Contact Information—Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Avenue S.E., Minneapolis, MN 55455 (612-625-0382; fax 612-626-7246; cemsgrad@umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step.

Regents Professor
H. Ted Davis, SM
Lanny D. Schmidt, SM
L. E. Scriven, SM

Professor
Frank S. Bates, SM
Raul Careta, SM
C. Barry Carter, SM
James R. Chelikowsky, SM
Philip I. Cohen, Electrical and Computer Engineering, ASM
Edward L. Cusser, SM
Prodromos Daoutidis, SM
Jeffrey J. Derby, SM
Michael C. Flickinger, Biotechnology Institute, ASM
Lorraine F. Francis, SM
Christie J. Geankoplis, SM
William W. Gerberich, SM
Steven L. Girshick, Mechanical Engineering, ASM
Wayne L. Gladfelter, Chemistry, ASM
J. Woods Hailey, Physics and Astronomy, ASM
Wei-Shou Hu, SM
Kenneth H. Keller, SM
David L. Kohlstedt, Geology and Geophysics, ASM
Timothy P. Lodge, SM
John S. Lowengrub, Mathematics, ASM
Christopher W. Macosko, SM
Alon V. McCormick, SM
Hans G. Othmer, Mathematics, ASM
Christopher J. Palmstrom, SM
David A. Shores, SM
Ronald A. Siegel, Pharmacy, ASM
J. Ilja Siepmann, Chemistry ASM
William H. Smyrl, SM
Friedrich Srienc, SM

Robert T. Tranquillo, SM
Michael Tsapatsis, SM
Michael D. Ward, SM
Karon Yin, Bio-based Products, ASM
Michael R. Zachariah, Mechanical Engineering ASM

Associate Professor
Victor H. Baroacs, Biomedical Engineering, ASM
Alfonso Franciosi, Chemical Engineering, ASM
Materials Science, SM
C. Daniel Frisbie, SM
Marc A. Hiltlmyer, Chemistry, ASM
David C. Morse, SM
David J. Norris, SM
David J. Odde, Biomedical Engineering, ASM
Claudia Schmidt-Dannert, Biochemistry, Molecular Biology, and Biophysics, ASM
Renata M. Wentzovitch, SM

Assistant Professor
Yiannis Kaxnessis, SM
Efrosini Kokoli, SM
Satish Kumar, SM
Christopher Leighton, SM
Jennifer Maynard, SM
Richard B. McClurg, SM
Beth Stadler, Electrical and Computer Engineering, ASM

Research Associate
Greg D. Haugstad, Characterization Facility, 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—Research activities are broadly organized in the areas of theory and computation; research engineering and chemical process synthesis; biotechnology and bioengineering; polymers; ceramics and metals; electronic and magnetic materials; and coating processes and interfacial engineering. The graduate courses offered cover core areas of chemical engineering (fluid mechanics, applied mathematics: linear and nonlinear analysis, transport, chemical thermodynamics, statistical thermodynamics and kinetics, and analysis of chemical reactors) and core areas of materials science (structure and symmetry of materials, thermodynamics and kinetics, electronic properties of materials, and mechanical properties of materials). In addition, several specialized topics are offered, including biochemical engineering, biological transport processes, food processing technology, colloids, principles of mass transfer in engineering and biological engineering, rheology, coating process fundamentals, process control, finite elements methods of computer-aided analysis, ceramics, polymers, materials design and performance, materials processing, corrosion, introduction to polymer chemistry, polymer laboratory, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electrochemical engineering, physical chemistry of polymers, solid state reaction kinetics, electronic structure of materials, electronic properties and applications of organic materials, electronic ceramics, dislocations and interfaces, epitaxial thin film growth, and science of porous media.

Prerequisites for Admission—A bachelor’s degree in chemical engineering, materials science, metallurgy, ceramics, polymer engineering, chemistry, physics, mechanical engineering, or electrical engineering is required. Applicants may be accepted without this prerequisite, but may be required to complete additional preparatory studies prescribed by their adviser or the director of graduate studies after admission. An M.S. is not a prerequisite for admissions to the Ph.D. program. Students requesting a research assistantship from the department should apply directly to the Ph.D. program. Only under special circumstances will the department admit students requesting a research assistantship to the M.S. program.

Special Application Requirements—Applicants must submit scores from the General Test of the GRE, three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts, and a clearly written statement of career interest, goals, and objectives. International students are required to provide scores of at least 560 on the paper-based or 220 on the computer-based TOEFL. Students may apply at any time; submission of all application materials by January 1 is strongly encouraged to ensure priority consideration for fellowships and assistantships; late applications are considered if space is available.

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

Courses—Please refer to Chemical Engineering (ChEn) and Materials Science (MatS) in the course section of this catalog for courses pertaining to these programs.

Use of 4xxx Courses—Chemical engineering allows MatS 4214 to be taken for graduate credit. Materials science allows MatS 4212, 4214, 4221, 4301, and 4511 to be taken for graduate credit. All other ChEn or MatS 4xxx courses must have adviser and director of graduate studies approval.
M.Ch.E or M.Mat.S.E. Design Project Degree Requirements

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

Both degrees require a minimum of 14 course credits in the major field and a minimum of 6 credits in the minor or related fields. The work-related design project consists of an in-depth study of an engineering design. It need not represent a publishable research project. While the amount of work should be the same as for an M.S. thesis, the project can contain elements that the thesis would not, such as economic considerations, design consultation, and social relevance.

Language Requirements—None.

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

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

M.S.Ch.E. and M.S.Mat.S.E. Plan A Degree Requirements

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

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

Language Requirements—None.

Final Exam—The final exam is oral.

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

Ph.D. Degree Requirements

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

Language Requirements—None.

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

Chemical Physics

Contact Information—Chemical Physics Program, Department of Chemistry, University of Minnesota, 137 Smith Hall, 207 Pleasant Street S.E., Minneapolis, MN 55455 (612-626-744; fax 612-626-7541; mounry@chem.umn.edu; www.chem.umn.edu/chemophys).

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

Regents Professor

H. Ted Davis, Chemical Engineering and Materials Science, SM
Lanny D. Schmidt, Chemical Engineering and Materials Science, SM

Professor

Barry C. Carter, Chemical Engineering and Materials Science, SM
Christopher J. Cramer, Chemistry, SM
Jiali Gao, Chemistry, SM
Allen M. Goldman, Physics, SM
J. Woods Halley, Physics, SM
Cheng-Cher Huang, Physics, SM
Kenneth R. Leopold, Chemistry, SM
Sanford Lipsky, Chemistry, SM
Karin Musier-Forsyth, Chemistry, SM
Jeffrey T. Roberts, Chemistry, SM
J. Ilja Siepmann, Chemistry, SM
David D. Thomas, Biochemistry, SM
Donald G. Truhlar, Chemistry, SM
Xiaoyang Zhu, Chemistry, SM

Associate Professor

David M. Ferguson, Medicinal Chemistry, Pharmacognosy, SM
Doreen G. Leopold, Chemistry, SM
David C. Morse, Chemical Engineering and Materials Science, SM
Renata M. Wentzcovitch, Chemical Engineering and Materials Science, SM
Darrin M. York, Chemistry, SM

Assistant Professor

David A. Blank, Chemistry, SM
Richard M. McClurg, Chemical Engineering and Materials Science, 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—Chemical physics focuses on areas where the techniques of chemistry and physics are brought together for the study of atoms and molecules; their interactions in gases, liquids, and solids; and the detailed structure and dynamics of material changes.

Areas of research and specialization include spectroscopy, optical properties, laser applications, molecular collisions, chemical dynamics, quantum mechanics, computational chemistry, statistical mechanics, thermodynamics, low-temperature behavior, polymers and macromolecules, surface science, biochemistry, and biochemical and heterogeneous catalysis.

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

Special Application Requirements—Three letters of recommendation are required.

Courses—Please refer to Chemistry (Chem), Physics (Phys), Chemical Engineering (ChEn), Materials Science (MatS), Mathematics (Math), Chemical Physics (ChPh) and Scientific Computation (SciC) in the course section of this catalog for courses pertaining to the program.

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

M.S. Plan A Degree Requirements

The M.S. degree is offered Plan A (with thesis) and requires at least 20 course credits and 10 or more thesis credits. The course credits must include at least 6 credits each in chemistry, physics, and quantum mechanics, and at least 3 credits in thermodynamics, statistical mechanics, or statistical physics.

Language Requirements—None.

Final Exam—The final exam is oral.

Ph.D. Degree Requirements

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

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Ph.D. minor requirements are determined by the director of graduate studies, the student, and the adviser.
Chemistry

Contact Information—Assistant to the Director of Graduate Studies, Department of Chemistry, University of Minnesota, 137 Smith Hall, 207 Pleasant Street S.E., Minneapolis, MN 55455 (612-626-7444 or 1-800-777-2431; fax 612-626-7541; inquiry@chem.umn.edu; www.chem.umn.edu).

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

Regents Professor
H. Ted Davis, SM

Professor
George Barany, SM
Breidette A. Barry, Chemistry, ASM
Frank S. Bates, Chemical Engineering and Materials Science, ASM
Victor A. Bloomfield, Biochemistry, ASM
Peter W. Carr, SM
Christopher J. Cramer, SM
John E. Ellis, SM
Jiali Gao, SM
Wayne L. Gladfelter, SM
Gary Roland Gray, SM
Christy L. Haynes, SM
Thomas R. Hoye, SM
Steven R. Kass, SM
Kenneth R. Leopold, SM
John D. Lipscomb, Biochemistry, ASM
Sanford Lipsky, SM
Timothy P. Lodge, SM
Kent R. Mann, SM
Karin Musier-Forsyth, SM
Wayland E. Noland, SM
Louis H. Pignolot, SM
Lawrence Que, Jr., SM
Jeffrey T. Roberts, SM
I. Ija Siepmann, SM
Marion Stankovich, SM
Andreas Stein, SM
William B. Tolman, SM
Donald G. Truhlar, SM
Michael D. Ward, Chemical Engineering and Materials Science, ASM
Michael R. Zachariah, Mechanical Engineering, ASM
Xiaoyang Zhu, SM

Associate Professor
Mark D. Disefano, SM
Craig J. Forsyth, SM
C. Daniel Frisbie, ASM
William B. Gleason, Laboratory Medicine and Pathology, ASM
Marc A. Hillmyer, SM
Richard Hsung, SM
Doreen G. Leopold, SM
Carston R. Wagner, Pharmacy, ASM
Darrin M. York, SM

Assistant Professor
Edgar A. Arriaga, SM
David A. Blank, SM
Michael T. Bowser, SM
Philippe Bühlmann, SM
Christopher McNeill, SM
Lee Penn, SM
T. Andrew Taton, SM
Gianluigi Veglia, 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—Graduate work in the Department of Chemistry is organized into six specialty areas: analytical chemistry, chemical biology, inorganic chemistry, materials chemistry, organic chemistry, and physical chemistry. Interdisciplinary work is also an option.

Prerequisites for Admission—Applicants must offer the substantial equivalent of the courses in analytical, inorganic, organic, and physical chemistry required of undergraduate majors in the University of Minnesota chemistry curriculum. They must also have at least one year of college physics plus college mathematics through calculus.

Special Application Requirements—Three letters of recommendation are required for all applications. Scores from General (Aptitude) and Subject (Advanced) Tests of the GRE are required for fellowship consideration and are strongly recommended for all other applicants. International applicants are expected to provide scores of at least 580 on the TOEFL, as well as GRE scores.

Proficiency Examinations—Student in the Ph.D. program are expected to pass four of five proficiency examinations during their first year in residence. The exams, which are at the level of an advanced undergraduate course, are in analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry. The exams are given during the chemistry first-year orientation program in August. In the event that a student does not pass the first exam, they are offered two more times during the academic year.

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

Use of 4XXX Courses—One of the following courses may be allowed: Chem 4150 or 4701.

M.S. Degree Requirements
M.S. students are expected to pass the proficiency exam in their specialty area in their first academic year in residence. Plan A requires 20 course credits and 10 thesis credits; Plan B requires 30 course credits (and one or two Plan B papers).

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—Six course credits from graduate-level chemistry courses are required for a master’s minor.

Ph.D. Degree Requirements
The Ph.D. program requires 24 course credits and 24 thesis credits. Students are also required to pass four out of five proficiency exams (see above) by the end of their first academic year in residence.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—Twelve course credits from graduate-level chemistry courses are required for a Ph.D. minor.

Child Psychology

Contact Information—Child Psychology Program, University of Minnesota, 204 Child Development Building, 51 East River Road, Minneapolis, MN 55455 (612-624-4127; fax 612-624-6373; http://education.umn.edu/icol).

See the College of Education and Human Development Professional Studies Catalog for information on the master of education (M.Ed.) program in early childhood education.

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

Professor
Dale A. Blyth, 4H Youth Development Center, AM2W
Sandra L. Christenson, Educational Psychology, AM2
Andrew Collins, SM
Nicki R. Crik, SM
Byron Egeland, SM
Michael K. Georgieff, Pediatrics, SM
Harold D. Grotevant, Family Social Science, AM2
Megan R. Gunnar, SM
Susan C. Hupp, Educational Psychology, AM2
William G. Iacono, Psychology, ASM
Gloria R. Leon, Psychology, ASM
Michael P. Maratsos, SM
Ann S. Masten, SM
Scott R. McConnell, Educational Psychology, AM2
Charles A. Nelson, SM
Anne D. Pick (emeritus), ASM
Herbert L. Pick, Jr., SM
Maria D. Sera, SM
Elsa G. Shapiro, Pediatrics, AM2
L. Alan Stroufe, SM
Auke Tellegen, Psychology (emeritus), AM2
Paulus W. van den Broek, Educational Psychology, AM2
Richard A. Weinberg, SM
Albert Yonas, SM
Steven R. Yussen, SM

Associate Professor
Canan Karatekin, SM
Monica Luciana, Psychology, ASM

Assistant Professor
Kathleen Thomas, SM

Senior Fellow
Martha Erickson, Children, Youth, and Family Consortium, AM2
Charles Oberg, Epidemiology, 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 Ph.D. in child psychology focuses primarily on training for research in normal human development, and most students take positions in academic or research
settings. The goal of the program is to train all students for careers in research and college teaching in child psychology, and to prepare students in the collaborative program options for careers in applied areas of child psychology as well. General program students may choose to specialize in an area such as cognitive neuroscience, language, learning, personality, memory, perception, psychobiology, or social development. Students interested in applied areas may specialize in developmental psychopathology and clinical science or school psychology.

The developmental psychopathology and clinical science (DPCS) program is a cooperative effort between the Institute of Child Development and the Department of Psychology to train leaders in research and teaching. Training draws on the unique strengths of each program. Students are admitted to the Ph.D. program in child psychology through the Institute of Child Development and to this training program by the agreement of program faculty in both departments.

The APA-approved school psychology program is a cooperative program of the Institute of Child Development, the Department of Psychology, and the Department of Educational Psychology. Students are admitted jointly to one of the cooperating departments and to the training program. Students must meet the standards and requirements of both the admitting department and the school psychology program.

Prerequisites for Admission—The equivalent of three semester (or four quarter) courses in psychology and one course in statistics are required.

Special Application Requirements—New students are normally admitted in fall semester. Application deadline is in December of the preceding year. Applicants must submit the departmental applications for graduate work, scores from the General Test of the GRE that are less than five years old, three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts, and a clearly written statement of career interests, goals, and objectives. The three letters of recommendation also must be received by the deadline. The TOEFL should be submitted when applicable.

Courses—Please refer to Child Psychology (CPsy) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—Child psychology Ph.D. students may include 4xxx courses as part of their supporting program coursework with director of graduate studies’ approval and if the course is taught by a member of the graduate faculty in the supporting program.

M.A. Degree Requirements
The Institute of Child Development does not offer admission for a master's degree. Students may choose to complete a master's degree (typically Plan B) during their progress toward the Ph.D. requirements for the M.A. are met through either Plan A or Plan B. Both require a full academic year of coursework.

Plan A requires a minimum of 20 course credits (a minimum of 14 in the major and 6 in the minor/related field) and 10 thesis credits.

Plan B requires 30 course credits, of which 14 credits must be in child psychology and 6 credits in one or more related fields. A project equivalent to 120 hours of work is also required.

Language Requirements—None.

Final Exam—The final exam for Plan A is oral; typically, the final exam for Plan B is written.

Ph.D. Degree Requirements
The Ph.D. degree usually requires five years of graduate work. Major program components include coursework, research activities, and teaching experience. Coursework requirements are specialization specific, but all students are required to take 44 credits in the major, 14 credits in a supporting program, and 24 thesis credits. Each student specializes in an area such as social and personality development, learning, cognitive development, cognitive neuroscience, language development, psychobiology, or perceptual development. Required courses include CPsy 8301, 8302, 8304, 8311, 8321, 8360, 8888, 8994, and statistics through EPsy 8263 or equivalent.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A Ph.D. minor requires 12 credits in child psychology, to include CPsy 8301 (4 cr), 8302 (4 cr), and 8996 (1-6 cr). Remaining credits can be taken from 4xxx (subject to their own program’s approval) or 8xxx courses.

Chinese
See Asian Literatures, Cultures, and Media.

Civil Engineering
Contact Information—Department of Civil Engineering, University of Minnesota, 122 Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522, fax 612-626-7750, gradsec@ce.umn.edu, www.ce.umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step.

Professor
Roger E. A. Arndt, SM
Patrick L. Brezonik, SM
Steven L. Crouch, SM
Peter A. Cundall, SM
Gary A. Davis, SM
Emmanuel M. Detournay, SM
Andrew Drescher, SM
Eli Foufoula-Georgiou, SM
Catherine E. French, SM
John S. Gulliver, SM

Jerome F. Hajjar, SM
Joseph F. Labuz, SM
Panos Michalopoulos, SM
John L. Nieber, Biosystems and Agricultural Engineering, SM
Fernando Porté-Agell, SM
Michael J. Semmens, SM
Karl A. Smith, SM
Heinz G. Stefan, SM
Henryk K. Stolarski, SM
Otto D. L. Strack, SM
Vaughn R. Voller, SM

Associate Professor
William A. Arnold, SM
Randall J. Barnes, SM
Bojan B. Guzina, SM
Miki Honda, SM
Raymond M. Hozalski, SM
Lev Khazanovich, SM
David M. Levinson, SM
Paige J. Novak, SM
Fernando Porté-Agell, SM
Arturo E. Schulz, SM
Carol K. Shield, SM
Paul D. Capel, AM2

Assistant Professor
Kevin J. Krizik, Urban and Regional Planning, AM2
Timothy M. LaPara, SM
Mihai O. Marasteanu, SM

Senior Research Associate
Soita G. Mogilevskaya, ASM
Venugopal Vuruputur, 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 are available in environmental engineering (e.g., pollutant fate and transport, process modeling, soil and groundwater remediation, water and wastewater treatment), geomechanics engineering (e.g., fracture and localization, groundwater flow, stability and liquefaction, wave and shock propagation), structural engineering (e.g., computational and structural mechanics, earthquake engineering, infrastructure performance and durability, new systems and materials), transportation engineering (e.g., intelligent transportation systems, pavement design and materials, transportation economics, traffic safety), and water resources engineering (e.g., earthscape processes, environmental and biological systems, hydrologic and climate dynamics, hydrodynamics, and turbulence).

Prerequisites for Admission—A bachelor’s degree in an engineering, basic science, or mathematics program is preferred. Admission depends primarily on the applicant’s academic record and letters of recommendation. Applicants who lack civil engineering training are often required to complete one or more appropriate courses from the undergraduate civil engineering program. Graduate credit is not awarded for such preparatory work. For the M.C.E. program, an ABET-accredited bachelor's degree in engineering is required.
Degree Programs and Faculty

Special Application Requirements— Applicants are required to submit results of the GRE in support of their applications. A preferred score of 550 on the paper-based or 213 on the computer-based TOEFL is required of foreign applicants from non-English-speaking countries. Admission requirements also include three letters of recommendation and a statement of purpose that outlines the prospective student’s research interests, reasons for pursuing graduate studies, and career plans after graduation. Students are admitted each semester, but applicants are strongly encouraged to submit their applications by December 31 in order to begin the following fall semester.

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

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

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

The master of civil engineering (M.C.E.) degree is designed for the practicing engineer who would like to obtain an advanced degree on a part-time or full-time basis. Students who intend to proceed to the Ph.D. program or think they may later wish to be admitted to the Ph.D. program should apply for the master of science program.

Students are expected to follow a coherent program of coursework in one of the following subareas of civil engineering: environmental, geomechanics, structural, transportation, or water resources engineering. The program is selected with the help of a faculty adviser. A wide variety of studies have been submitted as Plan B papers, including computer programs, annotated bibliographies, field or laboratory investigations, and the analysis/design of special engineering problems. At least 6 of the course credits must be taken outside the department for either Plan A or Plan B.

Language Requirements—None.

Final Exam—The final oral exam is oral.

Minor Requirements for Students Majoring in Other Fields—For a master’s minor, two or more 5xxx or 8xxx courses from one or two subareas of civil engineering are required, for a total of 6 or more credits.

M.S. Degree Requirements

The master of science (M.S.) degree balances education in engineering fundamentals and design with research and development. The M.S. degree provides preparation for students wishing to pursue a career in industry or to continue studies toward a Ph.D. degree. Students are expected to follow a coherent program of coursework and research in one of the following subareas: environmental, geomechanics, structural, transportation, or water resources engineering. The program is selected with the help of a faculty adviser and approved by the director of graduate studies and typically takes 18 to 24 months to complete.

The M.S. degree requires 30 credits and is offered under two plans. Plan A emphasizes research and preparation of a thesis and Plan B emphasizes coursework. The thesis must be written on a research project carried out in consultation with a faculty adviser and should result in a scientific or technical contribution to the field. Under Plan B, students must demonstrate the ability to work independently and present the results of such work effectively by completing one to three Plan B papers as determined by the faculty adviser. A wide variety of studies have been submitted as Plan B papers, including computer programs, annotated bibliographies, field or laboratory investigations, and the analysis/design of special engineering problems. Plan A requires 20 course credits and 10 thesis credits. Plan B requires 30 course credits. At least 6 of the course credits must be taken outside the department for either Plan A or Plan B.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—For a Ph.D. minor, four or more 5xxx to 8xxx courses from one or two subareas of civil engineering are required for a total of 12 or more credits.

Ph.D. Degree Requirements

The Ph.D. degree couples independent research with coursework in a comprehensive program for those wishing to attain mastery of their field. The Ph.D. degree demands the ability and desire to pursue independent and original studies and can be earned with emphasis in environmental, geomechanics, structural, transportation, or water resources engineering. Research performance, as judged by preparation of a dissertation on an independently pursued research topic, is the primary requirement for the Ph.D. degree. Students enter the Ph.D. program normally after completing the M.S. degree. The Ph.D. program is typically completed in five to six years following the bachelor’s degree.

Each program of study is designed in consultation with a faculty adviser to meet the special needs of the student, although programs must be approved by the director of graduate studies. A typical program consists of 45 credits of coursework beyond the bachelor’s degree, plus 24 thesis credits. A supporting program or minor consisting of at least 12 credits taken outside the department must be included. Credits earned in a M.S. program may be presented in partial fulfillment of the Ph.D. requirements. Rigid requirements for the number of 5xxx courses appropriate for Ph.D. programs have not been set, nonetheless, the Ph.D. represents the highest level of scholarly achievement and coursework should be selected accordingly.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—For a Ph.D. minor, four or more 5xxx to 8xxx courses from one or two subareas of civil engineering are required for a total of 12 or more credits.

Classical and Near Eastern Studies

Contact Information—Department of Classical and Near Eastern Studies, University of Minnesota, 305 Folwell Hall, 9 Pleasant St. S.E., Minneapolis, MN 55455 (612-625-5353; fax 612-624-4894; cnes.umn.edu; http://cnes.cla.umn.edu).

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

Regents Professor

Thomas Clayton, English, ASM

Professor

Elizabeth Belfiore, SM
Andrea Berlin, SM
Frederick Cooper, Art History, ASM
Sheila McNally, Art History, ASM
S. Douglas Olson, SM
Sandra Peterson, Philosophy, ASM
Theofanis G. Stavrou, History, ASM
Peter Wells, Anthropology, ASM

Associate Professor

Nita Krevans, SM
Bernard Levinson, SM
Christopher Nappa, M2
Oliver Nicholson, SM
Philip Sellew, SM
George Sheets, SM
John Steyaert, Art History, ASM

Assistant Professor

Ra’an an Boustan, AM2
Lauren Monroe, AM2
Eva Von Dassow, M2
Amanda Wilcox, 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—Classical and Near Eastern Studies (CNES) is an interdisciplinary department that brings together faculty and graduate students who might in other settings be dispersed among a wide range of programs. CNES is dedicated to rigorous philological and literary training and to the conviction that the ancient Mediterranean world is best studied as a diverse but richly integrated cultural whole. The various M.A. and Ph.D. tracks allow students to concentrate in the area and period that most appeals to them, but students are strongly encouraged to take courses across the entire range of the department’s offerings and to develop a broad, multidisciplinary approach to research and teaching. Students entering the Ph.D. program with an M.A. can usually receive credit for some earlier coursework, subject to the approval of the graduate faculty and graduate school requirements. Related special facilities include the Center for Medieval Studies, the Center for Jewish Studies, and the Center for Modern Greek Studies.

Prerequisites for Admission—For the major track in ancient and medieval art and archaeology, a background in archaeology, art history, and history sufficient to begin graduate level studies in the discipline, and evidence of language-acquisition ability. For the major track in classics, sufficient knowledge to begin graduate reading courses in either Greek or Latin and at least intermediate ability in the other language. For the major tracks in Greek or Latin, sufficient knowledge to begin graduate reading courses in the language of the track. For the major in religions in antiquity, an undergraduate background in the field and sufficient knowledge to begin graduate reading courses in classical Hebrew, Greek, or Latin. Some course prerequisites can be made up on provisional admission.

Applications are welcome from students with undergraduate majors in fields such as ancient Near Eastern studies, art history, biblical studies, classical archaeology, classics, history, Jewish studies, linguistics, and religious studies.

Special Application Requirements—Applicants must send the following directly to the Department of Classical and Near Eastern Studies: department application; copy of all transcripts; copy of the GRE; three letters of recommendation from persons well acquainted with the student’s academic work and professional experience; and a statement describing the student’s intended course of study and professional goals. For nonnative speakers of English, a copy of the TOEFL is required. Students may be admitted in any academic term, but financial assistance is normally available only to applicants admitted for fall semester (deadline: February 10).

Courses—Please refer to Akkadian (Akka), Aramaic (Arm), Classical and Near Eastern Studies (CNES), Greek (Grk), Hebrew (Hebr), Latin (Lat), Religions in Antiquity (RelA), and Sumerian (Sum) 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 prior approval by the adviser and the director of graduate studies.

Ancient and Medieval Art and Archaeology Track

M.A. Degree Requirements

The degree allows concentrations ranging broadly over the ancient and medieval periods, with an emphasis on art historical and archaeological approaches. Work in an appropriate ancient language is encouraged.

The minimum requirement for Plan A is 38 credits (including 10 thesis credits), and for Plan B, 32 credits (including directed study registrations for the Plan B papers).

Language Requirements—Reading knowledge of one modern foreign language appropriate to the student’s program is required (normally German or French).

Final Exam—The final exams are written and oral.

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794, as well as 9 credits in graduate art/archaeology courses with a CNES designator.

Ph.D. Degree Requirements

The degree allows concentrations ranging broadly over the ancient and medieval periods, with an emphasis on art historical and archaeological approaches. Graduate-level ability in an appropriate ancient language is required for graduation.

Students who continue from the M.A. program may apply those credits toward the Ph.D., with the exception of Plan A thesis credits or Plan B paper credits. A typical Ph.D. program is at least 71 credits, including at least 21 credits in the major, 12 in a supporting program, and 24 thesis credits.

Language Requirements—Reading proficiency in German and in a second modern language as appropriate (usually French), and research knowledge of an ancient language are required.

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794, as well as 12 credits in graduate art/archaeology courses with a CNES designator.

Classics Track

M.A. Degree Requirements

This program provides a broad training in the literature of ancient Greece and Rome in its cultural context. Work in Greek and Latin is supplemented by courses in a related field or area of interest.

The program requires nearly equal emphasis on courses and seminars in Greek and in Latin, as well as supporting work in a related field or area of interest. The minimum requirement for Plan A is 47 credits (including 10 thesis credits), and for Plan B, 41 credits (including directed study registrations for the Plan B papers).

Language Requirements—One modern research language as appropriate (normally French or German) and proficiency in reading both Greek and Latin as certified by a department exam on previously unseen passages is required.

Final Exam—The final exams are written (Greek and Latin reading proficiency) and oral (general).

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794, as well as 6 credits in graduate-level Latin courses (excluding Lat 8120) and 6 credits in graduate-level Greek courses (excluding Grk 8120).

Ph.D. Degree Requirements

This program requires extensive advanced work in both Latin and Greek, together with some study in a related field or area of interest.

The program requires nearly equal emphasis on courses and seminars in Greek and in Latin. Students must take at least three seminars in the major, a graduate level course in archaeology, and a two-semester sequence in ancient history, in addition to fulfilling all course requirements specified for the M.A. Students who continue from the M.A. program may apply those credits toward the degree, with the exception of Plan A thesis credits or Plan B paper credits. A typical Ph.D. program is 77 credits, including at least 35 credits in the major, 12 in the supporting program, and 24 thesis credits.

Language Requirements—German, plus another modern language, preferably French, and proficiency in reading Greek and Latin as demonstrated by a department exam on previously unseen passages is required.

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794, as well as 9 graduate credits of Greek (excluding Grk 8120) and 9 graduate credits of Latin (excluding Lat 8120).

Greek Track

M.A. Degree Requirements

A core of advanced work in Greek is supplemented by a minor or supporting program in a related field or area of interest. The minimum requirement for Plan A is 47 credits (including 10 thesis credits), and for Plan B, 41 credits (including directed study registration for Plan B papers).

Language Requirements—One modern research language as appropriate, preferably French or German, is required.
Final Exam—The final exams are written (Greek reading proficiency) and oral (general).

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794, as well as 9 graduate credits of Greek (excluding Grk 8120).

Ph.D. Degree Requirements
A core of advanced work in Greek is supplemented by a minor or a supporting program in a related field or area of interest. Students must take at least three seminars in the major, a graduate level course in archaeology, and a two-semester sequence of ancient history in addition to completing all M.A. course requirements. Students who continue from the M.A. program may apply those credits toward the degree, with the exception of Plan A thesis credits or Plan B paper credits. A typical Ph.D. program is 77 credits, including at least 15 credits in Greek, 15 credits in the supporting program, and 24 thesis credits.

Language Requirements—German and a second modern language, preferably French, and reading proficiency in ancient Greek as demonstrated by a department exam on previously unseen passages is required.

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794 and 15 graduate credits of Greek (excluding Grk 8120).

Latin Track
M.A. Degree Requirements
A core of advanced work in Latin is supplemented by a minor or supporting program in a related field or area of interest. The minimum requirement for Plan A is 47 credits (including 10 thesis credits), and for Plan B, 41 credits (including directed study registration for Plan B papers).

Language Requirements—One modern research language as appropriate, preferably German or French, and reading proficiency in Latin as demonstrated by a department exam on previously unseen passages is required.

Final Exam—The final exams are written (Latin reading proficiency) and oral (general).

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794, as well as 9 graduate credits of Latin (excluding Lat 8120).

Ph.D. Degree Requirements
A core of advanced work in Latin is supplemented by a minor or supporting program in a related field or area of interest. Students must take at least three seminars in the major, a graduate level course in archaeology, and a two-semester sequence in ancient history, in addition to completing all M.A. course requirements. Students who continue from the M.A. program may apply those credits towards the degree, with the exception of Plan A thesis credits or Plan B paper credits. A typical Ph.D. program is 77 credits, including at least 15 credits in Latin, 15 credits in the supporting program, and 24 thesis credits.

Language Requirements—German and a second modern research language, normally French, and reading proficiency in Latin as demonstrated by a department exam on previously unseen passages is required.

Minor Requirements for Students Majoring in Other Fields—Students must complete CNES 5794 and 15 graduate credits of Latin (excluding Lat 8120).

Religions in Antiquity Track
M.A. Degree Requirements
The religions in antiquity track is comparative in both method and content. Although students may focus on a particular religious tradition, they will nonetheless study several ancient religions. The Plan A requires 22 credits in the major, 9 credits in a related field, plus 10 thesis credits. The Plan B requires 26 credits in the major plus 9 credits in a related field.

Language Requirements—Proficiency in one modern language (normally German) and M.A.-level proficiency in classical Hebrew, Greek, or Latin as demonstrated by a department exam on previously unseen passages is required.

Final Exam—The final exams are written (ancient language reading proficiency) and oral (general).

Classics
See Classical and Near Eastern Studies.

Clinical Laboratory Science
Contact Information—Clinical Laboratory Science Program, Department of Laboratory Medicine and Pathology, University of Minnesota Medical School, MMC 609, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-625-8952; fax 612-625-5901; lsm@umn.edu, http://medtech.umn.edu/MSClinicalLab)

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

Professor
Fred S. Apple, Laboratory Medicine and Pathology, M2
Henry H. Balfour, Jr., Laboratory Medicine and Pathology, M2
Paul P. Cleary, Microbiology, M2
Agustin P. Dalmasso, Laboratory Medicine and Pathology, M2
Gary M. Dunny, Microbiology, M2
John H. Eckfeldt, Laboratory Medicine and Pathology, M2
Stanley L. Erlandsen, Cell Biology and Neuroanatomy, M2
Patricia Ferriero, Laboratory Medicine and Pathology, M2
Robert P. Hebel, Medicine, M2
Stephen S. Hecht, Laboratory Medicine and Pathology, M2
Ronald R. W. Jemmerson, Microbiology, M2
Marc K. Jenkins, Microbiology, M2
Russell C. Johnson, Microbiology, M2
Vivek Kapur, Veterinary Pathobiology, M2
John H. Kersey, Laboratory Medicine and Pathology, M2
Nigel Key, Medicine, M2
Tucker W. LeBien, Laboratory Medicine and Pathology, M2
J. Jeffrey McCullough, Laboratory Medicine and Pathology, M2
R. Scott McIvor, Laboratory Medicine and Pathology, M2
Gary L. Nelsestuen, Biochemistry, M2
Harry T. Orr, Laboratory Medicine and Pathology, M2
Gundu H. R. Rao, Laboratory Medicine and Pathology, M2
Michael J. Wilson, Laboratory Medicine and Pathology, M2

Associate Professor
Ronald C. McGlennen, Laboratory Medicine and Pathology, M2
Timothy W. Olsen, Ophthalmology, M2
Amy P. Skubitz, Laboratory Medicine and Pathology, M2
William R. Swaim, Laboratory Medicine and Pathology, M2

Assistant Professor
Connie J. Gebhart, Veterinary Pathobiology, M2
Angela Panoskaltsis-Mortari, Pediatrics, M2
Kim-Sue Tudor, Laboratory Medicine and Pathology, M2
Xinjing Wang, Laboratory Medicine and Pathology, 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 offers students with basic science or medical technology backgrounds the opportunity to gain competence in a specialized area of laboratory medicine. It provides training in the research, supervisory, and teaching aspects of the field. Students pursue investigative work in one of five specialty areas: chemistry, genetics, hematology, immunology, and microbiology.

Prerequisites for Admission—A bachelor’s degree in a basic science or in medical technology, including standard college courses in organic/inorganic chemistry, biochemistry, quantitative analysis, physics, and mathematics, is required. Previous laboratory experience is desirable.
Special Application Requirements—Applicants must forward to the Department of Laboratory Medicine and Pathology three letters of recommendation, an autobiographical outline that includes a statement of career goals, and scores from the General Test of the GRE. A preferred TOEFL score of 213 computer-based and 550 paper test is required for applicants whose native language is not English.

Courses—Please see Clinical Laboratory Science (CLS) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—The program accepts MedT 4xxx courses when cross-listed with CLS 5xxx courses and approved by the adviser and/or director of graduate studies, (e.g., MedT 4104 and 4105)—Principles of Diagnostic Microbiology: Lecture and Lab, MedT 4251—Hematology I: Basic Techniques, MedT 4310 and 4311—Clinical Chemistry I and II: Lecture and Lab. However, credit will not be granted if the CLS equivalent of these MedT courses was taken as part of an undergraduate degree.

M.S. Plan A Degree Requirements

The M.S. is a multidisciplinary program that prepares the medical technologist or basic science undergraduate for a career in research, teaching, or industry within a specialized area of laboratory medicine. Students pursue investigative work in one of five specialty areas: clinical chemistry, genetics/molecular genetics, hematology, immunology, or microbiology. Each area has required courses, but flexibility is maintained to allow students to choose some coursework that meets individual requirements and research interests.

Requirements include at least 17 credits in the specialty area, at least 6 credits in a minor or in related fields outside the specialty area, 10 thesis credits, and 2 student seminar credits.

Language Requirements—None.

Final Exam—The final exam is oral.

Clinical Research

Contact Information—Student Services Center, School of Public Health, University of Minnesota, MMC 819, 420 Delaware Street S.E., Minneapolis, MN 55455 612-626-3500; fax 612-626-6931; sphp-scc@umn.edu (www.sph.umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step1.

Professor

Linda H. Bearinger, Nursing, M2
Carole J. Bland, Family Medicine and Community Health, M2
Donna Z. Bliss, Nursing, M2
Hanna Bloomfield, Medicine, M2
James C. Floyd III, Pharmacy Practice, M2
Allan J. Collins, Medicine, M2
Daniel Duprez, Medicine, M2
Kristine E. Ensrud, Medicine, M2
Richard H. Grimm, Medicine, M2
Dorothy Hatsukami, Psychiatry, M2
Robert L. Kane, Health Services Research and Policy, M2
Joseph M. Keenan, Family Medicine and Community Health, M2
Nigel S. Key, Medicine, M2
Frank Lederle, Medicine, M2
Russell V. Luepker, Epidemiology and Community Health, M2
Antoinette Moran, Pediatrics, M2
Jim D. Neaton, Biostatistics, M2
Joseph Neglia, Pediatrics, M2
Thomas E. Nevin, Pediatrics, M2
Mark S. Paller, Medicine, M2
Bruce A. Peterson, Medicine, M2
Leslie L. Robison, Pediatrics, M2
S. Charles Schulz, Psychiatry, M2
Elizabeth R. Seaquist, Medicine, M2
Daniel J. Weisdorf, Medicine, M2
Douglas Yee, Medicine, M2

Associate Professor

K. Scott Baker, Pediatrics, M2
Gregory J. Beliman, Surgery, M2
Linda J. Burns, Medicine, M2
Patricia Fontaine, Family Medicine and Community Health, M2
Edward W. Greeno, Medicine, M2
James G. Gurney, Pediatrics, M2
David R. Hardten, Ophthalmology, M2
Timothy D. Henry, Medicine, M2
Alan T. Hirsch, Medicine, M2
Andrew J. W. Huang, Ophthalmology, M2
Karen L. Margolis, Medicine, M2
Ann C. Mertens, Pediatrics, M2
Timothy W. Schacker, Medicine, M2
M. Kathryn Schmitz, Epidemiology and Community Health, M2
John William Thomas, Biostatistics, M2

Assistant Professor

Alan K. Berger, Medicine, M2
Hassan N. Ibrahim, Medicine, M2
Mark A. Pereira, Epidemiology and Community Health, M2
Mark W. Yeazel, Family Medicine and Community Health, M2

Senior Research Associate

John O. Look, Diagnostic and Surgical Science, 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 interdisciplinary program trains health professionals to design, implement, and manage research in human populations. Because the field is fast becoming more complex, sophisticated, and regulated, there is an emerging recognition of, and demand for, formalized training. This program focuses primarily on patient-oriented health research including mechanisms of human disease, therapeutic interventions, clinical trials, and development of new technologies. It focuses less on epidemiologic and behavioral studies, or on outcomes research and health services research; students interested in these areas might better be served by seeking a master of public health (M.P.H.) degree.

Prerequisites for Admission—The program is designed for individuals interested in a research career in academia, industry, research institutes, health agencies, or regulatory agencies. Applicants must have an advanced health professional degree such as M.D., D.D.S., D.O., D.V.M., Pharm.D., Ph.D., or advanced doctoral degree in a clinical biomedical field; or advanced nursing degree (e.g., M.S. in nursing). Students must have completed or be at an advanced stage of their clinical practice training and be affiliated with someone at the University of Minnesota who can provide advising and access to a clinical project. The admissions committee considers exceptions on an individual basis.

Special Application Requirements—In addition to the School of Public Health requirements listed in their catalog, the M.S. has specific application requirements including a health science professional degree, and training sufficient to be eligible for a license to practice as supported in the form of an official transcript. An official TOEFL score with a preferred performance level of at least 600 (written) or 250 (computer) is required of international students who have earned all of their degrees from nonnative English speaking countries. There are three exceptions: 1) students who have taken and successfully passed the ECFMG or USMLE exams do not need to submit a TOEFL score; 2) University of Minnesota Medical Fellows or Medical Fellow Specialists who have taken at least 24 credits as part of their University fellowship are exempt from providing an official TOEFL score if they provide a transcript of these credits; 3) the MELAB has been taken as an alternative exam to the TOEFL. The GRE is not required. One of the three required recommendation letters and a completed School of Public Health Recommendation form should be from the clinical director of training supporting the applicant’s potential as a clinical researcher.

Note: For international students who have earned all of their degrees from nonnative English speaking countries. There are three exceptions: 1) students who have taken and successfully passed the ECFMG or USMLE exams do not need to submit a TOEFL score; 2) University of Minnesota Medical Fellows or Medical Fellow Specialists who have taken at least 24 credits as part of their University fellowship are exempt from providing an official TOEFL score if they provide a transcript of these credits; 3) the MELAB has been taken as an alternative exam to the TOEFL. The GRE is not required. One of the three required recommendation letters and a completed School of Public Health Recommendation form should be from the clinical director of training supporting the applicant’s potential as a clinical researcher.

Note: faculty members at the University of Minnesota above the rank of instructor have additional administrative procedures required by the Graduate School. Contact the Graduate School Admissions Office early in the process.

For an online application, see the School of Public Health Web site at www.sph.umn.edu/students/application/home.html. Note: If you are or ever were a student in the University of Minnesota Graduate School and you are applying to any graduate or professional program in the University of Minnesota, you must complete a change of status application. See the Graduate School Web site for the appropriate form and fee at www.grad.umn.edu/current_students/forms/cos.pfd.

Courses—Please refer to the clinical research program available on the School of Public Health Web site at www.epi.umn.edu/academic/ms_cr_shl.htm for courses pertaining to the program.
Degree Programs and Faculty

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

M.S. Plan A Requirements
The M.S. requires 38 credits, including 3 elective credits and 10 thesis credits. Coursework in biostatistics, epidemiology, clinical trials, data collection, grant writing, and ethics is provided. Elective courses are chosen in consultation with an adviser. The thesis requires an active role in an ongoing approved clinical research project, and has specific requirements which are clarified in the student guidebook.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—The master's minor requires at least 6 credits. Contact the major coordinator for more information at gradstudies@epi.umn.edu.

Cognitive Science

Minor Only

Contact Information—Center for Cognitive Sciences, University of Minnesota, 205 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-624-5800; web: http://cogsci.umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step1.

Professor
Patricia J. Bauer, Child Development, M
Maria Gini, Computer Science, M
Jeanette K. Gundel, Linguistics, ESL, and Slavic Languages and Literatures, M
Keith Gunderson, Philosophy, M
Paul E. Johnson, Information and Decision Sciences, M
Michael B. Kac, Philosophy, M
Daniel J. Kersten, Psychology, M
Gordon E. Legge, Psychology, M
Charles A. Nelson, Child Development, M
J. Bruce Overmier, Psychology, M
Herbert L. Pick, Jr., Child Development, M
C. Wade Savage, Philosophy, M
Maria D. Sera, Child Development, M
Paulus W. van den Broek, M
Albert Yonas, Child Development, M

Associate Professor
Charles R. Fletcher, Psychology, M
Chad J. Marsolek, Psychology, M

Clinical Associate Professor
Mary Jo Nissen, Psychology, M

Curriculum—Cognitive science is a field of inquiry at the interface of cognitive psychology, computer science, linguistics, neuroscience, and philosophy. Cognitive science is concerned with the acquisition, representation, and use of knowledge by humans and machines. The curriculum provides students with a broad foundation in psychological, philosophical, and computational approaches to the study of cognition.

Prerequisites for Admissions—Admission is contingent upon prior admission to a master’s or doctoral degree-granting program within the Graduate School. Admission is limited and only by permission of the director of graduate studies in cognitive science.

Special Application Requirements—Contact the director of graduate studies in cognitive science for an Intent to Enroll form that students are encouraged to submit by the end of fall semester the year before initiating coursework. Later submissions are considered as space permits.

Courses—Please refer to the minor program office for coursework pertaining to the program.

Use of 4xxx Courses—4xxx courses may not be included on degree program forms for the cognitive science minor.

Minor Only Requirements
The minor in cognitive science is available to master’s (M.A. and M.S.) and doctoral students. Both a master’s and doctoral minor require the following core courses outside the student’s major department: CgSc 8000—Philosophy of Cognitive Science, CSci 5511—Artificial Intelligence I, and Psy 5015—Cognition, Computation, and Brain. Substitutions for these courses are permitted only with prior permission from the director of graduate studies for cognitive science. In addition, CgSc 8001—Proseminar in Cognitive Science is required for the doctoral minor. The master’s minor requires a minimum of 8 graduate credits; the doctoral minor requires 14 graduate credits. Additional courses beyond those required must be taught by faculty in the minor program or approved in advance by the cognitive science director of graduate studies. Courses in the student’s major department do not count toward the minor.

Communication Disorders

Communication Studies

Contact Information—Department of Communication Studies, University of Minnesota, 225 Ford Hall, 224 Church Street S.E., Minneapolis, MN 55455 (612-624-5800; web: www.comm.umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step1.

Professor
Donald R. Browne, SM
Karyn K. Campbell, SM
W. Andrew Collins, ASM
Alan G. Gross, ASM
Laura J. Garak, ASM
Dean E. Hewes, SM
Edward Schiappa, SM
Mary M. Lay Schuster, ASM
Robert L. Scott (emeritus), ASM
Amy L. Sheldon, SM

Michael Sunnafrank, Communication, Duluth, AM2
Arthur E. Walzer, ASM

Associate Professor
Rosita D. Albert, SM
Ronald W. Greene, SM
Ascan F. Koerner, M2
Dean L. Rarick (emeritus), ASM
Mary D. Vavrus, SM
Kirt H. Wilson, SM

Assistant Professor
Suzanne M. 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—Communication studies focuses on the study of communicative dimensions of human experience using humanistic and social scientific methods. This program prepares students to become researchers and teachers, offering three concentrations: communication theory, rhetorical studies, and critical media studies.

Coursework in communication theory has a social scientific orientation. Most students focus on a subarea such as small group, intercultural, electronic media, interpersonal communication, or problems (e.g., decision making, conflict resolution). Coursework outside the department is usually concentrated in one or more of the behavioral sciences. Students are expected to develop a command of research techniques and a thorough knowledge of statistics.

Coursework in rhetoric and public address emphasizes humanistic methods and includes argumentation and persuasion, ethics, rhetorical theory and criticism, and American public address. Students may also pursue special interests in rhetorical philosophies, movements and campaigns, or historical and contemporary political speaking. The program should be supplemented by coursework outside the department. An understanding of history, political science, sociology, or other social sciences is recommended.

Coursework in critical media studies emphasizes qualitative, historical, critical, and empirical methods and includes electronic media studies, feminist media studies, ethnic and racial minorities in media, critical media literacy, political economy of media, popular culture, and media regulation and industries. Coursework outside the department is usually in the fields of political science, cultural studies, or women’s studies.

Prerequisites for Admission—All applicants must have completed at least 15 undergraduate credits in speech or communication courses related to their proposed area of emphasis in the department. A brochure detailing prerequisite requirements is available from the department. All prerequisites must be completed before admission.
Degree Programs and Faculty

Special Application Requirements—Applicants must submit scores from the GRE General Test, transcripts of all postsecondary academic work, and a written statement of academic and occupational objectives. Three letters of recommendation and a writing sample are required of all applicants for assistantships or fellowships.

A deadline of January 15 is recommended for students applying for teaching assistantships or University fellowships for the following academic year.

Courses—Please refer to Communication Studies (Comm) 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. Such courses must be taught by graduate faculty and usually no more than two 4xxx courses are allowed on a degree program form.

M.A. Degree Requirements

The degree is offered under Plan A (thesis) and Plan B (without thesis). Both plans require a minimum of 15 course credits in communication studies, including Comm 5421 and 5615, and a minimum of 6 course credits in a minor or related fields. Plan A also requires 10 thesis credits, and Plan B requires a paper, 6 additional course credits in communication studies, and an additional 6 credits in either communication studies or related fields.

Language Requirements—None.

Ph.D. Degree Requirements

Students are expected to submit programs consisting of at least 60 course credits (which may include 30 credits from the M.A. and an additional 30 credits of doctoral coursework; Comm 5615 and 5421 or equivalents must be included); 24 thesis credits are required. The program should include 12 credits in research methods relevant for completing the degree and continuing a scholarly career. Under certain circumstances, foreign language courses may be used to satisfy this requirement.

Language Requirements—None.

Comparative and Molecular Biosciences

Contact Information—Director of Graduate Studies, Comparative and Molecular Biosciences Graduate Program, College of Veterinary Medicine, 443 VMC, 1365 Gortner Avenue, St. Paul, MN 55108 (612-624-7413; fax 612-625-4734; mvb@umn.edu www.cvm.umn.edu ResearchGradProg/GradPrograms MolecularVetBiosc).

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

Professor

Mitchell S. Abrahamsen, Veterinary and Biomedical Sciences, SM
Alvin J. Beitz, Veterinary and Biomedical Sciences, SM
Russell F. Bey, Veterinary and Biomedical Sciences, SM
David R. Brown, Veterinary and Biomedical Sciences, SM
Cathy Sue Carlson, Veterinary Population Medicine, SM
Douglas N. Foster, Animal Science, SM
Sagar Goyal, Veterinary Population Medicine, SM
Richard Isaacson, Veterinary and Biomedical Sciences, SM
Mathur S. Kannan, Veterinary and Biomedical Sciences, SM
Vivek Kapur, Microbiology, SM
Alice A. Larson, Veterinary and Biomedical Sciences, SM
Samuel R. Maheswaran, Veterinary and Biomedical Sciences, SM
James R. Mickelson, Veterinary and Biomedical Sciences, SM
Thomas W. Molitor, Veterinary Population Medicine, SM
Michael P. Murtaugh, Veterinary and Biomedical Sciences, SM
Scott M. O’Grady, Animal Science, SM
John W. Osborn, Physiology, SM
Stephanie J. Valberg, Veterinary Population Medicine, SM
Robert Washabau, Veterinary Clinical Sciences, SM
Douglas J. Weiss, Veterinary and Biomedical Sciences, SM

Associate Professor

Yang Da, Animal Science, SM
Kay S. Faaberg, Veterinary and Biomedical Sciences, SM
Scott Fahrenkrug, Animal Science, SM
James R. Lokensgard, Medicine, SM
Moses Njenga, Veterinary and Biomedical Sciences, SM
Kent Reed, Veterinary and Biomedical Sciences, SM
Mark S. Rutherford, Veterinary and Biomedical Sciences, SM
Leslie Sharkey, Veterinary Population Medicine, SM
Anthony Tobias, Veterinary Clinical Sciences, SM
Bruce K. Walcheck, Veterinary and Biomedical Sciences, SM
Scott Wells, Veterinary Population Medicine, SM

Assistant Professor

Dori Borjesson, Veterinary Population Medicine, SM
John Collister, Veterinary and Biomedical Sciences, SM
Yinduo Ji, Veterinary and Biomedical Sciences, SM
Sagarika Kanjilal, Veterinary and Biomedical Sciences, SM
Laura J. Mauro, Animal Science, SM
Elizabeth A. McNiel, Veterinary Clinical Sciences, SM
Randall Singer, Veterinary and Biomedical Sciences, SM
Pam Skinner, Veterinary and Biomedical Sciences, 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 comparative and molecular biosciences (CMB) graduate program is interdisciplinary and intercollegiate, drawing Academic Health Center faculty from the Departments of Medicine, Microbiology, Physiology, Veterinary and Biomedical Sciences, Veterinary Population Medicine, and College of Agriculture, Food and Environmental Sciences are important contributors to the mission of the CMB graduate program. The program brings together both basic and clinical scientists to provide students with individualized, cutting-edge research training on the causes, mechanisms, and manifestations of disease. The research programs utilize comparative aspects of biology and pathology across all species and implement animal models for understanding human disease processes. The scientific training students experience lead to a career as an independent investigator in one of two general areas: molecular mechanisms of pathogenesis in animals (immunobiology, microbiology, pathology) or comparative biomedical sciences (genetics and genomics, cellular and molecular biology, neuroscience, physiology, and pharmacology).

Prerequisites for Admission—A bachelor’s degree in a biological or basic science is required.

Special Application Requirements—Applicants must submit scores from the GRE General Test, a CV or résumé, three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts, and a clearly written statement of research experience as well as career interests, goals, and objectives. 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 research assistantships awarded for the next academic year. Students are typically admitted for full semester.

Courses—Please refer to Comparative and Molecular Biosciences (CMB) 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. Plan A Degree Requirements

The M.S. requires a core curriculum of fundamental coursework and laboratory experiences followed by one or more courses (6 credits) in the area of specialization. Students complete a minimum of 20 course credits and 10 thesis credits; the thesis is based on original laboratory research.

Language Requirements—None.

Final Exam—The final exam is written and oral.
Ph.D. Degree Requirements
The Ph.D. requires a core curriculum of fundamental coursework and laboratory experiences followed by one or more courses in areas of special interest. Considerable flexibility is available for students to construct a program around their own interests and research. Students typically complete 24–30 credits in the major field and 12 credits in a minor or supporting program for a recommended total of 36–42 credits. In addition, 24 thesis credits are required. All students are required to complete a science ethics course and a teaching experience.

Language Requirements—None.

Comparative Literature
Contact Information—Department of Cultural Studies and Comparative Literature, University of Minnesota, 350 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-62-5558; fax 612-625-0228; complit@umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step1.

Professor
Timothy A. Brennan, SM
John W. Mowitt, SM
Harvey B. Sarles, SM
Jochen Schulte-Sasse, German, Scandinavian, and Dutch, SM
Nicholas Spadaccini, Spanish and Portuguese Studies, AM2

Associate Professor
Maria M. Brewer, French and Italian, ASM
Robert Brown, SM
Cesare Casarino, SM
Keya Gauguy, SM
Leslie Morris, German, Scandinavian, and Dutch, ASM
Thomas A. Pepper, SM

Assistant Professor
Elizabeth W. Kotz, Cultural Studies and Comparative Literature, SM
Shaden M. Tageldin, Cultural Studies and Comparative Literature, 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—Comparative literature is the oldest field of literary criticism, dating back to the eighteenth century. Among the wide range of studies currently conducted in comparative literature nationally and internationally, the University focuses on theories of literary criticism and its explanatory bases; indeed the program is seen as one of the principal initiators of such fields of study. This program is likewise engaged in pushing the bounds of critical inquiry in related domains of literary inquiry, directing much of its energies toward women’s writing and emergent literatures, within both First- and Third-World cultures, as well as toward related problems ranging from narrative to postcolonial studies.

A major portion of coursework for degrees in comparative literature is cross-listed with the literature and language departments. Approval may also be given to take graduate courses in such areas as anthropology, art, architecture, history, music, philosophy, and sociology. In all cases, students should consult with an adviser concerning course selections.

Prerequisites for Admission—Although most students in the program have undergraduate majors in language or literature, applicants with other undergraduate backgrounds are considered.

Special Application Requirements—Scores from the General (Aptitude) Test of the GRE are required. Applications for admission as well as applications for financial aid must be postmarked by the December 10 deadline.

Courses—Please refer to Comparative Literature (CLit) in the course section of this catalog, the current Class Schedule, and flyers available in the department office for courses pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses may be permitted in majors or minors for the M.A. or Ph.D. degree with the approval of the adviser and director of graduate studies.

M.A. Plan B Degree Requirements
Students normally are not admitted to work toward the M.A. degree, but in certain circumstances where earning the M.A. degree is desirable, students already in the Ph.D. program may apply through the director of graduate studies to pursue this degree. Thirty credits including 8 credits of research seminar (8001-2), 12 additional CLit credits, 6 credits in courses in related fields outside comparative literature or in a formal minor in another program, and 4 credits either in CLit courses or in the related minor field are required. One substantial Plan B paper is required.

Language Requirements—In addition to English, high proficiency in one language and basic proficiency in another language are required. The choice of languages is made with respect to the student’s area of specialization and in consultation with and approval of, the adviser.

Final Exam—the final exams are written and oral.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 credits are required for a master’s minor, which must include CLit 8001 and 8002.

Ph.D. Degree Requirements
The Ph.D. requires 51 semester credits, as follows: 8 credits of basic seminar (CLit 8001-8002), 3 credits in CSDS 8901—Pedagogy of Cultural Studies and Comparative Literature, 28 credits in CLit courses (with approval of the adviser and the director of graduate studies, up to 4 credits of the 28-credit requirement may be taken in the field of the minor or supporting program), and 12 credits in coursework that constitutes a supporting program. A supporting program may be a formal Graduate School minor, or it may be a program designed by students in consultation with their adviser. Overall, the degree should include 16 credits of 8xxx courses (exclusive of CLit 8001-8002 and 8901). 24 thesis credits are also required. A paper of publishable quality must be submitted to, and approved by, the student’s doctoral committee before proceeding with the preliminary examinations.

Language Requirements—In addition to English, the following language competencies are required: high proficiency in two languages and basic proficiency in a third language. The choice of languages is made with respect to the student’s area of specialization and in consultation with and approval of, the adviser. Language requirements must be completed before taking the preliminary examination.

Minor Requirements for Students Majoring in Other Fields—A minimum of 16 credits is required for the doctoral minor and must include CLit 8001 and 8002.

Comparative Studies in Discourse and Society
Contact Information—Comparative Studies in Discourse and Society Program, University of Minnesota, 350 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-625-5358; fax 612-625-0228; csds@umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step1.

Professor
W. John Archer, Cultural Studies and Comparative Literature, SM
Timothy Brennan, Cultural Studies and Comparative Literature, SM
Richard D. Leppert, Cultural Studies and Comparative Literature, SM
Ellen Messer-Davidow, English, ASM
John W. Mowitt, Cultural Studies and Comparative Literature, SM
Paula Rabinowitz, English, ASM
Harvey Sarles, Cultural Studies and Comparative Literature, SM
Jochen Schulte-Sasse, German, Scandinavian, and Dutch, SM
Arlene Teraoka, German, Scandinavian, and Dutch, ASM
Jack D. Zipes, German, Scandinavian, and Dutch, ASM
**Associate Professor**
Robert L. Brown, Jr., Cultural Studies and Comparative Literature, SM
Cesare Casarino, Cultural Studies and Comparative Literature, SM
Maria Damon, English, ASM
Keya Ganguly, Cultural Studies and Comparative Literature, SM
Roger P. Miller, Geography, ASM
Leslie Morris, German, Scandinavian, and Dutch, ASM
Thomas Pepper, Cultural Studies and Comparative Literature, SM
Katherine M. Solomonson, Architecture, ASM
Gary C. Thomas, Cultural Studies and Comparative Literature, SM
Jacquelyn N. Zita, Women's Studies, ASM

**Assistant Professor**
Hisham Bizri, Cultural Studies and Comparative Literature, SM
Leo Chanjen Chen, Cultural Studies and Comparative Literature, M
Elizabeth W. Kotz, Cultural Studies and Comparative Literature, 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**—While most traditional humanistic disciplines tend to focus either on a given mode of discourse (e.g., art history, musicology) or a specific cultural context (e.g., American studies, European languages and literatures), this program engages a broader problematic—how discourse and cultural production both shape and are shaped by life in time, space, matter, and society. Drawing on a variety of theoretical positions, close attention is paid to various types of discourse, such as music, film, myth, ritual, architecture, landscape and urban design, painting, sculpture, and literature in elite, popular, folk, and mass culture, understanding these as both a site and an instrument of contestation and negotiation among social forces. More generally, the program seeks to re-associate intellectual and cultural history with social and political history, to set discourse of various sorts within a social context, and to consider specific social formations within the ongoing historical process. In all this, the program encourages work that is interdisciplinary (at times, even anti-disciplinary) as well as cross-cultural.

The curriculum emphasizes small seminars and directed research. The core requirement is a two-semester research seminar, a practicum that develops critical and analytic skills and introduces current theoretical perspectives with the study of historic problems. The majority of courses are nonrecurring and closely relate to current faculty research. In all cases, students should consult their advisers and the director of graduate studies concerning course selections. Each entering graduate student enrolls in CSDS 8001—Pedagogy, which focuses on developing skills and experience in teaching, fellowship application, placement, and other professional concerns.

**Prerequisites for Admission**—Applicants are required to have a B.A. in a humanities or social science discipline or other relevant field with clear evidence of comparative work. Because the program involves broad, often interdisciplinary, courses of study and a variety of emphases, the graduate admissions committee carefully reviews each applicant’s background in terms of analytical skills, knowledge of subject matter, experience, language preparation, and especially, congruity with faculty interests and expertise.

**Special Application Requirements**—Scores from the General (Aptitude) Test of the GRE are required. Applications for admission as well as applications for financial aid must be postmarked by the December 10 deadline.

**Courses**—Please refer to Comparative Studies in Discourse and Society (CSDS) in the course section of this catalog, the current Class Schedule, and flyers available in the department office for courses pertaining to the program.

**Use of 4xxx Courses**—4xxx courses may be included in majors or minors for the M.A. or Ph.D. degree with the approval of the adviser and director of graduate studies.

**M.A. Plan B Degree Requirements**

Students normally are not admitted to work toward the M.A. degree, but in certain circumstances where earning the M.A. degree is desirable, students already in the Ph.D. program may apply through the director of graduate studies to pursue this degree. Thirty credits including 8 credits of research seminar (8001-2), 12 additional CSDS credits, 6 credits in courses in related fields outside comparative literature or in a formal minor in another program, and 4 credits either in CSDS courses or in the related minor field are required. One substantial Plan B paper is required.

**Language Requirements**—Reading knowledge of one foreign language appropriate to the student’s program is required.

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

**Minor Requirements for Students Majoring in Other Fields**—A minimum of 12 credits is required for a master’s minor, which must include CSDS 8001 and 8002.

**Ph.D. Degree Requirements**

The Ph.D. requires 51 graduate credits, as follows: 8 credits of basic seminar (CSDS 8001-8002), 3 credits in CSDS 8901—Pedagogy of Cultural Studies and Comparative Literature, 28 credits in CSDS courses (with approval of the adviser and the director of graduate studies up to 4 credits of the 28-credit requirement may be taken in the field of the minor or supporting program), and 12 credits (or more, as necessary) to complete a formal minor in another Graduate School program, excluding comparative literature. If a minor is not pursued in another program, the student must complete 15 credits in coursework outside of CSDS, CSCL, or CLit courses, in a coherent and complementary program to be approved by the adviser and the director of graduate studies. Overall, the degree should include 16 credits of 8xxx courses (exclusive of CSDS 8001-8002 and 8901). 24 thesis credits are also required. A paper of publishable quality must be submitted to, and approved by, the student’s doctoral committee before proceeding with the preliminary examinations.

**Language Requirements**—Reading knowledge of two foreign languages appropriate to the student’s program is required. Language requirement must be completed before taking the preliminary examination.

**Minor Requirements for Students Majoring in Other Fields**—A minimum of 16 is required for a Ph.D. minor and must include CSDS 8001 and 8002.

**Complementary Therapies and Healing Practices**

**Minor Only**

**Contact Information**—Center for Spirituality and Healing, MMC 505, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-624-5166; fax 612-626-5280; www.csh.umn.edu).

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

**Professor**
Linda J. Brady, M
Francis F. Busta (emeritus), AM
Richard Kingston, M
Ruth A. Lindquist, AM
Barbara Leonard, M
Robert P. Patterson, M
Marah Snyder (emeritus), AM
Marilyn Speedie, M
Mark S. Umbreit, M

**Associate Professor**
Linda L. Chlan, M
Laura Duckett, M
V. Lois Erickson, M
Linda Halcon, M
Craig A. Hassel, M
Mary Jo Kreitzer, M
Gregory Plotnikoff, M
Pamela J. Schreiner, M
Carla Tabourne, M

**Assistant Professor**
Donald R. Hague (emeritus), AM
Karen Lawson, M
Gretchen M. Zunkel, M

**Associate Clinical Specialist**
Kate M. Hathaway, AM

**Lecturer**
Miriam Cameron, M
Pat Culliton, M
Dennis McKenna, M
Sue M. Towey, M
Curriculum—The graduate minor in complementary therapies and healing practices is an interdisciplinary program designed to expose students to the global range of complementary, cross-cultural, and spiritual healing practices. It enhances the preparation of graduate students in health sciences and other disciplines by developing knowledge and skills in the emerging field of complementary and alternative health care. Specifically, the minor provides students with a theoretical basis for applying complementary therapies and healing practices; prepares students to research complementary therapies and healing practices; and prepares students to work collaboratively with other health professionals and patients in a multicultural, pluralistic health care system. The minor includes a set of core courses that provide the theoretical foundation for the program. Students may elect to take additional courses offered by the Center for Spirituality and Healing in clinical applications, spirituality, or cross-cultural health and healing. A number of other University courses also satisfy the course requirements of the minor; contact the minor program office for more information.

Prerequisites for Admission—This graduate minor is available to master’s and doctoral students. To have the minor formally designated on a transcript students must be enrolled in a major in the Graduate School and have completed—or concurrently be enrolled in—a graduate research course upon beginning the first course in the minor. Note that the research course is in addition to the specified credits required for the minor. Students should work out their program of study with the director of graduate studies for the minor early in their graduate study.

Courses—Please refer to Center for Spirituality and Healing (CSpH) in the course section of this catalog. Contact the minor program office for the most current information on relevant coursework pertaining to the program.

Use of 4xxx Courses—Use of 4xxx courses in the degree program is permitted based on approval of the graduate faculty and the director of graduate studies.

Minor Requirements
Master’s and doctoral students take CSpH 5101 (3 cr) and 8101 (1 cr). Master’s students must take an additional 4 credits for a total of 8 credits; doctoral students must take an additional 1 credit 8xxx CSpH elective course and an additional 7 credits for a total of 12 credits. Note that students cannot use course credits to satisfy requirements for both a major and the minor.

Postbaccalaureate Certificate
Curriculum—The certificate program is open to graduate students both in a major at the master’s or doctoral levels or those not in a graduate program. The curriculum for the certificate program has three areas of focus: clinical applications, spirituality, and cross-cultural health and healing. The certificate program is individualized.

Prerequisites for Admission—Applicants must have a bachelor’s degree in a health-related field such as nursing or a graduate degree in medicine, public health, or pharmacy from an accredited U.S. institution or a foreign equivalent and a 3.00 GPA. Non-English speaking students need a TOEFL score of 550 printed test (213 for the computer-based version).

Special Application Requirements—In addition to the Graduate School online application, applicants must submit a letter describing their goals for obtaining the certificate and their professional qualifications. The statement should address this question: What are your short- and long-term professional goals after you complete the postbaccalaureate certificate program in complementary therapies and healing practices? Please be as specific as possible. Two letters of support are required if the individual is not currently enrolled in a graduate program at the University of Minnesota, one from an academic source and one from an employer/supervisor. A current CV is also required. Goal statement, letters of support, and CV should be mailed to: Center for Spirituality and Healing, MMC 505, 420 Delaware Street SE, Minneapolis, MN 55455.

The director of the Center for Spirituality and Healing assigns an adviser to each student as they are admitted to the certificate program. Advisers are any of the graduate faculty holding member status in the complementary therapies and healing practices minor. Students complete the Graduate School’s postbaccalaureate program form, have it signed by the adviser and director of graduate studies, and filed with the Graduate School. The program must be filed before completion of 6 credits. Eligible coursework includes a minimum of 12 CSpH graduate credits or those courses from other majors or minors in the Graduate School that the CSpH faculty has approved for use in the CSpH minor. Students may transfer in up to 3 credits after approved by the CSpH director of graduate studies. Twenty percent of total credits may be taken on an S-N grade basis. The student must complete the program in no more than four years if enrolled for certificate only. Registration is required every fall and spring semester.

Courses—Please refer to Center for Spirituality and Healing (CSpH) in the course section of this catalog. Contact the minor program office for the most current information on relevant coursework pertaining to the program.

Use of 4xxx Courses—No 4xxx courses are permitted.

Certificate Requirements
A total of twelve (12) semester credits are required to complete the certificate. Required courses: CSpH 5101—Introduction to Complementary Therapies and Healing Practices (3 cr) and CSpH 5102—Art of Healing: Self as Healer (1 cr). Students are encouraged to choose the remaining 8 credits from courses consistent with their academic training and professional goals. The student’s faculty adviser works with the student in designing a program plan that accommodates the student’s unique learning objectives. To earn a certificate, the preferred GPA for all courses is 2.80.

Composition, Literacy, and Rhetorical Studies
See Literacy and Rhetorical Studies.

Computer Science
Contact Information—Department of Computer Science and Engineering, University of Minnesota, 4-192 Electrical Engineering/Computer Science, 200 Union Street S.E., Minneapolis, MN 55455; 612-625-4002; fax: 612-625-0572; degs@cs.umn.edu; www.cs.umn.edu.

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

Professor
Daniel L. Boley, SM
John V. Carlis, SM
Vladimir Cherkassky, Electrical and Computer Engineering, ASM
David H. Du, SM
Ding-Zhu Du, SM
Maria Gini, SM
Caroline Hayes, AM2
Ravi Janardan, SM
Paul E. Johnson, Information and Decision Sciences, AM2
Daniel J. Kersten, Psychology, ASM
Larry L. Kinney, Electrical and Computer Engineering, AM2
Joseph A. Konstan, SM
Vipin Kumar, SM
E. Bruce Lee, Electrical and Computer Engineering, ASM
David J. Lilja, Electrical and Computer Engineering, ASM
Arthur L. Norberg, SM
Nikolaos P. Papanikolopoulos, SM
Haesun Park, SM
John T. Riedl, SM
Yousef Saad, SM
Shashi Shekhar, SM
Eugene B. Shragowitz, SM
Jaideep Srivastava, SM
Anand R. Tripathi, SM
Pen-Chung Yew, SM

Associate Professor
Mats P. E. Heimdahl, SM
Wei-Chung Hsu, SM
Jaideep Srivastava, SM
Mats P. E. Heimdahl, SM
Pen-Chung Yew, SM

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Assistant Professor
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Jaideep Srivastava, SM
Mats P. E. Heimdahl, SM
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Professor
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John V. Carlis, SM
Vladimir Cherkassky, Electrical and Computer Engineering, ASM
David H. Du, SM
Ding-Zhu Du, SM
Maria Gini, SM
Caroline Hayes, AM2
Ravi Janardan, SM
Paul E. Johnson, Information and Decision Sciences, AM2
Daniel J. Kersten, Psychology, ASM
Larry L. Kinney, Electrical and Computer Engineering, AM2
Joseph A. Konstan, SM
Vipin Kumar, SM
E. Bruce Lee, Electrical and Computer Engineering, ASM
David J. Lilja, Electrical and Computer Engineering, ASM
Arthur L. Norberg, SM
Nikolaos P. Papanikolopoulos, SM
Haesun Park, SM
John T. Riedl, SM
Yousef Saad, SM
Shashi Shekhar, SM
Eugene B. Shragowitz, SM
Jaideep Srivastava, SM
Anand R. Tripathi, SM
Pen-Chung Yew, SM

Assistant Professor
Mats P. E. Heimdahl, SM
Wei-Chung Hsu, SM
Victoria Interrante, SM
George Karypis, SM
Richard Maclin, Computer Science, Duluth, AM2
Gary Meyer, SM
Special Application Requirements—Three letters of recommendation are required. Scores from the General (Aptitude) Test of the GRE are required for M.S. and Ph.D. program applicants. The Subject Test is optional, although highly recommended, especially for those seeking financial assistance. If taken, it should be in the undergraduate major field or, if it is not offered in that field, in computer science, mathematics, or engineering. Master’s and Ph.D. students are accepted for fall admission only. The application deadline is April 1. Students seeking financial aid must apply by December 15.

Research Facilities—Graduate students have access to a wide range of computing facilities and equipment from the powerful supercomputers in the Minnesota Supercomputer Institute and Army High Performance Computing Research Center to handheld and portable computers used in research on mobile and location-aware computing. Specialized laboratories provide support for advanced graphics and visualization, virtual reality, computer networking, and distributed robotics. More general-purpose dedicated laboratories support a wide range of research activities, and shared graduate student laboratories provide extra computing for class work and other studies.

Use of 4xxx Courses—Use of CSci 4xxx courses on degree program forms is not permitted. Credits from 4xxx courses from an outside department may be used for related field course requirements if the course grants graduate credit.

Courses—Please refer to Computer Science (CSci) in the course section of this catalog for courses pertaining to the program.

M.C.S. Coursework Only Degree Requirements

The M.C.S. is a coursework-only degree. It requires 31 credits of graduate work, with the following conditions: 1) at least 18 of the credits must be from CSci classes; 2) students must fulfill a breadth requirement of four courses in three different areas: theory, systems and applications; 3) at least 6 credits must be from outside the department; 4) at least 6 credits must be from a 4xxx course; and 5) students must complete 1 credit of CSci colloquium, which cannot be counted toward any of the other requirements. Students must maintain a GPA above 3.00 after completing 8 credits.

Language Requirements—None.

M.S. Degree Requirements

The M.S. requires a minimum of 31 credits, with at least 14 of these from CSci courses (at least 3 of which must be 8xxx courses) and 6 from outside the department. There is a breadth requirement of four courses in three different areas, Theory, Systems and Applications. For Plan A, at least 10 thesis credits are required; for Plan B, three Plan B project credits are required. Students must also complete 1 credit of CSci colloquium, which cannot be counted toward the other requirements. Students are expected to maintain a GPA of at least 3.25 for all courses listed on their degree program.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A minor in computer science for master’s students majoring in other fields must include 9 credits of graduate courses in CSci. The colloquium credit may not be included. There is a limit of one 4xxx course and a requirement of at least one 8xxx course or a 5xxx course that has a prerequisite of a 5xxx course. A minimum GPA of 3.00 is preferred for these courses.

Ph.D. Degree Requirements

The Ph.D. requires at least 43 course credits of which 13 must be in CSci courses and at least 12 in a minor or supporting program. Additionally, at least 24 thesis credits are required. Students are expected to complete all courses in their degree program with a GPA of at least 3.45.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A minor in computer science for Ph.D. students majoring in other fields must include 13 credits of graduate courses in CSci, and should include the colloquium credit. There is a limit of one 4xxx course and a requirement of at least one 8xxx course or a 5xxx course that has a prerequisite of a 5xxx course. A minimum GPA of 3.25 is preferred for these courses.

Conflict Management

Minor Only

Contact Information—Director of Graduate Studies, Graduate Minor in Conflict Management, Conflict and Change Center, University of Minnesota, Hubert H. Humphrey Center, 301 19th Avenue S., Minneapolis, MN 55455 (612-625-4534; fax 612-625-3513; peustis@hhh.umn.edu).

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

Professor

Mario F. Bognanno, Industrial Relations, M
Eugene Borgida, Psychology, M
Paul V. Ellefson, Forest Resources, AM
Mark S. Umbreit, Social Work, M

Associate Professor

Kristen Nelson, Forest Resources, M
Melissa Stone, Humphrey Institute, M

Lecturer

Thomas R. Fiutak, Independent Study, M
Curriculum—The conflict management minor, available to master’s (M.A. and M.S.) and doctoral students, promotes inquiry into the origins, processes, dynamics, and consequences of social conflict and its management through various forms of dispute resolution procedures. The origins of this multidisciplinary field include but are not contained by the disciplines of sociology, psychology, socio-psychology, anthropology, management, organizational behavior, and communication.

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—None.

Courses—Appropriate courses are selected in consultation with the minor adviser and the director of graduate studies for the minor.

Use of 4xxx Courses—Use of 4xxx courses toward degree requirements is permitted with the approval of the instructor, the adviser, and the conflict management minor director of graduate studies.

Minor Only Requirements
A master’s minor requires 9 credits, including 1 credit of the Proseminar in Conflict Management. A doctoral minor requires 15 credits, including 2 credits of the Proseminar in Conflict Management. It is recommended that courses be selected according to the need to develop theory, practical applications, and skills in conflict management.

Conservation Biology
Contact Information—Director of Graduate Studies, Conservation Biology Graduate Program, 187 McNeal Hall, University of Minnesota, 1985 Buford Avenue, St. Paul, MN 55108 (612-624-7751, conscbio@umn.edu, www.conscbio.umn.edu). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step.

Professor
Ira R. Adelman, Fisheries, Wildlife, and Conservation Biology, SM
Deborah L. Allan, Soil, Water, and Climate, SM
Donald N. Alstad, Ecology, Evolution, and Behavior, SM
David E. Andersen, Fisheries, Wildlife, and Conservation Biology, SM
Dorothy H. Anderson, Forest Resources, SM
David A. Andow, Entomology, SM
Franklin H. Barnwell, Ecology, Evolution, and Behavior, SM
Marvin E. Bauer, Forest Resources, SM
Jay C. Bell, Soil, Water, and Climate, M2
Charles R. Blinks, Forest Resources, SM
James L. Bowyer, Bio-based Products, SM
Thomas E. Burk, Forest Resources, SM
Vernon B. Cardwell, Agronomy and Plant Genetics, SM
Jim Chen, Law School, SM
Yosef Cohen, Fisheries, Wildlife, and Conservation Biology, SM
Kendall W. Corbin, Ecology, Evolution, and Behavior, SM
James W. Curtin, Ecology, Evolution, and Behavior, SM
Edward J. Cushing, Ecology, Evolution, and Behavior, SM
Francesca J. Cuthbert, Fisheries, Wildlife, and Conservation Biology, SM
K. William Easter, Applied Economics, SM
Mohamed E. El Halawani, Animal Science, SM
Robert G. Haight, Forest Resources, SM
Nicholas R. Jordan, Agronomy and Plant Genetics, SM
Anne R. D. Kappusinski, Fisheries, Wildlife, and Conservation Biology, SM
Scott M. Lanyon, Bell Museum of Natural History, SM
Clarence L. Lehman, Ecology, Evolution, and Behavior, SM
Robert McMaster, Geography, SM
L. David Mech, Fisheries, Wildlife, and Conservation Biology, SM
Patrice A. Morrow, Ecology, Evolution, and Behavior, SM
Claudia Neuhauser, Ecology, Evolution, and Behavior, SM
Raymond M. Newman, Fisheries, Wildlife, and Conservation Biology, SM
Gerald J. Niemi, Natural Resources Research Institute, Duluth, SM
James A. Perry, Fisheries, Wildlife, and Conservation Biology, SM
A. Stephen Polasky, Applied Economics, SM
Anne E. Pusey, Ecology, Evolution, and Behavior, SM
Patrick T. Redig, Veterinary Clinical Sciences, SM
Philip J. Regal, Ecology, Evolution, and Behavior, SM
Peter B. Reich, Forest Resources, SM
Carl Richards, Minnesota Sea Grant Program, Duluth, SM
Carlisle F. Runge, Applied Economics, SM
Abdi I. Samatar, Geography, SM
Ruth G. Shaw, Ecology, Evolution, and Behavior, SM
Donald B. Siniff, Ecology, Evolution, and Behavior, SM
J. L. David Smith, Fisheries, Wildlife, and Conservation Biology, SM
Peter W. Sorensen, Fisheries, Wildlife, and Conservation Biology, SM
George R. Spangler, Fisheries, Wildlife, and Conservation Biology, SM
Anthony M. Starfield, Ecology, Evolution, and Behavior, SM
Robert W. Steners, Ecology, Evolution, and Behavior, SM
G. David Tilman, Ecology, Evolution, and Behavior, SM
Bruce C. Vondracek, Fisheries, Wildlife, and Conservation Biology, SM
Robert M. Zink, Ecology, Evolution, and Behavior, SM

Adjunct Professor
David Western, Fisheries, Wildlife, and Conservation Biology, SM

Associate Professor
Neil Anderson, Horticultural Science, SM
Gerald T. Ankley, Fisheries, Wildlife, and Conservation Biology, SM
Robert B. Blair, Fisheries, Wildlife, and Conservation Biology, SM
Paul V. Bolstad, Forest Resources, SM
Jeffrey Broadbent, Sociology, SM
Jay S. Coggins, Applied Economics, SM
David C. Fulton, Fisheries, Wildlife, and Conservation Biology, SM
Susan M. Galatowitsch, Horticultural Science, SM
David L. Garshelis, Fisheries, Wildlife, and Conservation Biology, SM
Tamara Giles-Vernick, History, SM
Jamie Grodsky, Law School, SM
Jay T. Hatch, General Science, SM
Sarah Hobbie, Ecology, Evolution, and Behavior, SM
Frances R. Homans, Applied Economics, SM
Peter A. Jordan, Fisheries, Wildlife, and Conservation Biology, SM
Katherine Klink, Geography, SM
Rica Nagar, Women's Studies, SM
Kristen C. Nelson, Forest Resources, SM
Daniel J. Phillipon, Rhetoric, SM
Andrew M. Simons, Fisheries, Wildlife, and Conservation Biology, SM
Roderick H. Squires, Geography, SM

Assistant Professor
Charles S. Anderson, Fisheries, Wildlife, and Conservation Biology, AM2
Todd Arnold, Fisheries, Wildlife, and Conservation Biology, SM
David N. Bengston, Forest Resources, SM
Jaques Finlay, Ecology, Evolution, and Behavior, SM
Sharon A. Jansa, Ecology, Evolution, and Behavior, SM
Mike Kilgore, Forest Resources, SM
Diane L. Larson, Ecology, Evolution, and Behavior, SM
John P. Loegering, Center for Ag/Natural Resources, Crookston, M2
Steven Manson, Geography, SM
Karen S. Oberhauser, Fisheries, Wildlife, and Conservation Biology, SM
Donald L. Pereira, Fisheries, Wildlife, and Conservation Biology, ASM
Ellen E. Strong, Ecology, Evolution, and Behavior, SM
Shinya Sugita, Ecology, Evolution, and Behavior, SM
Edward Swain, Fisheries, Wildlife, and Conservation Biology, SM
Susy Ziegler, Geography, SM

Adjunct Assistant Professor
Meredith Cornett, Forest Resources, SM

Lecturer
Thomas R. Fruetel, Educational Policy and Administration, SM

Research Associate
Lee E. Frelich, Forest Resources, SM
Loren M. Miller, Fisheries, Wildlife, and Conservation Biology, M2
Ingrid E. Schneider, Forest Resources, SM
Naomi Zeiotoni, Applied Economics, SM

Other
Jennifer Kuzma, HHH Institute of Public Affairs, 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 conservation biology program has two complementary objectives leading to a unique multidisciplinary program. The first is to provide students with sound graduate training in the biological sciences relevant to the global conservation of plants, animals, and ecosystems. The second objective promotes the study of social, political, and economic sciences that relate to recognition and solution of conservation problems. Students may select a named track, such as fisheries and aquatic biology, which offers an aquatic biology seminar, an aquatic and conservation biology seminar, and completing 6 elective credits. Electives are determined in consultation with the student's advisory committee.

Special Application Requirements—A statement of career goals and letters of recommendation evaluating the applicant’s potential for graduate study are required. Letters of recommendation should be sent directly to the Conservation Biology Program Office. Scores less than five years old from the General Test of the GRE are required. TOEFL is required for applicants who speak English as a second language. Applicants to the joint law degree program must also apply to the Law School. Application deadline is January 1. Typically students only are admitted for fall semester.

Research Facilities—Faculty are involved in local, regional, national, and international programs of research and education. Local research facilities include Cedar Creek Natural History Area, Cloquet Forestry Center, Itasca Biological Station and Laboratories, the Bell Museum of Natural History. Fisheries and aquatic biology research is conducted in the many lakes, rivers, and streams that Minnesota is famous for and in 13,000 feet of wet-lab space on the St Paul campus with dedicated wells and water conditioning equipment. The program is strongly linked with on-campus institutes such as the Institute for Social, Economic, and Ecological Sustainability and the Interdisciplinary Center for the Study of Global Change.

Courses—Conservation biology students take courses offered by a variety of colleges and departments across the University, including but not limited to fisheries, wildlife, and conservation biology; ecology, evolution, and behavior; soil, water, and climate; forest resources; geography; sociology; applied economics; and public policy. Acceptable courses for the degree are chosen in consultation with the adviser.

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

M.S. Degree Requirements
Students must complete a minimum of 30 credits in the biological and social aspects of conservation biology. For Plan A students, 10 of these credits are thesis credits; for Plan B students, 10 of these credits are for electives.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor may be earned by completing the two required courses for a major, plus participating in one semester of the conservation biology seminar.

Ph.D. Degree Requirements
Ph.D. students complete 46 credits, including 10 credits in courses required as part of the major, 12 credits in a minor or supporting program, and 24 thesis credits. Students are expected to show competency in both the biological and social sciences. With their advisory committee, students develop a program that emphasizes the ecological and social aspects of conservation biology. Dissertation research may require proficiency in supporting areas (e.g., statistics, computing, communications).

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor may be earned by completing the two required courses for a major, participating in one semester of the conservation biology seminar, and completing 6 elective credits. Electives are determined in consultation with the director of graduate studies and the student’s advisory committee.

Control Science and Dynamical Systems

Contact Information—Control Science and Dynamical Systems Center, University of Minnesota, 107 Akerman Hall, 110 Union Street S.E., Minneapolis, MN 55455 (612-625-3364, ddy@ame.umn.edu)

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

Regents Professor
Daniel D. Joseph, Aerospace Engineering and Mechanics, ASM

Professor
Gary J. Balas, Aerospace Engineering and Mechanics, ASM

Daniel L. Boley, Computer Science, SM

Prodromos Daoutidis, Chemical Engineering and Materials Science, SM

Max Donath, Mechanical Engineering, SM

David P. Fan, Genetics and Cell Biology, SM

William L. Garrard, Aerospace Engineering and Mechanics, SM

Tryphon T. Georgiou, Electrical Engineering, SM

Maria Gini, Computer Science, SM

Mostafa Kaveh, Electrical Engineering, SM

John C. Kieffer, Electrical Engineering, SM

Larry L. Kinney, Electrical Engineering, SM

E. Bruce Lee, Electrical Engineering, SM

Walter Littman, Mathematics, ASM

Richard P. McGehee, Mathematics, SM

Peter Olver, Mathematics, SM

Nikolaos P. Papanikolopoulos, Computer Science, SM

George R. Sell, Mathematics, ASM

Kim A. Stelson, Mechanical Engineering, SM

Ahmed H. Tewfik, Electrical Engineering, SM

Yiyuan Zhao, Aerospace Engineering and Mechanics, SM

Associate Professor
Perry Y. Li, Mechanical Engineering, SM

Adjoint Associate Professor
Dale F. Enns, Aerospace Engineering and Mechanics, 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—Student programs must emphasize modeling (mathematical and physical analyses of control or dynamical systems, with some computational or numerical expertise) and two areas selected from the following three: control theory for deterministic processes; stability theory and general analysis of dynamical systems; stochastic processes and information theory.

Prerequisites for Admission—Applicants must have completed a master’s degree in one of the related fields of engineering, computer science, mathematics, statistics, or physics. Master’s degrees with an emphasis in control science and/or dynamical systems can be earned in any of these fields at the University of Minnesota. An applicant with a master’s degree in another area whose scientific, mathematical, and/or engineering background is adequate to pursue the program also is considered. A high level of proficiency in mathematics is necessary to successfully complete the Ph.D. program. Applicants are strongly encouraged to obtain a faculty adviser before formally applying to the program.

Special Application Requirements—Three letters of recommendation evaluating the applicant’s scholarship and a complete set of transcripts are required. At least one letter of recommendation must be from a faculty member familiar with the applicant’s previous graduate work. Because the faculty is drawn from a number of disciplines and students’ programs can reflect a variety of emphases, it is important for applicants to clearly specify career goals and program emphasis desired in their application materials. Submission of GRE scores is strongly encouraged.

Degree Programs and Faculty
Use of 4xxx Courses—No 4xxx courses may be used for this program.

Ph.D. Degree Requirements
Programs are designed by the student and the adviser. Coursework is usually selected from those science, mathematics, engineering, and related fields that are relevant to control science and dynamical systems. Students can prepare for the written preliminary exam by completing three 8xxx or suitably advanced courses in three of the four areas of emphasis. In addition, students typically take substantial coursework in advanced mathematics.

Language Requirements—None.

Counseling and Student Personnel
See Educational Psychology.

Creative Writing
Contact Information—Director of Graduate Studies, Department of English, University of Minnesota, 204 Lind Hall, 207 Church Street S.E., Minneapolis, MN 55455 (612-626-6366; creawrit@umn.edu); http://english.cla.umn.edu/creativewriting/program. For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step1.

Regents Professor
Patricia M. Hampl, M2

Professor
Michael Dennis Browne, M2
Ray Gonzalez, M2
Valerie Minier, M2
Madelon M. Sprenger, M2

Adjunct Professor
Charles Baxter, M2

Associate Professor
Maria Damon, M2
Maria J. Fitzgerald, M2
Julie Schumacher, M2
Charles J. Sagnet, M2

Assistant Professor
David Trever, 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 Department of English offers the master of fine arts degree for students committed to pursuing the writing life. This three-year degree provides advanced, graduate-level coursework in writing, language, and literature, as well as study in a related field. The third year of the program focuses on the final development of a book-length manuscript suitable for publication. At the heart of the program are writing workshops in poetry, fiction, and literary nonfiction, and courses in the Reading as Writers and Topics in Advanced Writing series, which enable writers to explore a variety of issues relating to contemporary themes in American and world literature. The program encourages experimentation across genres, fostering the discovery of new and varied forms for a developing voice.

Courses—Please refer to English: Creative Writing (EngW), English: Composition (EngC), and English: Literature (EngL), 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.F.A. Degree Requirements
The M.F.A. requires 45 credits distributed over a three-year period, culminating in a book-length manuscript and an M.F.A. defense.

Required coursework includes EngW 8101, EngW 8140/50/60 (4 credits); four writing workshops (16 credits), three of which must be in the student’s genre of choice and include one 8xxx course, and one of which must be outside the student’s primary genre: language and literature courses (7 credits); related field (6 credits); and a creative project, a book-length manuscript suitable for publication (12 credits, 8 of which are for manuscript preparation and 4 for creative project registration).

Language Requirements—None.

Final Exam—The M.F.A. defense requires students to discuss their creative work as well as a literary essay that they write in response to a bibliography of 20 books chosen in consultation with creative writing faculty.

Dentistry
Contact Information—School of Dentistry, University of Minnesota, 15-136 Malcolm Moos Health Sciences Tower, 515 Delaware Street S.E., Minneapolis, MN 55455 (612-624-7934; fax 612-626-6096; wdgenet09@umn.edu; www.dentistry.umn.edu).
For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step1.

Professor
Dwight L. Anderson, Oral Sciences, M2
M. Bashar Bashak, Preventive Sciences, M2
Soraya M. Beiraghi, Preventive Sciences, M2
David O. Born, Preventive Sciences, M2
Edward C. Combe, Oral Sciences, M2
Ralph DeLong, Oral Sciences, M2
Anthony J. DiAngelis, Preventive Sciences, AM2
William H. Douglas, Oral Sciences, M2
James R. Fricton, Diagnostic/Surgical Sciences, M2
Mark C. Herzberg, Oral Sciences, M2
James E. Hinrichs, Preventive Sciences, M2
William F. Liljemark, Oral Sciences, M2
Leslie V. Martens, Preventive Sciences, M2
Karfnd T. Moller, Preventive Sciences, M2
Bruce L. Pihlstrom, Preventive Sciences, M2
Nelson L. Rhodus, Diagnostic/Surgical Sciences, M2
Charles F. Schachtele, Oral Sciences, M2
Burton L. Shapiro, Oral Sciences, M2
James Q. Swift, Diagnostic/Surgical Sciences, M2
Michael J. Till, Preventive Sciences, M2
Larry F. Wolff, Preventive Sciences, M2

Associate Professor
Gary C. Anderson, Restorative Sciences, M2
James L. Baker, Restorative Sciences, M2
Walter R. Bowles, Restorative Sciences, M2
Mary E. Brosky, Restorative Sciences, M2
Pamela R. Erickson, Preventive Sciences, AM2
James R. Holton, Restorative Sciences, M2
Ramesh K. Kuba, Diagnostic/Surgical Sciences, M2
Thomas D. Larson, Restorative Sciences, M2
Bryan S. Michalowicz, Preventive Sciences, M2
Kathleen J. Newell, Preventive Sciences, M2
Paul Olin, Restorative Sciences, M2
Joy B. Osborn, Preventive Sciences, M2
Jorge M. Perdigão, Restorative Sciences, M2
Igor J. Pesun, Restorative Sciences, M2
Maria R. Pintado, Oral Sciences, M2
Eric L. Schiffman, Diagnostic/Surgical Sciences, M2
John K. Schulte, Diagnostic/Surgical Sciences, M2
Stephen K. Shaman, Preventive Sciences, M2
Jill L. Stoltenberg, Preventive Sciences, M2
Omar A. Zidan, Restorative Sciences, M2

Adjunct Associate Professor
Kate M. Hathaway, Restorative Sciences, M2

Assistant Professor
John P. Beyer, Diagnostic/Surgical Sciences, M2
Darryl T. Hamamoto, Restorative Sciences, M2
Donald R. Nixdorf, Diagnostic/Surgical Sciences, M2

Research Associate
John O. C. Look, Diagnostic/Surgical Sciences, 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. program in dentistry prepares dentists and dental hygienists with clinical expertise for positions of leadership in education, research, and program administration in the oral health field. A multidisciplinary faculty of dental and dental hygiene educators, researchers, and clinicians teach the program, which is housed in the School of Dentistry. All students complete core coursework in teaching and evaluation in dentistry, research methods, and health care administration. Additional advanced coursework is offered in these same focus areas as well as in selected clinical and oral science topics with interdisciplinary impact, including conscious sedation, craniofacial pain, geriatrics, oral biology, oral medicine and radiology, oral pathology, practice administration, and psychology. Students have flexibility in planning individualized programs to accommodate their specific areas of interest, and courses from other disciplines may be included for credit in the major area.
Courses—Please refer to Dentistry (Dent) in the course section of this catalog for courses that pertain to this program. Information on additional 7xx courses included in the M.S. curriculum can be obtained directly from the program office or School of Dentistry Web site.

Use of 4xx Courses—Inclusion of 4xx courses on degree program forms is subject to adviser and director of graduate studies approval. Under no circumstances will courses below 4xxx be considered for graduate credit.

M.S. Degree Requirements

The M.S. degree, which usually requires at least 18 months to complete, is offered under Plan A (with thesis) and Plan B (without thesis). Students in both plans must complete 14 credits in the major, including four core courses in teaching and evaluation in dentistry; basic research methodology; introductory biostatistics; and fundamentals of health care administration. Courses from other disciplines may also be taken for credit in the major with the approval of the student’s adviser and the director of graduate studies. All students must complete at least 6 credits outside the major field (either as a minor or related field credits) as well as program requirements for training in the responsible conduct of research. Additionally, Plan A students must complete 10 thesis credits; Plan B students must complete 10 additional credits of coursework and submit three Plan B papers, one of which must be oriented toward research. Students must maintain a cumulative GPA of at least 3.00 in the program.

Language Requirements—None.

Final Exam—The final exam is oral.

Design, Housing, and Apparel

Contact Information—Director of Graduate Studies, Design, Housing, and Apparel, University of Minnesota, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108 (612-626-1219; fax 612-624-2750; dhagradinfo@che.umn.edu; http://dha.che.umn.edu/). For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step.

Regents Professor
Joanne B. Eicher, emeritus, ASM

Professor
William J. Angell, M2
Marilyn R. DeLong, SM
Denise A. Guerin, SM
Kim K. J. Johnson, SM
Karen L. LaBat, SM
Becky L. Yust, SM

Adjunct Professor
Edward G. Goetz, ASM

Associate Professor
Marilyn Bruin, M2
Sauman Chu, SM
Jeffrey R. Crump, SM
Sherri A. Gahring, M2
Delores A. Ginthner, emeritus, AM2
Brad Hokanson, SM
Barbara E. Martinson, SM
Steven McCarthy, M2
Stephanie A. Watson, SM
Gloria M. Williams, SM
Ann Ziebarth, SM

Assistant Professor
James Boyd-Brent, M2
Elizabeth Bye, M2
Tasoulla Hadiyanni, M2
Daniel Jasper, M2
Seung-Eun Lee, M2
Fiona L. Shen, SM
Carol C. Waldron, 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 design, housing, and apparel graduate program focuses on the study of relationships between humans and their designed environments. This focus is based on the assumption that design and analysis of environments contributes to the improvement of the human condition. The program addresses theory, research, and application, using a shared disciplinary base from the social and behavioral sciences. The goal of the program is for students to analyze, evaluate, and integrate theoretical frameworks related to humans and their designed environments.

The M.A., M.S., and Ph.D. degrees are available with four areas of emphasis: apparel, design communication, housing studies, and interior design. The M.F.A. and M.A. degrees are available with an emphasis in interactive design. The emphasis in apparel advances both theoretical knowledge and applications for textile and apparel products related to human behavior. Students may focus on design, aesthetics, apparel product development, material culture, historic dress, social science aspects of dress, consumer behavior, and merchandising. The emphasis in design communication focuses on design theory, process, and methods related to design practice and research. Potential areas of study include multicultural communication, visual representation of information, human interaction with designed objects, social and cultural implications of design, color systems and perception, design history, and design education. Students and faculty collaboratively develop designed objects and information resources that will enhance people’s lives. The emphasis in housing studies advances both theoretical and applied knowledge in the housing field. Through research experiences, students are prepared to assist people and communities in addressing housing-related issues. Courses emphasize human needs and behavior, analysis of designed environments and technology, policy and community development, and housing for special populations such as the elderly or low-income households. Graduate study in interior
Degree Programs and Faculty

Design emphasizes the theory, research, and specialized practice components of design as applied to people’s health, safety, and welfare in the interior environment, including culture, sustainability, and issues facing design education. Advances in theoretical knowledge and study of the interactions of humans in interior environments prepare students for teaching and research positions as well as design specializations within the profession. The emphasis in interactive design provides students with experience in designing for the electronic environment. The program integrates theory with practice in the application of emergent and established technologies to digital design solutions. Students complete a creative thesis.

Prerequisites for Admission—Individuals must have adequate undergraduate education in the area of emphasis and background in the basic disciplines of art, social science, physical science, and biological science appropriate to the area of emphasis. To pursue a degree with interior design as the emphasis area, a first professional degree in interior design is required. Students interested in pursuing a Ph.D. must first complete a master’s degree. Specific requirements may be obtained by contacting the director of graduate studies.

Special Application Requirements—Consult the director of graduate studies; scores from the GRE are required. Students pursuing a degree in an emphasis related to design are required to submit a portfolio consisting of 15-20 examples of recent work. Students are admitted fall and spring semesters.

Courses—Please refer to Design, Housing, and Apparel (DHA) in the course section of this catalog for courses that pertain to this program.

Use of 4xxx Courses—No more than 30 percent of a student’s official degree program may be comprised of 4xxx courses. Not all of the department’s 4xxx courses are available for graduate credit. Appropriate courses are selected in consultation with the student’s advisers.

M.A. and M.S. Degree Requirements

Minimum requirements include 4 credits in courses that focus on theory building and the theoretical and philosophical bases of inquiry in the discipline; 6 credits in courses that focus on qualitative and quantitative methods of research and evaluation; 8 credits for Plan A students, and 12 for Plan B students in the area of emphasis; 10 thesis credits for Plan A students; and 6 credits in a related field. Required courses include DHA 8181—Ethics and Research or the equivalent, and DHA 8101—Philosophical Foundations of Design, Housing, and Apparel. Students may be required to complete additional credits upon recommendation of their committee.

Language Requirements—None.

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—For a master’s minor, a minimum of 9 credits in design, housing, and apparel is required, including DHA 8101. Courses are selected in consultation with the director of graduate studies.

M.F.A. Degree Requirements

Minimum requirements for the M.F.A. include 7 credits in courses that focus on theory building and the theoretical and philosophical bases of inquiry in the discipline, including DHA 8101—Philosophical Foundations of Design, Housing, and Apparel and DHA 5399—Theory of Electronic Design; 6 credits in evaluation and analysis, including DHA 5388—Design Planning and Analysis; 27 credits in the area of emphasis, including DHA 8114—Design Studio and DHA 8181—Ethics and Research or the equivalent; 12 credits of M.F.A. creative thesis; and 8 credits in a related field. Students may be required to complete additional credits upon recommendation of their committee.

Language Requirements—None.

Final Exam—The final exam is oral.

Ph.D. Degree Requirements

Minimum requirements for the Ph.D. include 6 credits in courses that focus on theory building and the theoretical and philosophical bases of inquiry in the discipline; 9 credits in courses on qualitative and quantitative methods of research and evaluation; 12 credits in the area of emphasis; 24 thesis credits; and 12 credits in a supporting program. Required courses include DHA 8181—Ethics and Research or the equivalent and DHA 8101—Philosophical Foundations of Design, Housing, and Apparel. Students may be required to complete additional credits upon recommendation of their committee.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—For a doctoral minor, a minimum of 12 credits in design, housing, and apparel is required, including DHA 8101. Courses are selected in consultation with the director of graduate studies.

Development Studies and Social Change

Minor Only

Contact Information—Interdisciplinary Center for the Study of Global Change, University of Minnesota, 537 Heller Hall, 271 19th Avenue S., Minneapolis, MN 55455 (612-624-0832; fax 612-625-1879; macarthy@umn.edu); www.icsg.umn.edu

For up-to-date graduate faculty listings, see [www.grad.umn.edu/faculty_rosters/step]

Regents Professor

Allen Isaacman, History, M
G. Edward Schuh, Public Affairs, M
John Sullivan, Political Science, M

Professor

Ronald R. Aminzade, Sociology, M
Ragu A. Assaad, Public Affairs, M
Vernon B. Cardwell, Agronomy and Plant Genetics, M
Lisa J. Dish, Political Science, M
Raymond D. Duval, Political Science, M
Lawrence Jacobs, Political Science, M
Amy K. Kaminsky, Women’s Studies, M
Anne R. D. Kapuscinski, Fisheries, Wildlife, and Conservation Biology, M
Sally Kenney, Public Affairs, M
Helga Leitner, Geography, M
John W. Mowitt, Cultural Studies and Comparative Literature, M
August H. Nintz, Jr., Political Science, M
James A. Perry, Fisheries, Wildlife and Conservation Biology, M
Philip J. Regal, Ecology, Evolution, and Behavior, M
Terry L. Roe, Applied Economics, M
Abdi I. Samatar, Geography, M
Eric S. Sheppard, Geography, M
Kathryn A. Sikkink, Political Science, M
George R. Spangler, Fisheries, Wildlife, and Conservation Biology, M
Karen B. Thompson, M
Ann B. Waltner, History, M
Donald Wyse, Agronomy and Plant Genetics, M

Associate Professor

Fernando E. Arenas, Spanish and Portuguese Studies, M
Keletso E. Atkins, African American and African Studies, M
Daphne J. Berdahl, Anthropology, M
Elizabeth H. Boyle, Sociology, M
Bruce P. Braun, Geography, M
Rose Brewer, African American and African Studies, M
Jeffrey P. Broadbent, Sociology, M
Sarah C. Chambers, History, M
Catherine C. Choy, American Studies, M
Jay S. Coggins, Applied Economics, M
Jigna Desai, Women’s Studies, M
Douglas R. Hartmann, Sociology, M
Qadri Ismail, English, M
Daniel Kelfliher, Political Science, M
Deborah Levison, Public Affairs, M
Carol A. Miller, American Studies, M
Richa Nagar, Women’s Studies, M
Kristen Nelson, Forest Resources, M
Jean M. O’Brien-Kehoe, History, M
Joanna O’Connell, Spanish and Portuguese Studies, M
Jennifer L. Pierce, American Studies, M
Ajay Skaria, History, M
Charles J. Sugnet, English, M
John S. Wright, African American and African Studies, M

Assistant Professor

Katy Gray Brown, General College, M
Barbara Frey, Human Rights Program, M
Vinay Gidwani, Geography, M
Degree Programs and Faculty

Ann Hironaka, Sociology, M
Helene Murray, Agronomy and Plant Genetics, M
Michele Wagner, History, M

Curriculum—This structured interdisciplinary doctoral minor is offered in conjunction with the Interdisciplinary Center for the Study of Global Change (ICGC). By focusing on the social bases of change in the developing world, the program engages a wide range of academic disciplines, including the social sciences, humanities, and biological sciences. The minor focuses on three areas: 1) the relationships between macroscopic processes of political, economic, and social change, and the microscopic conditions of lived experience in the developing world; 2) specifically interdisciplinary perspectives (encompassing the social sciences, the biological sciences, and the humanities) on this general thematic concern; and 3) preparation of doctoral students for research on the developing world.

Prerequisites for Admission—Admission is contingent upon prior admission to a doctoral degree-granting program within the Graduate School and upon affiliation with ICGC.

Special Application Requirements—Students enrolled in a doctoral degree-granting program may apply for the minor at any time during the academic year; acceptance will take effect the following term.

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

Use of 4xxx Courses—Courses used to fulfill minor requirements must be 5xxx or above.

Minor Only Requirements

The doctoral minor requires a sequence of three core seminars (DSSC 8111, 8211-12, 8310) for 9 credits total (8310 is taken twice). Students also take one or two courses (minimum 3 credits total) chosen from an approved list of courses from across the Graduate School curriculum that are relevant to the field of development studies and social change.

Early Childhood Policy

Postbaccalaureate Certificate

Contact Information—Scott McConnell, Early Childhood Policy Certificate, Center for Early Education and Development, University of Minnesota, 215 Pattee Hall, 150 Pillsbury Dr. SE, Minneapolis, MN 55455; 612-624-8543; skc@umn.edu. For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step1.

Professor

Joseph Allen, Asian Languages and Literatures, M2
Tsan-Kuo Chang, Journalism and Mass Communication, M2
Edward L. Farmer, History, M2
Chin-Chuan Lee, Journalism and Mass Communication, M2
Michael Molasky, Asian Languages and Literatures, M2
Robert J. Poor, Art History, M2
Ann B. Waltner, History, M2

Associate Professor

Jeffrey P. Broadbent, Sociology, M2
Keya Ganguly, Cultural Studies and Comparative Literature, M2
Christopher M. Isett, History, M2
Daniel Kelleri, Political Science, M2
Liping Wang, History, M2

Assistant Professor

Mark Anderson, Asian Languages and Literatures, M2
Christine Marran, Asian Languages and Literatures, M2
Hiromi Mizuno, History, M2
Maki Morinaga, Asian Languages and Literatures, M2
William Schaefer, Asian 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—The program offers an entry point for interdisciplinary study of East Asia, particularly China and Japan. It serves both as a stepping stone to advanced academic work and as a terminal degree for those with non-academic career goals related to East Asia.

Prerequisites for Admission—Ideally, an applicant’s background should include undergraduate study in fields related to East Asia or East Asian languages. Students from other academic areas may be admitted with the provision that prerequisite coursework be made up after admission.

Special Application Requirements—Three letters of recommendation, an academic writing sample, and a statement of purpose should be submitted to the department. GRE test scores are required. Students are admitted each semester.

Courses—Please refer to East Asian Studies (EAS) and Global Studies (GloS) 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.

No new students are currently being accepted to this program. Contact the Graduate School for information on the status of the program.

Contact Information—East Asian Studies, Area Studies Programs, University of Minnesota, 214 Social Sciences Building, 267 19th Avenue S., Minneapolis, MN 55455 (612-624-8543; eas@umn.edu)
M.A. Degree Requirements

The program uses an interdisciplinary approach that emphasizes the humanities and social sciences and requires proficiency in a foreign language, a theoretical framework, broad knowledge of the area in question, and a concise understanding of a topical theme to be developed in the Plan A thesis or Plan B papers.

Plan A requires 31 credits: a minimum of 21 course credits (seven courses), including 15 credits (five courses) in the major and 6 credits (two courses) in one or more fields outside the major, and 10 thesis credits. Coursework must include three proseminars/seminars. A Plan A thesis must be written.

Plan B requires 30 course credits in order to provide a broader knowledge of the chosen field and allied subjects. It requires at least 15 credits (five courses) in the major field and 12 credits (four courses) in one or more related fields outside of the major, which must include three proseminars/seminars. Three Plan B papers must be written, at least one of them outside of the major.

Language Requirements—The language requirement may be fulfilled by successful completion of either three years (six semesters) of a Chinese or Japanese language sequence, or at least four semesters of Chinese or Japanese language study and an approved study abroad experience in East Asia. For a Korean focus, it is possible to have a comparable level of Korean language in lieu of the Chinese or Japanese requirement. (Note: Proficiency exams and evaluations are provided by relevant language departments.)

Final Exam—The final exam is oral.

Minor Requirements for Students Majoring in Other Fields—A master’s minor requires two years of language study or equivalent proficiency, plus at least three courses (minimum of 9 credits) in the field that include at least two semesters of seminars/proseminars.

Ecology, Evolution, and Behavior

Contact Information—Department of Ecology, Evolution and Behavior, Director of Graduate Studies, University of Minnesota, 100 Ecology Building, 1987 Upper Buford Circle, St. Paul, MN 55108-6097
(612-624-5700; fax 612-624-6777; EEBGrad@ cbs.umn.edu; www.cbs.umn.edu/eeb/graduateprogram)
For up-to-date graduate faculty listings, see www.grad.umn.edu/faculty_rosters/step.

Regents Professor
Margaret B. Davis (emeritus), AM2
G. David Tilman, SM

Professor
Donald N. Alstad, SM
David A. Andow, Entomology, SM
Franklin H. Barnwell, SM
Patrick L. Breznick, Civil Engineering, SM
James W. Curtsinger, SM
Edward J. Cushing, SM
Thomas C. Johnson, Geology, Duluth, SM
Linda L. Kinkel, Plant Pathology, SM
Scott M. Lanyon, SM
Robert O. Megard (emeritus), AM2
L. David Mech, Fisheries, Wildlife, and Conservation Biology, SM
Patrice A. Morrow, SM
Claudia Neuhauser, SM
Raymond M. Newman, Fisheries, Wildlife, and Conservation Biology, SM
Craig Packer, SM
John Pastor, Duluth, SM
Stephen Polasky, SM
Anne E. Pusey, SM
Philip J. Regal, SM
Peter B. Reich, Forest Resources, SM
Michael J. Sadowsky, Soil, Water, and Climate, SM
Ruth G. Shaw, SM
Michael J. Simmons, Genetics and Cell Biology, SM
Peter W. Sorensen, Fisheries, Wildlife, and Conservation Biology, SM
Marla Spivak, Entomology, SM
Anthony M. Starfield, SM
David W. Stephens, SM
Robert W. Sterner, SM
Bert E. Stromberg, Jr., Veterinary and Biomedical Sciences, SM
Robert M. Zink, SM

Associate Professor
James B. Cotner, SM
Antony M. Dean, SM
Susan M. Galatowitsch, Horticultural Science, SM
George Heimpel, Entomology, SM
Sarah E. Hobbie, SM
Georgiana May, SM
Andrew M. Simons, Fisheries, Wildlife and Conservation Biology, SM
Susan J. Weller, Entomology, SM

Assistant Professor
Mark Borrello, SM
Jeaninne Cavender-Bares, SM
Jacques Finlay, SM
Sharon Jansa, SM
Jennifer King, SM
Joseph McFadden, SM
Helene Muller-Landau, SM
Karen S. Oberhauser, Fisheries, Wildlife and Conservation Biology, SM
Ellen Strong, Fisheries, Wildlife, and Conservation Biology, SM
Shinya Sugita, SM
Peter Tiffin, Plant Biology, SM
George Weiblen, Plant Biology, SM

Other
Lee E. Frelsich, Forest Resources, SM
Diane L. Larson, SM
Clarence Lehman, 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 graduate program in ecology, evolution, and behavior (EEB) links faculty and students interested in the biology of organisms from molecules to ecosystems. Studies address questions from molecular mechanisms of evolution, the interactions of organisms in social groups and populations, the distributions and abundances of species in communities and ecosystems, to global biogeochemical processes. The program provides broad training in the general areas of ecology, evolution, and animal behavior, and specialized courses and research in vertebrate and invertebrate zoology; behavior and ethology; evolution; population genetics; molecular evolution; systematics; population, community, and ecosystem ecology; global ecology, limnology, paleoecology, ecology of vegetation, and theoretical ecology. Opportunities for field research are available in Africa, Alaska, Central America, and other parts of the world, as well as in local ecosystems. Seminars and individually designed tutorials are an important part of student programs and provide an exciting intellectual environment.

Prerequisites for Admission—Courses in inorganic chemistry, organic chemistry, biochemistry, general physics, one year of college calculus, animal biology, genetics, physiology, and plant biology are strongly recommended and provide an important background to pursue graduate work in EEB. Proficiency in a foreign language is not required but is strongly recommended for students who expect to pursue field work in a country where English is not the native language. Deficiencies must be made up early in the graduate program.

Special Application Requirements—Students are admitted only in fall semester. Deadline for application is December 15. Three letters of recommendation evaluating the applicant’s scholarship are required, plus GRE scores (the Subject Test in biology is recommended, though not required).

Courses—Please refer to Ecology, Evolution, and Behavior (EEB) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—As preparation for their preliminary examinations, Ph.D. students are expected to acquire basic knowledge in ecology, evolution, behavior, and organismal biology by taking graduate courses or 4xxx courses that are approved by the director of graduate studies. One of these courses can be a graduate seminar or reading course, and one of these courses can be substituted by an advanced undergraduate course taken prior to entering into the EEB graduate program.

M.S. Degree Requirements
The M.S. is offered under both Plan A (with thesis) and Plan B (without thesis). Both plans require a minimum of 14 course credits in the major and a minimum of 6 course credits in one or more related fields outside the major;
Plan A also requires 10 thesis credits, and Plan B requires 10 additional course credits and one to three research papers, which may be written in conjunction with graduate courses. Significant field or laboratory experience and competence in statistics, to include hypothesis testing, regression, and correlation are required. Degree programs are planned by the student and an advisory committee of three faculty members to meet the student’s interests and needs.

Language Requirements—None.

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

Minor Requirements for Students Majoring in Other Fields—A minimum of 7 credits of EEB 4xxx, 5xxx, and 8xxx courses is required for a master’s minor in EEB.

**Ph.D. Degree Requirements**

A minimum of 3 course credits and 24 thesis credits are required in the major, and at least 12 course credits are required for either a minor in another field or a supporting program from several related fields. Significant field or laboratory experience, proficiency in using computers in research, and competence in advanced statistics are required. Students are expected to gain some appreciation of history or philosophy of science and are required to teach a minimum of two semesters 50 percent time. Degree programs are planned by the student and an advisory committee of three to five faculty members.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 credits of EEB 4xxx, 5xxx, and 8xxx courses is required for a doctoral minor in EEB.

**Economics**

**Contact Information**—Director of Graduate Studies, Department of Economics, University of Minnesota, 1035 Heller Hall, 271 19th Avenue S., Minneapolis, MN 55455 (612-625-6833; fax 612-624-0209; econgrads@econ.umn.edu; www.econ.umn.edu).

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

**Regents Professor**
John S. Chipman, SM
G. Edward Schuh, Public Affairs, ASM

**Professor**
Beth E. Allen, SM
Michele Boldrin, SM
Varadarajan V. Chari, SM
Zvi Eckstein, SM
Roger D. Feldman, Public Health, ASM
Edward M. Foster, SM
Thomas J. Holmes, SM
Larry E. Jones, SM
Patrick J. Kehoe, SM
Timothy Kehoe, SM
Samuel Kortum, SM
Andrew McLennan, SM
Marcel K. Richter, SM
Aldo Rustichini, SM
Craig E. Swan, SM
Ian Werner, SM

**Adjunct Professor**
Ellen McGrattan, AM2
Christopher Phelan, AM2
James A. Schmitz, AM2
Warren E. Weber, AM2

**Associate Professor**
George D. Green, History, AM2
Erzo G. J. Luttmer, SM

**Assistant Professor**
Christina Arellano, M2
Marco Bassetto, M2
Mariacristina DeNardi, M2
Andrea Moro, M2
Vasiliki Skreta, M2
Julia K. Thomas, M2

**Other**
Simran Sahi, 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 economics graduate program offers degree work in both theoretical and applied fields of economics. It is possible to pursue thesis research in microeconomic or macroeconomic theory. In addition, the following fields of specialization are offered: econometrics, economic growth and development, financial economics, game theory, industrial organization, international economics, labor economics, mathematical economics, monetary economics, and public economics. Students are admitted only for the Ph.D.; the M.A. is an optional part of the Ph.D. program.

**Prerequisites for Admission**—The general requirement is the capability to pursue Ph.D.-level work. Normally a student should have an undergraduate record from a recognized college that includes coursework in economic theory. Prerequisites for Admission—The economics graduate program includes courses equivalent to Econ 5151 and 5152 or more advanced courses in economic theory. Significant field or laboratory experience and competence in economic theory are required; the Ph.D. written preliminary exams are required in two fields outside of economic theory (“field exams”) may be used to satisfy either or both of the Plan B projects. Because the standards used to judge whether a preliminary exam has satisfied the requirement for the M.A. are less rigorous than those for the Ph.D., students may qualify for the master’s Plan B without having satisfied all requirements for the Ph.D. written preliminary exams.

Language Requirements—None.

**Final Exam**—The final exam is oral for Plan A, written for Plan B.

Minor Requirements for Students Majoring in Other Fields—A master’s minor consists of 6 credits in 4xxx, 5xxx, or 8xxx economics courses, all taken A-F and completed with grades of B or better (one 8xxx course may carry a grade of C). The 6 credits include Econ 5151 and 5152 or more advanced courses in economic theory. The economics theory requirement may be waived if, in the judgment of the director of graduate studies, the student’s previous work in economics includes courses equivalent to Econ 5151 and 5152, though the requirement to complete 6 credits would still stand.

**Ph.D. Degree Requirements**

Emphasis in all aspects of the program is on careful development of the theoretical basis for the work, whether the work is theoretical or applied, and whether the relevant theory is drawn from economics, econometrics, mathematics, statistics, or other related disciplines.

Before undertaking research for a doctoral thesis, the student must pass written preliminary exams in micro- and macroeconomic theory, plus in two of the fields listed under the curriculum section above. The program does not specify a minimum number of courses for the major; rather, the courses taken to help prepare for the prelim exams constitute the major program. In addition, students must complete 12 credits outside of the major for a supporting program, which may include economics courses not included in the major.

**Language Requirements**—None.

**M.A. Degree Requirements**

The M.A. is offered under Plan A (with thesis) or Plan B (without thesis). Coursework for the M.A. is drawn from the Ph.D. program and must include at least 10 credits of economic theory from the first-year Ph.D. sequences in theory (for majors) or microeconomic analysis (for minors) and macroeconomics. Beyond these restrictions, the general Graduate School requirements govern. For the Plan B degree, a Ph.D. student will have completed requirements for the M.A. when the written preliminary exams have been completed. Two Plan B projects consisting of research papers or literature reviews are required; the Ph.D. written preliminary exams required in two fields outside of economic theory (“field exams”) may be used to satisfy either or both of the Plan B projects. Because the standards used to judge whether a preliminary exam has satisfied the requirement for the M.A. are less rigorous than those for the Ph.D., students may qualify for the master’s Plan B without having satisfied all requirements for the Ph.D. written preliminary exams.
Minor Requirements for Students Majoring in Other Fields—Requirements for a doctoral minor include five or more from among the following courses: Econ 8001-2-3-4 or 8101-2-3-4, and 8105-6-7-8; plus completion of at least two 8xxx courses in economics other than those listed above. All courses must be taken A-F, with no grade lower than C and no more than two course grades of C.

In addition, students must pass the microeconomics preliminary exam for minors or majors and either the macroeconomics preliminary exam for minors or majors, or a preliminary exam for majors in one of the fields listed under the program description above.

Education
Advanced work leading to the professional degree of master of education (M.Ed.) is offered in several areas of study. For more information, see the College of Education and Human Development Professional Studies Catalog. This catalog can be found online at www.education.umn.edu/catalogs/catalog_intro.html.

Education Emphases (Twin Cities campus)—At the Ph.D. level, the education major is divided into two emphases; Recreation, Park, and Leisure Studies and Work, Community, and Family Education.

Recreation, Park, and Leisure Studies
Contact Information—Director of Graduate Studies, School of Kinesiology, University of Minnesota, 220 Cooke Hall, 1900 University Avenue S.E., Minneapolis, MN 55455 (612-624-1221; rpls@umn.edu; http://education.umn.edu/kls).

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

Professor
Dorothy H. Anderson, Forest Resources, AM2
William Gartner, Applied Economics, AM2
Mary Jo Kane, SM
Leo H. McAvoy, Jr., SM
John E. Rynders, Educational Psychology, AM2
Michael G. Wade, SM

Associate Professor
Bruce D. Anderson, SM
Carla E. S. Tabourne, SM
Diane M. Wiese-Bjornstal, SM

Assistant Professor
Kenneth Bartlett, Work, Community, and Family Education, AM2
W. Corliss Outley, SM

Lecturer
Maurice K. Fahnestock, AM2

Other
JoAnn Buyse, M2
Stephen Paul Carlson, Forest Resources, AM2
Robert Dunforth, AM2

Carol A. Leitschuh, M2
David W. Lime, Forest Resources, AM2
Ingrid Elena Schneider, Forest Resources, 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—Ph.D. students in education with an emphasis in recreation, park, and leisure studies (RPLS) pursue an individualized program specializing in park and recreation administration, outdoor education/recreation, sport management, or therapeutic recreation.

Prerequisites for Admission—Although prospective students generally have completed undergraduate and masters’ degrees in recreation, park, and leisure studies, others with a baccalaureate degree may be admitted who have related preparation and a significant background and interest in the subject. Admitted students may be required by their adviser to complete background preparation in undergraduate and graduate recreation and related coursework.

Special Application Requirements—Applicants must submit a completed University of Minnesota, Twin Cities Graduate School application form including a clearly written statement of academic interests, goals, and objectives, scores from the General Test of the GRE (verbal and quantitative) or Miller Analogies Test that are less than five years old, three letters of recommendation from persons familiar with their scholarship and research potential, a scholarly paper, and copies of official transcripts. Students may apply at any time; however, submission of all application materials by January 15 is strongly encouraged to ensure priority consideration for admission as well as teaching and research assistantships awarded for the next academic year. The three letters of recommendation must be sent directly to the department. Students can be admitted any term.

Research Facilities—Research facilities include the Institute on Community Integration and the Tucker Center for Research on Girls and Women in Sport.

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

Ph.D. Degree Requirements
The Ph.D. requires at least 86 credits, which must include 12 credits in an RPLS common core [including one course from Educational Policy and Administration (EdPA) or the Preparing Future Faculty Program (Grad)], 21 credits in an RPLS emphasis area, 17 credits in research development, 12 credits in a supporting program or minor, and 24 thesis credits (Educ 8888). A minimum GPA of 3.00 is preferred to maintain good standing and to graduate.

Language Requirements—None.

Minor Requirements for Students Majoring in Other Fields—A doctoral minor requires at least 12 credits of graduate level courses in RPLS, including Rec 5101 (3 cr) and 8980 (2 cr).

Work, Community, and Family Education
Contact Information—Professor Jim Brown, Director of Graduate Studies, Department of Work, Community, and Family Education, University of Minnesota, 210 Vocational and Technical Education Building, 1954 Buford Avenue, St. Paul, MN 55108 (612-624-1221; wcfe@umn.edu; www.education.umn.edu/wcfe).

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

Professor
James M. Brown, SM
Richard A. Krueger, SM
Judith J. Lambrecht, SM
Theodore Lewis, SM
Gary N. McLean, SM
Roland L. Peterson, SM
David J. Pucel, SM
Richard A. Swanson, SM

Associate Professor
Rosemarie J. Park, SM
Thomas D. Peacock, Education, Duluth, AM2
James R. Stone III, SM
Baiyun Yang, SM

Assistant Professor
Kenneth R. Bartlett, SM
Brad Greiman, M2
Richard M. Joerger, M2
Shari L. Peterson, SM

Other
Barry Craig Johnsen, AM2

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

Prerequisites for Admission—Prospective 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), Human Resource Development (HRD), and Work, Community, and Family Education (WCFE) in the course section of this catalog for courses pertaining to the program.

Use of 4xxx Courses—A maximum of 15 credits of 4xxx courses may be used in the related field or supporting program. Students who plan to use any 4xxx courses in their program are responsible for determining that the course is available for graduate credit. Degree programs must include rationale for the use of 4xxx course credits.

M.A. Degree Requirements

The M.A. is offered under Plan A and Plan B. Students in either plan complete a minimum of 30 to 34 credits of 5xxx courses, including 14 credits in the major and 6 credits in the related field. Plan A students also take 10 thesis credits; Plan B students complete a 3- to 6-credit project or paper, with remaining credits taken in either the major or related field.

Language Requirements—None.

Final Exam—The final exam is oral.

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

Ph.D. Degree Requirements

The Ph.D. requires 60 course credits and 24 thesis credits. Course credits include a minimum of 12 credits in general aspects, a minimum of 20 credits in research, and a minimum of 16 credits in the specialization. Course credits must also include 12 elective credits and 12 credits from outside the department, which may overlap with those in general aspects, research, and the specialization.

Language Requirements—None.

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

Education, Curriculum, and Instruction

Contact Information—Department of Curriculum and Instruction, University of Minnesota, 125 Peik Hall, 159 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-2545; sigs@umn.edu; www.education.umn.edu/ch

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

Professor

Patricia G. Avery, SM
Richard W. Beach, SM
Carol A. Carrier, Human Resources, AM
John J. Cogan, Educational Policy and Administration, ASM
Deborah R. Dillon, SM
Lee Galda, SM
Roger T. Johnson, SM
Judith J. Lambrecht, Work, Community, and Family Education, ASM
Frances P. Lawrenz, Educational Psychology, ASM
David O’Brien, SM
R. Michael Paige, Educational Policy and Administration, ASM
Thomas R. Post, SM
S. Jay Samuels, Educational Psychology, ASM
Barbara M. Taylor, SM
Ruth G. Thomas, SM

Associate Professor

Lisa D. Albrecht, School of Social Work, AM2
Kathleen Cramer, CM
Fred N. Finley, SM
Simon R. Hooper, SM
Patricia James, General College, AM2
Timothy Lensmire, SM
Jerry Hammond McClellan, SM
Rosemarie J. Park, Work, Community, and Family Education, AM2
Jane Pihlal, SM
Diane J. Tedick, SM
Constance L. Walker, SM

Assistant Professor

Martha H. Bigelow, SM
Lesa Covington-Clarkson, M2
Lori A. Helman, M2
Joan E. Hughes, M2
Bic Ngo, M2
Gillian H. Roehrig, M2
Bhaskar Upadhyay, M2

Lecturer

Mary Bents, Student and Professional Services, AM2
L. JoAnne Buggey, M2
Faith M. Clover, M2
Aaron H. Doering, M2
Theresa L. Johnson, M2
Terrence Wyberg, M2

Other

Tara W. Fortune, Center for Advanced Research on Language Acquisition, AM2
Michael Michlin, Center for Applied Research and Educational Improvement, AM
Donna D. Pearson, M2
Debra Stevens Peterson, AM2
Joyce A. Walker, Center for 4-H Youth Development, M2

Curriculum—By focusing on the curricular and instructional processes central to all educational endeavors, graduate programs within the Department of Curriculum and Instruction prepare students for professional roles in preK-12 education, in postsecondary and research settings, in educational service agencies, and in business and industry.

The M.A. and Ph.D. degrees include formal tracks in art education; elementary education; family, youth, and community; learning technologies; literacy education (including children’s literature, English education, language arts education, reading education, and writing education); mathematics education; science education; second languages and cultures education (including ESL, foreign language, bilingual, and immersion education); and social studies education.

Students must have an interest in research in education or a related field; students plan a program of coursework that prepares them to conduct scholarly research in an area of expertise related to education, curriculum, and instruction.

Prerequisites for Admission—Generally a bachelor’s degree with licensure and/or teaching experience fulfills the requirement. For some areas, however, there is no equivalent undergraduate program. In that case, 15 to 20 credits of undergraduate coursework determined acceptable by advisers and the director of graduate studies is adequate. A master’s degree is also generally required for admission to the Ph.D. program.

Special Application Requirements—Applicants must submit scores from the General Test of the Graduate Record Examination (GRE) that are less than five years old, three letters of recommendation from 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. Master’s and doctoral applications are reviewed by department faculty twice per academic year, with December 1 as the deadline for priority consideration for fellowships and teaching and research assistantships, and with March 15 as the secondary deadline.

Courses—Please refer to Curriculum and Instruction (CI), and Mathematics Education (MthE) 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.A. Degree Requirements

In education, curriculum, and instruction, students may pursue Plan A (with thesis) or Plan B (with one or two papers). Plan A requires 15-18 credits in the major, depending upon the formal track chosen, and a minimum
of 6 credits in one or more related fields outside the major. Plan A also requires 10 thesis credits. Plan B requires a minimum of 30 credits, which includes a minimum of 14 credits in the major and at least 6 credits in one or more related fields outside the major. Core and research course requirements are specified for Plan A and Plan B in accord with each major track and are chosen in consultation with the adviser.

Language Requirements—Although language requirements for second languages and cultures (SLC) students are not specified in terms of degrees or coursework, each SLC student must give evidence of proficiency in communicating within the second language of choice. There is no language requirement for other tracks.

Final Exam—The final exam is oral.

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

Ph.D. Degree Requirements

A total of 78 credits is required for the Ph.D. Requirements include three core courses (CI 8131, 8132, 8133 for 9 credits) and at least 15 other credits in the major track. Students must also complete 12 credits in research methodology; 6 credits in educational foundations; 12 credits in a minor or supporting program; and 24 thesis credits. Specific courses and additional work vary depending on the major track and are planned with the adviser.

Language Requirements—Although language requirements for second languages and cultures (SLC) students are not specified in terms of degrees or coursework, each SLC student must give evidence of proficiency in communicating within the second language of choice. There is no language requirement for other tracks.

Minor Requirements for Students Majoring in Other Fields—A minimum of 12 credits is required for a minor. Requirements include a demonstrated understanding of foundational knowledge related to curriculum and instruction and consultation with the director of graduate studies.

Educational Policy and Administration

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

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

Professor

William M. Ammentorp, SM
Robert H. Bruninks, SM
David W. Chapman, SM
John J. Cogan, SM
Gerald W. Fry, SM
David R. Johnson, SM
Jean A. King, SM
Darrell R. Lewis, SM
Theodore Lewis, Work, Community, and Family Education, ASM
Josef A. Mestenhauser (emeritus), ASM
Neal C. Nickerson (emeritus), ASM
R. Michael Paige, SM
Karen Rose Seashore, SM
Robert D. Tennison, Educational Psychology, ASM
James E. Ysseldyke, Educational Psychology, ASM

Associate Professor

Melissa S. Anderson, SM
C. Cryss Brunner, SM
Arthur M. Harkins, SM
Darwin D. Hendel, SM
Byron J. Schneider, M2
James R. Stone III, Work, Community, and Family Education, AM2
Jennifer York-Barr, SM

Assistant Professor

Nicola A. Alexander, SM
Scott C. McLeod, SM
Stuart S. Yeh M2

Lecturer

Laura L. Bloomberg, AM
Deanne L. Magnusson, AM2
Joseph H. Nathan, Public Affairs, AM2
Lynn R. Scearcy, AM2
Patricia S. Seppanen, AM2
Kyla L. Wahlstrom, AM2
Ann Z. Werner, AM2

Other

Joyce Ann Walker, 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 Department of Educational Policy and Administration prepares administrators, scholars, and analysts for leadership roles in education. The department is committed to the preparation of leaders who can act effectively and ethically within the structures, processes, and cultural contexts of organized education. Students in the M.A. and Ph.D. programs choose from one of four complementary but distinct program tracks: educational administration (EdAd), evaluation studies (ES), higher education (HiEd), and comparative and international development education (CID). In addition, the department offers a variety of Ed.D. programs for practicing professionals and four PK-12 administrative licensure programs.

The department also offers various certificate programs including school technology leadership and, in cooperation with other certificate programs (program evaluation, staff development, disability policy and services, postsecondary developmental education), an individualized concentration in youth leadership development, and minors in international education and program evaluation. See the department Web site address above for details on minors and certificate programs.

These graduate programs incorporate relevant knowledge from the behavioral and social sciences and the humanities, with primary reliance on sociology, management science, political science, psychology, public affairs, economics, philosophy, history, and anthropology.

Prerequisites for Admission—Applicants must have completed appropriate undergraduate and graduate study. In some cases, where previous coursework or degrees are marginally related, otherwise qualified applicants will be asked to complete additional background courses after admission.

Applications are encouraged from individuals who may have completed undergraduate and/or master’s programs in related areas such as curriculum studies, public affairs, sociology, psychology, economics, political science, international relations, management science, measurement and statistics, and educational psychology. The department offers study opportunities for professionals who are employed full time as well as for those who wish to pursue graduate studies full time.

Special Application Requirements—Applicants must submit scores from the General Test of the GRE, two letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts (sent directly from institution(s) to the Graduate School), a current résumé, and three brief essays (personal statement, educational issue of interest, career goals). The GRE is not required for EdAd M.A. applicants but is required for application to other M.A. program tracks (CID, ES and HiEd) and all tracks in the doctoral degree programs (Ed.D. and Ph.D.). International students must also submit a TOEFL or IELTS score, but international applicants to the M.A. program are exempt from the GRE. All applications for admission, except those for the CID Ph.D., are reviewed on a monthly basis. CID Ph.D. applications are reviewed on January 15 and April 15. Submission of all application materials by February 15 is strongly encouraged to ensure priority consideration for assistantships awarded on March 1 for the next academic year. All new students begin in fall semester unless permission to start earlier is granted by the program coordinator. The department application, letters of recommendation, résumé, and essays are sent directly to the