DIVISION OF GRADUATE EDUCATION

For the most up-to-date catalog information:
www.montana.edu/wwwcat

Division of Graduate Education

Mission and Goals Statement

The mission of the Division of Graduate Education (DGE) is to develop, nurture, promote and sustain graduate programs of the highest quality at Montana State University (MSU). DGE seeks to support graduate students and graduate programs at the highest level, to provide a foundation for MSU graduate program growth and development, and advance the health, prosperity, and welfare of the United States and the State of Montana.

Welcome from the Vice Provost for Graduate Education

Carl A. Fox, Ph.D.
Vice Provost for Graduate Education

The Division of Graduate Education welcomes you to Montana State University. We are very excited that you have chosen MSU and we invite you to learn more about our highly regarded graduate programs, the exciting and challenging opportunities afforded graduate students, and the wonderful community of Bozeman, Montana.

As a top 100 research university, Montana State continues to honor its land grant heritage by providing outstanding educational experiences to students from throughout the state, the nation, and the world. Our faculty are highly recognized for their world-class research, teaching and outreach. The opportunities to work in state-of-the-art facilities on cutting-edge research projects are virtually endless at MSU. We encourage you to visit our departments and their websites for more information about these opportunities.

The community of Bozeman offers a truly unique and quality lifestyle to complement the rich intellectual environment at MSU. The area is home to a large and growing number of high-technology companies, many of which have originated from the research programs at MSU. Opportunities abound for graduate students seeking employment and research opportunities in these high technology companies.

The Division of Graduate Education staff and I welcome your questions and comments about the graduate programs at MSU. Please contact us at gradstudy@montana.edu so that we can assist you in making your graduate experience at Montana State University the most rewarding time in your career development.

Graduate Programs

The master's and doctoral degree offerings at MSU are listed below, along with each academic department's website address. To find out more information about the programs you are interested in, we invite you to talk with someone from the department. For detailed information about the graduate study opportunities that await you at MSU, visit the Division of Graduate Education web pages at www.montana.edu/wwwdg.

Department of Animal and Range Sciences
http://animalrange.montana.edu/degrees-grad.htm
- Master of Science in Animal and Range Sciences
- Master of Science in Entomology
- Doctor of Philosophy in Animal and Range Sciences

School of Architecture
http://www.arch.montana.edu/program/degrees/masters.htm
- Master of Architecture

School of Art
www.montana.edu/wwwart/haveflash.html
- Master of Fine Arts

College of Business
www.montana.edu/cob/Graduate/MPAC2002.htm
- Master of Professional Accountancy

Department of Cell Biology and Neuroscience
http://www.montana.edu/cbn/
- Master of Science in Biological Sciences
- Master of Science in Neuroscience
- Doctor of Philosophy in Biological Sciences
- Doctor of Philosophy in Neuroscience

Department of Chemical and Biological Engineering
www.chbe.montana.edu/
- Master of Science in Chemical Engineering
- Master of Science in Environmental Engineering (interdisciplinary)
- Doctor of Philosophy in Engineering (option in Chemical Engineering)
Department of Chemistry and Biochemistry
http://www.chemistry.montana.edu/graduate/
- Master of Science in Biochemistry
- Master of Science in Chemistry
- Doctor of Philosophy in Biochemistry
- Doctor of Philosophy in Chemistry

Department of Civil Engineering
www.coe.montana.edu/ce/layer_one_docs/graduate_programs.html
- Master of Science in Civil Engineering
- Master of Science in Environmental Engineering (interdisciplinary)
- Master of Construction Engineering Management
- Doctor of Philosophy in Engineering (options in Applied Mechanics, Civil Engineering, and Environmental Engineering)

Department of Computer Science
www.cs.montana.edu/
- Master of Science in Computer Science
- Doctor of Philosophy in Computer Science

Department of Earth Sciences
www.montana.edu/wwwes/programs/graduate.htm
- Master of Science in Earth Sciences
- Doctor of Philosophy in Earth Sciences

Department of Ecology
www.montana.edu/eco/gradinfo.html
- Master of Science in Biological Sciences
- Master of Science in Ecological and Environmental Statistics
- Master of Science in Fish and Wildlife Management
- Doctor of Philosophy in Biological Sciences
- Doctor of Philosophy in Fish and Wildlife Biology
- Doctor of Philosophy in Ecology and Environmental Sciences

Department of Education
www.montana.edu/wwweduc/
- Master of Education (options in Adult and Higher Education, Curriculum and Instruction, and Education Administration)

Department of Geography
www.gis.montana.edu/graduate
-Master of Science in Geography
-Doctor of Philosophy in Geography

Department of History
www.montana.edu/hist/graduate
- Master of Arts in History
- Doctor of Philosophy in History

Department of Health and Human Development
www.montana.edu/wwwhhd/academicprograms/graduateprograms.htm
- Master of Education in School Counseling
- Master of Science in Health and Human Development (options in Counseling, Exercise and Nutrition Sciences, Family and Consumer Sciences, Family Financial Planning, and Health Promotion and Education)

Department of History and Philosophy
www.montana.edu/hist/
- Master of Arts in History
- Doctor of Philosophy in History

Department of Mathematical Sciences
http://www.math.montana.edu/grad
- Master of Science in Mathematics (options in Mathematics and Mathematics Education)
- Master of Science in Statistics
- Master of Science in Ecological and Environmental Statistics
- Doctor of Philosophy in Mathematics
- Doctor of Philosophy in Statistics

Department of Mechanical and Industrial Engineering
www.coe.montana.edu/mie/
- Master of Science in Mechanical Engineering
- Master of Science in Industrial and Management Engineering
- Doctor of Philosophy in Engineering (options in Industrial Engineering and Mechanical Engineering)

Department of Media and Theatre Arts
http://naturefilm.montana.edu/
- Master of Fine Arts in Science and Natural History Filmmaking

Department of Chemistry
www.coe.montana.edu/graduate/
- Master of Science in Chemistry
- Doctor of Philosophy in Chemistry

Department of Mathematics
www.math.montana.edu/graduate
- Master of Science in Mathematics (options in Mathematics and Mathematics Education)
- Master of Science in Statistics
- Master of Science in Ecological and Environmental Statistics
- Doctor of Philosophy in Mathematics
- Doctor of Philosophy in Statistics

Department of Microbiology
www.montana.edu/wwwmb/
- Master of Science in Microbiology
- Doctor of Philosophy in Microbiology

Department of Native American Studies
www.montana.edu/wwwnas/index.php?page=graduate
- Master of Arts in Native American Studies

College of Nursing
www.montana.edu/wwnu/academic/mn.htm
- Master of Nursing (options in Family Nurse Practitioner or Clinical Nurse Specialist)
- Post-Master’s Family Nurse Practitioner Certificate

Department of Physics
www.physics.montana.edu
- Master of Science in Physics
- Doctor of Philosophy in Physics

Department of Plant Sciences
http://plantsciences.montana.edu/studentGrad.htm
- Master of Science in Entomology (interdisciplinary)
COLLEGE OF AGRICULTURE

Jeff Jacobsen, Dean and Director
Bob Gough, Associate Dean and Assistant Director

Graduate Programs Available:
• M.S. in Agricultural Education
• M.S. in Animal and Range Sciences
• M.S. in Applied Economics
• M.S. in Entomology
• M.S. in Land Rehabilitation
• M.S. in Land Resources and Environmental Sciences
• M.S. in Plant Pathology
• M.S. in Plant Science
• M.S. in Veterinary Molecular Biology
• Ph.D. in Animal and Range Sciences
• Ph.D. in Ecology and Environmental Sciences (Please see Interdisciplinary Programs)
• Ph.D. in Plant Science
• Ph.D. in Veterinary Molecular Biology

AGRICULTURAL EDUCATION PROGRAM

Division of Agricultural Education
106 Linfield Hall
PO Box 172830
Bozeman, MT 59717-2830
Ph: 406-994-2132
Fax: 406-994-6996
ag.montana.edu/ageducation/
aged@montana.edu

Professors
• Martin Frick; program planning and evaluation, curriculum, power mechanics, cooperative business education; international agriculture (406) 994-5775; mfrick@montana.edu

Assistant Professors
• Carl Igo; research methods, teacher education, leadership development; (406) 994-3693; cigo@montana.edu
• Shannon Arnold; extension education, professional development, international agricultural education, leadership education; (406) 994-6663; shannon.arnold@montana.edu

Degree Offered
M.S. in Agricultural Education

The graduate program in agricultural education at Montana State University is designed to prepare graduates for entry into or advancement in formal and non-formal teaching careers. This program also provides development of professional leadership skills for other careers in agribusiness, government service, extension, or adult education.

The master's degree program in agricultural education, with its various options, provides a program that can be tailored to meet each student's career goals. In addition to the wide variety of professional courses in agricultural education, offerings are also available from all academic departments in the College of Agriculture, including agricultural economics, animal and range sciences, land resources and environmental sciences, plant sciences and plant pathology, and veterinary molecular biology. Specialization areas such as adult education, educational administration, career education, and curriculum coordination are also available through cooperation with the College of Education, Health and Human Development. Either Plan A (thesis) or Plan B (project or professional paper) is available.

Admission
To gain admission to the graduate program, contact the Agricultural Education Program, 106 Linfield Hall, Montana State University Bozeman, MT 59717, and request admission forms. Completion of the Division's pre-application is strongly recommended prior to submitting formal application to the Division of Graduate Education.

Program Requirements
The program offers considerable flexibility to students to help them meet their professional and personal objectives. Plan A requires a thesis. A minimum of 30 credit hours must be completed, 20 credits of course work and 10 credits of thesis preparation.

Students who choose Plan B are required to complete a professional paper based on a current research issue related to the student's emphasis area.
Students will take a minimum of 30 hours of course work (no thesis credits). The final selection of the student’s research activity will be the student’s responsibility in collaboration with the advisor and the graduate committee.

**Required Core Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>AgEd 506</td>
<td>Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>AgEd 507</td>
<td>Program Planning and Evaluation</td>
<td>3</td>
</tr>
<tr>
<td>AgEd 590</td>
<td>Thesis Preparation (Plan A Only)</td>
<td>10</td>
</tr>
<tr>
<td>EDCI 402</td>
<td>Educational Statistics</td>
<td></td>
</tr>
</tbody>
</table>

11 additional credits (Plan A) or 21 additional credits (Plan B) in the emphasis areas of Agricultural Instruction, Agricultural Extension, or Agricultural Relations (Communications).

**Financial Assistance**

Teaching and research assistantships may be available for qualified students. Interested students should request an assistantship application from: Agricultural Education 106 Linfield Hall, MSU, Bozeman, MT 59717. See the Graduate Assistantship sections for detailed information on appointment criteria.

**DEPARTMENT OF ANIMAL AND RANGE SCIENCES**

P.O. Box 172900
Bozeman, MT 59717-2900
Tel: (406) 994-5582

**Interim Department Head**

Dr. Bret Olson

**Professors**

- James Berardinelli — Reproductive Physiology
- Janice Bowman — Beef Cattle Nutrition
- Patrick Hatfield — Range Sheep Nutrition and Management
- Gregory Johnson — Veterinary Entomology
- Rodney Kott — Extension Sheep Specialist
- John Paterson — Ruminant Nutrition
- Dennis Cash — Forage Production Management
- Clayton Marlow — Plant and Animal Interactions, Riparian Mgmt
- Jeffrey Mosley — Grazing Management, Foraging Behavior
- Bret Olson — Rangeland Ecology
- Bok Sowell — Range Improvements and Nutrition

**Assistant Professors**

- Jane Ann Boles — Meat Science
- Rachel Endecott — Extension Beef Cattle Specialist
- Shannon Moreaux — Equine Science

**Degrees Offered**

- M.S. in Animal and Range Sciences
- M.S. in Land Rehabilitation (interdisciplinary)
- Ph.D. in Animal and Range Sciences

**Admission**

A minimum of 3.0 on a 4.0 scale is required by Division of Graduate Education for admittance. We require that a student take the GRE (Graduate Record Examination) and that the scores be included as part of the application material. If you have not taken the GRE exam, you should do so at your earliest convenience. In addition to the above requirements international applicants must have a TOEFL (English proficiency) score of 550 (paper) or 213 (computer).

The undergraduate work should have been in Animal Science, Range Science or a closely related field. A faculty member must agree to advise a student before they will be accepted into the Animal and Range Sciences department. Acceptance to the MSU Animal and Range Sciences department does not imply automatic acceptance to the MSU Division of Graduate Education. Financial support in the form of research assistantships and/or tuition and fee waivers is limited and will be awarded on a competitive basis.

**Master of Science**

**Animal Science Emphasis**

Graduate students in the Animal Science emphasis receive broad based training resulting in experiences that qualify them for many agricultural jobs. Areas of emphasis include nutrition, breeding and genetics, physiology, production systems, and meat science/muscle growth. Research problems may involve beef cattle, sheep and biochemical or other properties of agricultural products. Supporting course work may be taken from Animal Science, Range Science, Biology, Wildlife Management, Biochemistry, Statistics, Plant Sciences, Land Resources and Environmental Sciences, and Economics.

Research laboratories are available in the department and specialized equipment is also available through cooperation with other departments. The department conducts cooperative research with the U.S. Livestock and Range Research Station at Miles City, Montana, and the U.S. Sheep Experiment Station at Dubois, Idaho. Facilities for the maintenance of beef cattle and sheep are available at the Red Bluff Research Ranch, 30 miles west of Bozeman, the Fort Ellis Research Center, near Bozeman, and the Northern Agricultural Research Center at Havre. The main station has facilities for sheep, horses and beef cattle (a cattle feedlot and nutrition laboratory). A wool laboratory is located on campus.

**Range Science Emphasis**

Research and training opportunities in the Range Science programs are diverse, and students with a wide variety of backgrounds, goals, and educational needs are accepted. Major areas of study are range ecology, habitat management, watershed management, grazing management, monitoring, riparian ecosystems, measurements, and plant-animal (livestock and wildlife) interactions. A graduate degree in range science prepares for careers in rangeland management, wildlife management, habitat management, natural resource conservation and restoration, research, land-use planning, and consultation. Research facilities include the Red Bluff Research Ranch, several research centers of the Montana Agricultural Experiment Station, U.S. Livestock and Range Research Station at Miles City, Montana, and the U.S. Sheep Experiment Station at Dubois, Idaho. Cooperative projects with ranchers and federal and state agencies are also conducted. Supporting courses at the graduate level include botany, wildlife biology and management, soils, animal science, earth science, plant science, statistics and biochemistry.

**Biology Emphasis**

Graduate students in the Biology emphasis receive training directed toward the basic biological functions as they relate to animal production, meat science/meat food safety or entomology. Research projects may involve...
beef cattle, sheep and biochemical or other properties of agricultural products. Supporting course work may be taken from Animal Science, Range Science, Biology, Wildlife Management, Biochemistry, Statistics and Plant Sciences.

Interdisciplinary M.S. Degree in Land Rehabilitation

Animal and Range Sciences participates with the interdisciplinary M.S. Program in Land Rehabilitation. The program offers advanced study in rehabilitation of disturbed lands. Site revegetation, soil remediation, riparian zone restoration, stream channel restoration, investigation of impacted geologic resources and remediation of contaminated sites are included in areas of study. Emphasis is placed on developing a broad understanding of soil, plant, and hydrologic processes. Students may focus in a subject area of direct importance to land rehabilitation, such as plant ecology, soil sciences, hydrology, geology, geography, biology, or range science.

The M.S. degree in Land Rehabilitation is offered through each of the following departments: Animal and Range Sciences; Biology; Civil (Bio-resource) Engineering; Earth Sciences, and Land Resources and Environmental Sciences. Please refer to College of Agriculture, where a more detailed program description can be found.

Interested students should contact Graduate Programs Secretary, Department of Land Resources and Environmental Sciences, 334 Leon Johnson Hall, 994-7060, lresinfo@montana.edu.

Requirements for a M.S. in Animal & Range Sciences
1. At least two courses from the Graduate Range Science block (must be 500 level course)
2. At least one course from the Graduate Animal Science block or Range Science block

Proficiency Requirements

Graduate Animal & Range Science Block

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARNR 520 - Nutrient Metabolism in Domestic Animals</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 521 - Advanced Ruminant Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 523 - Advanced Physiology of Reproduction</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 524 - Advanced Animal Breeding</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 5 - Muscle and Growth Biology</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 541 - Range Ecosystem Physiology</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 543 - Riparian Processes and Function</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 544 - Advanced Grazing Management &amp; Ecology</td>
<td>3</td>
</tr>
</tbody>
</table>

Students must meet the Proficiency Requirements for their emphasis area (see Proficiencies below).

Proficiency Requirements for Range Science Emphasis

By the time a student completes a M.S. or Ph.D. in Animal & Range Sciences (Animal Science Emphasis), he/she must have successfully completed undergraduate or graduate coursework in three of the four areas listed below. Examples of MSU courses that fulfill these requirements are given. Students who have successfully completed an equivalent course may apply that course toward the proficiency requirements, subject to the approval of the student's Graduate Committee. Undergraduate courses in these categories are not intended to comprise a substantial portion of a student's graduate curriculum. These courses should be taken in addition to, not in lieu of, other courses in a graduate program. While some courses may apply to Requirements for the M.S. in Animal & Range Sciences and Proficiency Requirements, the student's Graduate Committee must not allow the need to meet Proficiency Requirements detract from a student completing a rigorous graduate degree program.

- Breeding/Genetics (ARNR 322 - Principles of Animal Breeding or BIOL 301 - Principles of Genetics)
- Physiology/Reproduction (ARNR 321 - Physiology of Reproduction)
- Nutrition (ARNR 320 - Animal Nutrition)
- Production/Management (ARNR 434 - Beef Cattle Management)
Proficiency Requirements for Biological Science Emphasis

By the time a student finishes the M.S. degree in Animal & Range Sciences (Biological Science Emphasis), he/she must have successfully completed a minimum of 15 credit hours in the biological sciences with at least 9 credit hours in upper division coursework which may include: biological sciences, chemistry, microbiology, food science, entomology, and ecology. Examples of MSU courses that fulfill these requirements are given. Students who have successfully completed an equivalent course may apply that course toward the proficiency requirements, subject to the approval of the student’s Graduate Committee.

DEPARTMENT OF AGRICULTURAL ECONOMICS AND ECONOMICS

Montana State University
P.O. Box 172920
Bozeman, MT 59717-2920

www.montana.edu/econ/
agecon@montana.edu

Tel: (406) 994-3701
Fax: (406) 994-4838
Location: 306 Linfield Hall

Department Head
Co-Dept. Heads:
Dr. Wendy Stock
Dr. Myles Watts

Professors
• J.M. Antle; production economics, econometrics, international development
• J.A. Atwood; production economics, agricultural finance.
• G.W. Brester; agricultural marketing.
• D.E. Buschena; decision analysis, applied microeconomics, agricultural marketing.
• R.K. Fleck; public choice, public finance, economic history.
• A. Hanssen; industrial organization, law and economics, political economics.
• G. Haynes; Small business finance, agricultural policy.
• M.A. Goetting; personal and family finance, estate planning, financial planning.
• R.R. Rucker; resource economics, agricultural policy, applied microeconomics.
• V.H. Smith; macroeconomics, agricultural policy analysis, applied microeconomics.
• W.A. Stock; Labor economics, econometrics.
• M.J. Watts; production economics, farm management, agricultural finance.
• D.J. Young; macroeconomics, public finance, labor.

Assistant Professors
• J.R. Brown; entrepreneurial finance, industrial organization.
• D.A. Griffith; farm management, computer assisted decisions.

Associate Professor
• C. Stoddard; labor economics, public finance, economics of education.

Degree Offered
M.S. in Applied Economics

Our Master of Science degree in Applied Economics encourages students to develop and apply their skills in economic analysis and examine a wide array of economic and political issues. Learning takes place through coursework in economic theory, quantitative methods and econometrics, through collaborative work with departmental faculty, and through an intensive research thesis that addresses an important economic issue selected by the student.

Admission
To receive full consideration for assistantship awards for Fall Semester, applications should be received by January 15. Late applications will be considered as space and funding are available. With the application, students must submit General Graduate Record Examination (GRE) scores, official transcripts of all degree coursework, and three letters of recommendation. Foreign students must also include scores from (1) the Test of English as a Foreign Language (TOEFL) with a score of 550 or higher and (2) the Test of Spoken English (TSE/SPEAK) with a score of 50 or higher. To ensure timely consideration, submit all requested materials directly to the Department, as directed in the application. To apply online use the following link: http://www.applyweb.com/apply/mstug/menu.html
Core courses are taught at a level that requires entering students to have successfully completed courses in intermediate microeconomic theory, intermediate macroeconomic theory, calculus, matrix theory, and statistics. Students who have not completed the prerequisite material, but with apparent potential for graduate study, may be admitted to the program on a provisional basis. Coursework required to make up deficiencies will be in addition to graduate coursework. A two-week math review course is offered each year for all graduate students prior to Fall Semester.

Program Requirements

A core of economic theory and quantitative methods courses (or equivalent) is required. Students are required to maintain a 3.0 grade point average overall in their core courses and the courses in their graduate program. Failure to meet these requirements, as well as receipt of more than one grade less than a "B-" in the core courses will be grounds for termination.

The core includes:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE 467</td>
<td>Quantitative Methods in Economics</td>
<td>3</td>
</tr>
<tr>
<td>ECON 401</td>
<td>Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECON 501</td>
<td>Advanced Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECON 502</td>
<td>Macroeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECON 561</td>
<td>Econometrics I</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

In addition to theory and quantitative methods core courses, students will successfully complete ECON 569 (Research Methodology). Supplementary coursework and research may focus on agricultural economics, natural resource economics, or general applied economics. Through continued discussions with the advisor and other faculty, students will select additional courses and either a thesis topic (Plan A) or research paper topic (Plan B) to complete a program of study consistent with their interests.

Students may choose to study special problems on an individual basis. Students desiring "Individual Problem" credit as either ECON 570, AGE 570, ECON 580, or AGE 580 should consult with a faculty member and agree upon a plan of study before the beginning of the semester in which the credits are to be undertaken. The College of Graduate Studies must approve all such courses, and limits the number of credits applicable toward degree requirements as: maximum of 3 credits for Option A or 6 credits for Option B.

**Under Plan A**, required minimums are: 20 semester credits (including the core courses of graduate coursework), and 10 semester credits of thesis. For those who have satisfied coursework prerequisites, the required degree coursework should be completed in two semesters. The thesis must be acceptable to the student’s graduate committee and to the College of Graduate Studies, and it must demonstrate independent and original research.

**Under Plan B**, a thesis is not required. This option includes at least 30 semester credits of graduate coursework. Students who select Option B are required to include a research paper (ECON 575; maximum of 4 credits in a semester and a maximum of 6 credits for the program) as part of their program. For those who have satisfied coursework prerequisites, the required degree coursework (other than the research paper) should be completed in two semesters. The paper must be original, of professional quality (meet style and format requirements set forth in the College of Graduate Studies’ Guide for Preparation of Thesis and Professional Papers), be acceptable to the student’s graduate committee, and receive final approval by the Department Head.

Two examinations complete degree requirements. Each student is required to pass a Microeconomics Theory Core Exam—a written exam administered by the Department’s Graduate Affairs Committee. The exam is offered early spring semester, and may be offered one additional time each year; it will consist of questions covering the fundamental concepts of microeconomic theory and their application. Results of the Core Exam will be reported to the Dean of the College of Graduate Studies as constituting the comprehensive examination.

In addition to the Core Exam, each student is required to pass an oral examination in defense of their thesis (Option A) or research paper (Option B). The oral examination is administered by the student's graduate committee and is open to all members of the faculty. Students are expected to present a typed draft, in final form, of the thesis or research paper to each member of their graduate committee at least seven days prior to the scheduled date of their examination. The examination for Option A students should not be scheduled until the student’s thesis committee agrees that the thesis is essentially in a form acceptable to the University Library (that is, copies of the typed draft should be readable and have a table of contents, list of tables and figures, chapter titles, section headings, bibliography, and consecutively numbered pages). The examination for Option B students should not be scheduled until the paper is in a form which satisfies style and format requirements.

Financial Assistance

A number of research and teaching assistantships are available for graduate students and are awarded on a competitive basis. Late applications will be considered as space and funding become available. For further information, refer to the Graduate Assistantships sections.

DEPARTMENT OF
LAND RESOURCES AND
ENVIRONMENTAL SCIENCES

Montana State University
P.O. Box 173120
Bozeman, MT 59717-3120
Tel: (406) 994-3090
http://landresources.montana.edu
lresinfo@montana.edu

Application Deadlines:
Fall - June 15
Spring - November 1
Summer - March 1
*International students must submit their application one (1) month prior to the above deadline.

Department Head
Dr. Jon M. Wraith
330 Leon Johnson Hall
(406) 994-4605

Professors
• J.W. Bauter; soil and water quality management.
• W.P. Inskeep; soil chemistry.
• B.D. Maxwell; agroecology and weed biology.
• T.R. McDermott; soil microbiology.
• W.L. Morrill (emeritus): field crop entomology.
• G.A. Nielsen (emeritus): soil genesis, morphology and classification.
• K.M. O'Neill; insect behavior and ecology.
• D.L. Patten (research); riparian and hydroecology.
• J.C. Priscu; microbial biogeochemistry in aquatic systems.
• L.J. Rew; plant ecology.
• F.D. Menalled; cropland weed ecology.
• C.A. Jones; soil fertility and nutrient management.
• C.A. Zabinski; restoration ecology.
• D.K. Weaver; chemical ecology and restoration ecology.
• R.K. Peterson; agricultural and biological risk assessment.
• D.K. Weaver; chemical ecology and behavior; insect physiology.
• C.A. Zabinski; restoration ecology.

Assistant Professors
• R.E. Engel; soil nutrient management and plant nutrition.
• R.L. Lawrence; remote sensing, GIS, spatial analysis.
• B.L. McGlynn; watershed hydrology
• P.R. Miller; cropping systems.
• C. Montagne; soil classification and land resources.
• R.K. Peterson; agricultural and biological risk assessment.
• D.K. Weaver; chemical ecology and behavior; insect physiology.
• C.A. Zabinski; restoration ecology.

Associate Professors
• C. M. Foreman (research); microbial ecology.
• C.A. Jones; soil fertility and nutrient management.
• R.E. Macur (research); soil and environmental chemistry.
• L.A. Marshall; watershed analysis.
• F.D. Menalled; cropland weed ecology and management
• G.C. Poole; fluvial landscape ecology
• L.J. Rew; plant ecology.
• S.E. Sing (research); weed ecology, biocontrol and risk assessment

Degrees Offered
• M.S. in Entomology (coordinating department)
• M.S. in Land Rehabilitation
• M.S. in Land Resources and Environmental Sciences
• Ph.D. in Ecology and Environmental Sciences (Interdisciplinary)

M.S. Degree in Land Resources and Environmental Sciences
The M.S. program in Land Resources and Environmental Sciences is designed to provide outstanding graduate training opportunities across a substantial breadth of disciplinary interests. Research and coursework programs are specifically adapted to each graduate student. Research projects are directed toward improving our understanding of principles and processes important to land resources and environmental sciences, with opportunities for direct ties to management in many cases. Many projects address processes at multiple scales through well-integrated, multi-disciplinary efforts. Understanding is developed through targeted advanced coursework tailored to the student and to the research project. Research projects involve topics such as hydrology, watershed analysis, integrated management of invasive species, soil nutrient management, bioremediation, land reclamation, restoration ecology, fluvial systems ecology and restoration, riparian ecology, microbial ecology of natural systems, chemical fate and transport, water quality, crop diversification, precision agriculture, environmental risk assessment, remote sensing applications, and climate variability.

Curriculum
30 credits minimum (10 thesis, 20 course work) required for master's degree. 2/3 of total credits must be 500 level. 2 Credits of LRES 500 Seminar required.

Admission
Students seeking admission to graduate status must hold a B.S. degree, have a record of high scholarship, and show significant promise for success in a graduate program. For further information, refer to the sections on Admission Policies and Application Requirements. Successful applicants are accepted into the department and the Division of Graduate Education.

Core Curriculum
Candidates for the M.S. degree in Land Rehabilitation must complete a ten (10) credit core curriculum. Elective credits will reflect foundational courses as well as student's special interests. A minimum of 20 credits of coursework must be taken from MSU.
Candidates for the M.S. degree in Land Rehabilitation are expected to be familiar with the degree requirements of both their home department and the Division of Graduate Education. For additional degree requirements, see the For Master’s Students section.

M.S. Degree in Entomology

The graduate program in Entomology at Montana State University leads to a Master of Science degree. Students in the program are required to take formal course work and conduct independent research guided by the student’s advisory committee. Each student, during the course of her/his graduate program, will also have the opportunity to participate in activities outside their degree program that will benefit them academically and professionally. Such activities include participating in teaching and outreach programs, taking part in the entomology seminar series, and attending and presenting research results at professional meetings. Each student is strongly encouraged to take advantage of these opportunities. A student’s individual program can be designed, with approval of the graduate advisor and graduate committee, to suit the student’s individual interests and career goals.

The entomology faculty at MSU conduct research in a variety of disciplines, including behavioral ecology, biodiversity studies, biological control of insects and weeds, biosystematics, chemical ecology, ecology, integrated pest management, pollination ecology, risk assessment, stored-product entomology, thermal biology, and veterinary entomology. Entomological research at MSU includes some of the most important pests in the western U.S., including alfalfa weevil, aphids, cutworms, grasshoppers, Hessian fly, lygus bugs, mosquito vectors of West Nile Virus, wheat-stem sawfly, wireworms, and others. Beneficial insects under study include various biological control agents and pollinators. Most faculty conduct both applied and basic research.

Admission

An entering student is expected to have a solid background in the basic sciences and a B.S. or B.A. in biological or related sciences. The following general guidelines are used for regular admission: 1) combined verbal and quantitative scores on the GRE General Test of at least 1000, with a verbal score of at least 420; 2) minimum undergraduate grade point average of 3.0 on 4.0 scale; 3) positive letters of recommendation; 4) mutual acceptance of a major advisor/student association.

Entomology Curriculum

A minimum of 20 semester hours of course work and at least 10 thesis credit hours are required for the degree. Students deficient in preliminary course work may be required to take additional courses for which they will not receive graduate credit (course numbers <400). A minimum of 24 credits of course work (Including not more than 10 thesis credits) must be taken from Montana State University. Courses taken outside of Entomology must constitute a unified program approved by the student’s graduate committee.

Current research focuses on insect pests of agricultural importance, biological control of insects and weeds, integrated pest management, and basic studies in ecology, physiology, behavior, and evolution. Fieldwork is an integral part of most programs. Resources include: a comprehensive insect collection, the Regional Insect Quarantine Facility, and access to a state-of-the-art Plant Growth Center with glasshouse space, growth rooms, and growth chambers.

Required Courses (must be taken by all M.S. students):

- BIOL 435 - Insect Identification
- ENTO 525 - Insect Morphology
- ENTO 520 - Insect Physiology
- ENTO 580 - Master's Thesis or Research
- STAT 401* - Applied Methods in Statistics
- STAT 412* - Methods for Data Analysis II

Restricted Electives (fulfill option in each row):
- LRES 401 - Integrated Pest Mgmt
- ENTO 510 - Insect Ecology
- ENTO 514 - Behavioral Ecology
- ENTO 516 - Biosystematics
- ENTO 500 - Seminar
- STAT 401* - Applied Methods in Statistics
- STAT 412* - Methods for Data Analysis II

Other entomology elective courses:
- BIOL 204 - Insect Biology
- ARNR 410 - Veterinary Entomology

* or approved equivalent courses in statistics

Program Participants:
- Animal and Range Sciences
  http://animalrange.montana.edu/
- Land Resources and Environmental Sciences
  http://landresources.montana.edu/
- Plant Sciences and Plant Pathology
  http://plantsciences.montana.edu/

Interested students should contact Graduate Program Coordinator, Department of Land Resources and Environmental Sciences, 334 Leon Johnson Hall, 994-3090, Iresinfo@montana.edu

Departmental Facilities

LRES faculty members conduct cutting-edge investigations in state-of-art laboratory facilities, the modern Plant Growth Center, and in the many outstanding and diverse natural laboratories within and beyond the Greater Yellowstone Ecosystem. We utilize public and private lands across the state and region, as well as the MSU Agricultural Experiment Station facilities. Our faculty are participants and collaborators in many Centers and Institutes within and outside
MSU. LRES faculty advisors work with national and international scientific collaborators, and are internationally recognized for their research and instructional excellence.

**Environmental Sciences Analytical Laboratory**

The department boasts a modern shared analytical facility that houses many state of art instruments for soil, water, air and plant analyses. The facility supports faculty and graduate student research programs, and provides outstanding hands-on experiences and instruction with diverse analytical measurement techniques.

**Spatial Sciences Center**

LRES faculty and staff are key members of the MSU Spatial Sciences Center. The Global Positioning System (GPS) Laboratory provides GPS base station data for determination of accurate location coordinates for field mapping projects. The Remote Sensing Laboratory offers a state-of-the-art facility with extensive abilities to analyze both digital and analog imagery. Equipment and support for both laboratories facilitate teaching, cooperative research, and land resource inventory and management activities.

**Financial Assistance**

Assistantships are awarded on a competitive basis. Contact the department for more information. See the Graduate Assistantship section for detailed information on appointment criteria.

**INTERDISCIPLINARY GRADUATE PROGRAMS**

**Ph.D. Degree in Ecology and Environmental Sciences**

This cross-college doctoral degree represents a broad collaboration among departments and faculty from across MSU. It provides the opportunity for motivated students to integrate our world-class faculty research programs in diverse aspects of ecology and environmental sciences, within the unparalleled natural laboratory that is the Greater Yellowstone Ecosystem. Particular program strengths include terrestrial and aquatic ecology, environmental biogeochemistry, evolutionary biology, hydrology and watershed analysis, quantitative ecology, invasive plant ecology and management, conservation biology, land rehabilitation/ restoration ecology, environmental microbiology, remote sensing and spatial sciences. Please see our website for a more comprehensive list of EES faculty programs and research opportunities: http://eesprogram.montana.edu/index.asp

Graduates will be well-trained professionals who will compete strongly in research, teaching, and related fields nationally and internationally.

EES doctoral students will be affiliated with a home department that corresponds to that of their major faculty advisor. Some specific graduate program criteria, procedures, and processes vary among departments; students will follow those of their home department, which are also consistent with policies set forth by the Division of Graduate Education.

**Admission**

Prospective students should submit a pre-application or application to the graduate program online at http://eesprogram.montana.edu/index.asp. The application should specify the desired area(s) of study to facilitate its full evaluation by faculty members in the desired field(s). Applicants are expected to have appropriate preparation to undertake the doctoral degree in the area of study. Students may undertake the Ph.D. following completion of a Master's degree, or exceptional students may apply directly following completion of a suitable bachelor degree. An appropriate faculty mentor must agree to serve as the student's major advisor as a condition of admission. Stipend and operations funding are generally from research grants and contracts awarded to faculty members, but graduate teaching assistantships and other forms of support are also available on a limited basis.

**Core Curriculum**

Because of the substantial diversity in disciplinary and multidisciplinary foci within the EES doctoral program, there is no universal required core curriculum. The student's individual coursework program will be developed in partnership with the major advisor and graduate committee, and must be consistent with the home department and DGE guidelines and requirements. A minimum of 30 credits of resident coursework must be taken from MSU.

Candidates for the Ph.D. degree in Ecology and Environmental Sciences are expected to be familiar with the degree requirements of both their home department and the Division of Graduate Education.

**Program Participants**

The program is jointly centered in the departments of Ecology (College of Letters and Sciences) and Land Resources and Environmental Sciences (College of Agriculture), but is also specifically open to students and faculty mentors in other MSU departments and colleges who undertake relevant doctoral study.

Interested students should consult the program website at http://eesprogram.montana.edu/index.asp for additional information and to submit a graduate pre-application or application.

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**DEPARTMENT OF PLANT SCIENCES AND PLANT PATHOLOGY**

Montana State University
324 Leon Johnson Hall
Bozeman, MT 59717
Tel: (406) 994-4832

plantsciences.montana.edu/studentinfo/grad/student_grad.html
psppgrad@montana.edu

**Department Head**

John Sherwood

**Professors**

- T.K. Blake; barley breeding and genetics.
- P.L. Bruckner; winter wheat breeding and genetics.
- W.E. Dyer; weed physiology, plant molecular biology.
- M.J. Giroux; molecular genetics and cereal chemistry.
- B.J. Jacobsen; biocontrol, sugar beet and potato diseases.
- M.T. Lavin; plant systematics and evolution.
- J.M. Martin; plant breeding and biometrics.
• D.E. Mathre (emeritus); soil-borne diseases, biocontrol.
• J.H. Riesselman (extension); plant pathology.
• D.C. Sands; bacterial diseases, biocontrol, biotechnology.
• R.A. Sharrock; plant molecular biology, physiology of light adaptation.
• J.E. Sherwood; molecular genetics of plant disease.
• G.A. Strobel; emeritus; biochemistry of plant diseases, biocontrol.
• L.E. Talbert; spring wheat breeding and genetics.
• Norm Weeden; genetics.
• G.A. Strobel; emeritus; biochemistry of plant diseases, biocontrol.
• M.A. Young; virology, thermal biology.

Associate Professors
• A. Fischer; plant biochemistry, tissue senescence.
• T.A.O. Dougher; horticulture.
• E.V. Dunkel; entomology.
• Mike Ivie; entomology.
• M. Johnston (research adjunct); foliar diseases of cereals.
• A.D. Richman; molecular evolution.
• R.G. Stout; retired; plant physiology, thermally adapted plants.

Assistant Professors
• Thamir Al-Niemi (research adjunct); physiological & molecular mechanisms of plant tolerance.
• Mary Burrows (extension); plant pathology.
• C. Cripps; mycology, mycorrhizae.
• Alan Dyer; soil-borne pathogens.
• W.E. Grey; research adjunct; soil-borne disease, seed production.
• William Hoch; horticulture.
• L. Huang; genetics.
• Robyn Klein (adjunct); medicinal plants.
• Chaofu Lu (research adjunct); genetics.
• Cheryl Moore-Gough (extension adjunct); horticulture.
• Alice Pilgeram (research adjunct); bacterial diseases.
• W.S. Pond; landscape design.
• J. Sherman (research adjunct); cytogenetics.
• K. Wanner (extension); entomology.
• Yousef Zadegan; landscape design.
• N. Zidack (research adjunct); bacteriology, biocontrol of weeds.

Degree Offered
• M.S. in Plant Sciences
• M.S. in Plant Pathology
• Ph.D. in Plant Sciences

The department offers advanced study leading to a Master of Science degree in plant sciences and plant pathology under either Plan A (thesis) or B (project or professional paper). In addition, a Ph.D. degree is offered in plant sciences with an option in either plant pathology or plant genetics. Supporting minors are also available in each of the degree fields. The department has major research strengths in the following areas: plant breeding and genetics, plant pathology, plant-microbe interactions, mycology, biocontrol, biotechnology, plant physiology, plant systematics, thermal biology of plants, molecular evolution, and biochemistry.

Admission
Graduate Record Examination General Test scores are required prior to consideration for admission. Students seeking admission to graduate status must hold a BS degree and have a record of high scholarship in areas closely related to the plant sciences. All applications are reviewed by a departmental committee for final recommendation to the Graduate College. Successful applicants are accepted by both the department and the College of Graduate Studies. Students must first submit a pre-application on our website at http://plantsciences.montana.edu.

Plant Sciences
Graduate students majoring in this field may obtain a Master of Science degree in plant science or a Ph.D. degree in plant science with a plant genetics option. Areas of concentration include plant breeding and genetics, plant molecular genetics and biotechnology, physiological genetics, plant systematics, and population genetics.

Plant Pathology
Graduate students majoring in this field may obtain a Master of Science degree in plant science or a Ph.D. degree in plant science with a plant pathology option. Areas of concentration include: biocontrol, mycology, plant-pathogen interactions, biochemistry and molecular genetics of plant disease and virology.

Required Courses
There are no set course requirements for Plant Sciences degree programs. Course requirements are set by the student's graduate committee, however, all students are required to register for PSPP 500-01 (1 credit seminar) once a year.

Departmental Facilities
The department is housed in both Leon Johnson Hall and the Plant BioScience Facility located on the Bozeman campus. The research laboratories range in size from 600-720 sq. ft and are assigned to individual researchers. Individual laboratories are well equipped with the instruments and tools necessary to complete each research project. Researchers cooperate to purchase, share and maintain expensive pieces of specialized equipment or facilities such as the Electron Microscope Lab. Laboratories and offices are wired with high-speed computer lines for direct access to the Internet and the World Wide Web. The faculty has access to the Plant Growth Center Facility (a teaching and research facility available to the College of Agriculture staff). The current 60,000 square-foot facility houses 29 glasshouse rooms with 8,300 square feet of bench space – both temperature and lights are micro-computer controlled; 13 walk in growth rooms where all environmental variables are computer controlled; insect quarantine facilities with separate glasshouses and growth chambers; plant pathogen isolation facilities with 4 glasshouse rooms of 320 sq. ft; the Montana Potato Lab which is responsible for providing disease free seed stock to Montana potato producers. Other important accesses to the department are the Horticulture Farm, Post Research Farm, which is a 300 acre site dedicated to plant and soil research activities, and the MSU Herbarium located in Lewis Hall.
Financial Assistance
Assistantships are awarded on a competitive basis. See the Graduate Assistantship sections for detailed information on appointment criteria. Assistantships are requested through the student's home department.

DEPARTMENT OF VETERINARY MOLECULAR BIOLOGY
P.O. Box 173610
Bozeman, MT 59717
Tel: (406) 994-4705
Fax: (406) 994-4303
vmb@montana.edu

Graduate Coordinator
M.E. Hardy

Department Head
M.T. Quinn

Professors
• A.G. Harmsen; pulmonary immunology
• M.A. Jutila; immunopathology
• M.T. Quinn; pharmacology
• D.W. Pascual; mucosal immunology
• M.W. White; molecular & cellular biology

Associate Professors
• R.A. Bessen; prion diseases
• M.E. Hardy; virology
• E.E. Schmidt; molecular genetics

Assistant Professors
• R.A. Cramer; fungal pathogenesis
• B. Lei; bacteriology
• R.J. Mattix (adjunct); veterinary medicine.
• J.R. Radke; parasitology
• J.J. Voyich-Kane; bacteriology

Degrees Offered
• M.S. in Veterinary Molecular Biology
• Ph.D. in Veterinary Molecular Biology

The Department of Veterinary Molecular Biology (VMB) uniquely combines expertise in the study of pathogen biology, host defense, cell biology in both small and large animal models of human and animal diseases. Three areas broadly encompass the scope of VMB research:

Molecular and genetic studies of animal and pathogen biology.

Understanding molecular pathways of communication between pathogen and host.

Regulation of host immune responses in human and animal diseases.

Funding of research in the Department of VMB comes from diverse sources such as the National Institutes of Health, US Dept of Agriculture, National Science Foundation and the Montana Agricultural Experimental Station among others. Several large grants were awarded to the department in 2004 including a $10.1 million COBRE grant from the NIH, $10.5 million from NIH to study innate immunity, and a $2 million grant from the Department of Defense for advant discovery.

The Department of VMB sponsors undergraduate programs in Biotechnology and Pre-Veterinary training and Masters and Ph.D. programs that emphasize training in cell biology, genetics, immunology, and infectious disease. Weekly seminars are offered by the department and the Nelson seminar series brings many accomplished scientists to Montana State University.

Admission

For detailed information, refer to the Admission Policies and Application Requirements sections. The VMB Core Committee will screen all applications and make recommendations to the Graduate Dean for acceptance to the VMB graduate program. Successful applicants are accepted into both the department and the College of Graduate Studies.

In addition to the documents required in the Application Requirements sections, the Graduate Core Committee will consider the applicant's research experience and the potential of the applicant to complete an appropriate program of study and an independent research project. The final disposition of each application will also take into account other factors, such as the availability of research positions (stipends).

The Graduate Core Committee, VMB faculty, and the VMB head will decide on the acceptability of all applicants. The Graduate Core Committee will serve as the "advisor" for all students accepted into the program during their first year of study.

Program Requirements

Graduate students in VMB are expected to have a basic understanding of biochemistry, molecular biology, immunology, and infectious disease. The Master of Science degree requires a minimum of twenty (20) course credits and ten (10) credits of Master's Thesis Research beyond the baccalaureate degree as specified below, and maintain a 3.0 GPA.

1. A maximum of 3 credits of 400-level coursework may be applied to the M.S. degree.

Required 400-level coursework

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 441: Biochemistry</td>
<td>(Required, or satisfactory undergrad equivalent)</td>
</tr>
<tr>
<td>BCHM 442: Biochemistry</td>
<td>(Required, or satisfactory undergrad equivalent)</td>
</tr>
<tr>
<td>MB 401 – Immunology</td>
<td>(Required, or satisfactory undergrad equivalent)</td>
</tr>
<tr>
<td>STAT 401 – Statistics (Elective)</td>
<td></td>
</tr>
<tr>
<td>VTMB 424 – Ethical Science (Required)</td>
<td></td>
</tr>
</tbody>
</table>

2. There are 7 credits of required 500-level coursework for the M.S. degree.

Required 500-level coursework

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTMB 500 – Seminar</td>
<td>1</td>
</tr>
<tr>
<td>VTMB 501 – Adv. Immunology</td>
<td>3</td>
</tr>
<tr>
<td>VTMB 505 – Gene Expression</td>
<td>3</td>
</tr>
</tbody>
</table>

3. A minimum of 9 credits of elective 500-level coursework is required for the M.S. degree.

Elective Coursework

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 524 – Mass Spectrometry</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 545 – Proteins</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 544 – Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>VTMB 565 – Adv. Virology</td>
<td>3</td>
</tr>
<tr>
<td>VTMB 590 – Microbial Pathogenesis</td>
<td>3</td>
</tr>
</tbody>
</table>

4. A minimum of 14 credits of VTMB 590 (Master's Thesis) is required for the M.S. degree.

Master's Thesis Research

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTMB 590 – Master's Thesis</td>
<td>14</td>
</tr>
</tbody>
</table>

Graduate students enrolled for the Ph.D. degree are required to take at least 25 credits of coursework and 35 credits of doctoral Thesis Research credits as specified below, and maintain a 3.0 GPA.
1. 9 credits of 400-level coursework may be applied to the Ph.D. degree.

Required coursework

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 441 - Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>(Required, or satisfactory</td>
<td></td>
</tr>
<tr>
<td>undergrad equivalent)</td>
<td></td>
</tr>
<tr>
<td>BCHM 442 - Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>(Required, or satisfactory</td>
<td></td>
</tr>
<tr>
<td>undergrad equivalent)</td>
<td></td>
</tr>
<tr>
<td>MB 401 - Immunology</td>
<td>2</td>
</tr>
<tr>
<td>(Required, or satisfactory</td>
<td></td>
</tr>
<tr>
<td>undergrad equivalent)</td>
<td></td>
</tr>
<tr>
<td>STAT 401 - Statistics</td>
<td>3</td>
</tr>
<tr>
<td>(Elective)</td>
<td></td>
</tr>
<tr>
<td>VTMB 424 - Ethical Science</td>
<td>3</td>
</tr>
<tr>
<td>(Required)</td>
<td></td>
</tr>
</tbody>
</table>

2. There are 16 credits of required 500-level coursework for the Ph.D. degree.

Required coursework

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTMB 500 - Seminar</td>
<td>1</td>
</tr>
<tr>
<td>VTMB 501 - Advanced Immunology</td>
<td>3</td>
</tr>
<tr>
<td>VTMB 505 - Gene Expression</td>
<td>3</td>
</tr>
<tr>
<td>VTMB 521 - Laboratory Rotation 1</td>
<td>2</td>
</tr>
<tr>
<td>VTMB 522 - Laboratory Rotation 2</td>
<td>2</td>
</tr>
<tr>
<td>VTMB 523 - Laboratory Rotation 3</td>
<td>2</td>
</tr>
</tbody>
</table>

3. A minimum of 14 credits of elective 500-level coursework is required for the Ph.D. degree.

Elective coursework

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 524 - Mass Spectrometry</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 543 - Proteins</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 544 - Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>MEDS 523 - Molecular Cell Disease</td>
<td>4</td>
</tr>
<tr>
<td>VTMB 503 - Adv.Virology</td>
<td>3</td>
</tr>
<tr>
<td>VTMB 580 - Microbial Pathogenesis</td>
<td>3</td>
</tr>
</tbody>
</table>

4. 35 credits of VTMB 690 (Doctoral Thesis) is required for the Ph.D. degree.

Doctoral Thesis Research

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTMB 690 - Doctoral Thesis</td>
<td>35</td>
</tr>
</tbody>
</table>

Candidates for either the M.S. or Ph.D. degree are required to pass examinations prepared by the members of the graduate committee. Refer to the For Master's Students and For Doctoral Students sections for further degree requirements.

Research

The research problem will be chosen after consultation with the student's major professor. Research areas include molecular biology and immunology, bacteriology, cell biology, parasitology, genetics, biochemistry, ultrastructural cytology, virology, and immunopathology, among others. Specialized equipment and facilities include large and small animal isolation units, a flow cytometry core facility, automated DNA sequencers, proteomics and genomics instrumentation, a microscopy core numerous analytical equipment, multiple tissue-culture and histopathology laboratories.

Financial Assistance

Normally, all students accepted into the VMB graduate program are offered graduate stipends funded by State sources and research grants obtained by VMB faculty. Teaching assistantships are normally not available. Appointments are made on a 12-month basis. Beginning stipends are supported at a level of $18,000 per year plus tuition, health insurance, and other fees.

See the Graduate Assistantship sections for detailed information on appointment criteria.

COLLEGE OF ARTS AND ARCHITECTURE

Susan Agre-Kippenhan, Dean
Heather Bentz, Assistant Dean

Graduate Programs Available:

- Master of Architecture
- M.F.A. in Art
- M.F.A. in Science and Natural History Filmmaking

SCHOOL OF ARCHITECTURE

Montana State University
P.O. Box 173760
Bozeman, MT 59717-3760
Tel: (406) 994-4256

Director

Steven P. Juroszek, Interim Director
John C. Brittingham, Interim Associate Director

Graduate Program Coordinator

John C. Brittingham

Professors

- J. Brittingham; architectural design, theory.
- R. Johnson; architectural design, history, theory.
- S. Juroszek; design, graphics.
- P.C. Kommers; architectural design, theory.
- H.E. Sorenson, Jr.; delineation, architectural design.
- T.R. Wood; architectural design, environmental technology.

Associate Professors

- M.E. O'Neil; architectural design.

Assistant Professors

- M. Everts; design, professional practice.
- Z. Karczewska; design, graphics.
- C. Livingston; design, building construction.
- B. Wrightsman. Everts; design, structures.

Degree Offered

M. of Architecture

The School of Architecture professional curriculum leads to a Master of Architecture degree, a professional degree program in architecture fully accredited by the National Architectural Accrediting Board. The design studio forms the core of architectural education, and every student makes a significant design studio commitment each semester.

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 three types of degrees: the Bachelor of Architecture, the Master of Architecture and the Doctor of Architecture. A program may be granted a 6-year, 3-year or 2-year term of accreditation, depending on the extent of its conformance with established educational standards.

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

Admission

Admission into the architecture graduate program is highly competitive. The school is able to admit approximately 70 graduate students per
Application Submittal Requirements

Prior to June 1, applicants for the fall semester must submit the following documents to the School of Architecture:

1. Portfolio of architectural work sufficient to demonstrate the student's ability and achievement in architecture. Portfolio form and format are left to the discretion of the student, though the portfolio must be suitable for review by a committee.

   NOTE: For return of the portfolio, please submit a suitable mailing receptacle and sufficient postage. We cannot guarantee its return; portfolios have been lost in transit.

2. Written statement outlining the student's background, professional goals, and specific interests in pursuing graduate education in architecture at Montana State.

3. Graduate Application for Admission form as required by the Division of Graduate Education. This is the "blue" form. NOTE: International students must submit the International Graduate Application for Admission form and follow the instructions therein. This is the "green" form.

4. Cumulative GPA calculation form required by the Division of Graduate Education.

5. Three letters of reference on the Personal Reference Form enclosed with the application materials.

6. Official results of the Graduate Record Examination.

7. $50.00 non-refundable application fee, payable to Montana State University.

Expected Placement for Students with an Undergraduate Degree in an Architecture Related Field, Environmental Design, or Architectural Studies

If you have an undergraduate 4-year degree in architectural studies or environmental design and are admitted to the Master of Architecture program, you will be placed at an appropriate point in the architecture curriculum and can expect to pursue a series of rigorous design studios, specialized courses in advanced architecture, a thesis research course and the architectural thesis, in order to be granted the Master of Architecture degree.

Students entering with excellent portfolios can expect to complete the Master of Architecture degree in two to four semesters.

Expected Placement for Students with an Undergraduate Degree in Other Fields

If you have an undergraduate degree in another field and desire to study architecture at Montana State, you will be expected to complete the full ten semesters of design studio. Advanced placement can be made depending on the quality of your portfolio that may demonstrate equivalent achievement. You will be placed as a "Second-Degree Student" until the prerequisites for graduate study have been completed. Upon successful completion of the required prerequisites, you can be advanced to "graduate degree" status.

Dates to Remember

June 1 - Deadline for submittal to School of Architecture of portfolio, application forms, GRE scores for Fall admittance.

November 25 - Deadline for submittal to School of Architecture of portfolio, application forms, GRE scores for Spring admittance.

March 20 - Deadline for submittal to School of Architecture of portfolio, application forms, GRE scores for Summer admittance.

November 25 - Deadline for submittal to School of Architecture of portfolio, application forms, GRE scores for Spring admittance.

March 20 - Deadline for submittal to School of Architecture of portfolio, application forms, GRE scores for Summer admittance.

Submittal Address for all Application Materials and Portfolio

Graduate Placement, School of Architecture, Montana State University
PO Box 173760, 160 Cheever Hall
Bozeman, Montana 59717-3760

For Further Information

Fill out the online form available at the MSU Division of Graduate Education website www.montana.edu/wwwdg/

Program Requirements

The Master of Architecture professional degree is offered under Plan A and Plan B. For students entering the graduate program in AY 2008-09, thirty (30) credits of coursework are required, including ten (10) credits of thesis and thesis presentation for Plan A. For students entering the graduate program in AY 2009-10, forty-two (42) credits of coursework are required including ten (10) credits of thesis and thesis presentation for Plan A.

Once accepted into the Master of Architecture program, students have two paths which they may follow—Plan A Which includes a thesis and requires students to successfully complete ARCH 590 Master's Thesis or Plan B which substitutes a graduate level design studio, Arch 558 Advanced Building Studio, for a Master's Thesis.

The graduate thesis project (Plan A), with expectations of students to address contemporary theoretical issues in architecture and urban design, is a significant capstone experience for entering the profession. The topic for the architectural, urban design project or architectural research project, based on original thought and inquiry, is selected by the student and approved by the thesis committee.

The Plan A Program is a traditional thesis plan where 10 credits of thesis are required on the program of study.
A 4 credit research semester and a 6 credit design semester comprise the 10 credit requirement. All thesis credits are taken pass/fail and a thesis defense is required.

The Plan B Program will require a 6 credit studio course instead of a thesis and the program of study will still include 30 credits minimum. (42 credits starting AY 2009-10.) Students will enroll in the Arch 558 Advanced Building Studio with an instructor. Arch 558 Advanced Building Studio is best described as a programmatically complex problem with an underlying agenda or theoretical component. Arch 558 Advanced Building Studio is required for all graduate students opting for Plan B.

Plan A Students:
Plan A Thesis students will be required to be in the top 1/3 of their class unless a petition is granted.

Plan A thesis students would be required to write a substantive proposal and find two full-time faculty members who share expertise in the area of research outlined in the proposal. A third faculty member would be assigned to the committee by the Graduate Program Director. The proposal will also be reviewed by the Graduate School Admissions Committee.

Thesis proposals will be due on the first day of fall semester.

Reviews with Advisors will include three scheduled reviews with full committee. These three reviews will be scheduled and coordinated by the thesis student. All three reviews will occur prior to the Closed Door Thesis Defense.

Closed Door Thesis Defense would occur at least 14 days prior to end of semester.

Full committee of three will sit on Thesis Defense with the School Director and the Graduate Program Director acting as observers.

Thesis Defense will be graded, Pass/Fail. A minimum of two votes will be required for a Pass with concurrence from either one or both of the observers.

Open Thesis Presentation will occur during final exam week. In addition to committee members reviewers might include mentor advisory committee members, local practitioners, architecture faculty, etc. This review would be more celebratory in nature. At this time a student may receive a “Commend” with a majority concurrence of the final reviewers.

A three year limitation will be placed on thesis as it allows for a student to take one year off for financial reason. Also, students need to make satisfactory progress (as deemed by Committee) with their project.

Plan B Students:
Plan B students will take the 6 credit ARCH 558 - Advanced Building Studio in lieu of doing a Thesis.

Arch 558 – Advanced Building Studio would be complex programmatically with some type of theoretical component or agenda.

Arch 558 – Advanced Building Studio would be graded on 4 point scale.

Notes:
1. All graduate students will be required to receive a minimum grade of "B" (3.0) in any Option Studio. Failure to receive a “B” will result in the student needing to take another Option Studio.
2. All Plan B students would be required to receive a minimum grade of 3.0 in the Advanced Building Studio. Failure to receive a 3.0 will result in the student needing to take another Advanced Building Studio, A student may only have two opportunities to pass the Arch 558 Advanced Building Studio similar to a thesis student having only two opportunities to pass the closed door defense and the comprehensive examination.
3. Neither Arch 450 Community Design Center nor Arch 414 Foreign Study Abroad are allowed to substitute for any graduate level studio.
4. Students who received credit for ARCH 458 Architectural Design VI as part of the Remote Studio option can not repeat the Remote Studio option to satisfy ARCH 551 Advanced Architectural Studio. However, students may repeat the Remote Studio option to receive graduate electives.

All students continue to meet with the Graduate Program Coordinator or Administrative Support staff throughout their fifth year to track their progress toward completion of the Master program. The program study will be developed with the advisor, approved by the committee and be submitted to the Division of Graduate Education by the add deadline of the first semester of attendance. Final approval of the program and committee rests with the Graduate Office. Students may change courses or committee members on the program by completing a Program Change or Change of Committee form. All College of Graduate Study transfer credit policies apply to M Arch students.

The student is expected to be familiar with both School of Architecture and Division of Graduate Education degree requirements. Refer to the For Master’s Students section for additional information.

Required Courses*

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</table>
Financial Assistance

Students should contact the director of the school for information regarding the availability of assistantships. See the Graduate Assistantship section for detailed information on appointment criteria.

SCHOOL OF ART

213 Haynes Hall
Montana State University
Bozeman, MT 59717-3680
406-994-4501
www.montana.edu/art/
art@montana.edu

Director
Richard Helzer
helzer@montana.edu

Professors
• J. Conger; graphic design
• A.C. Garner; graphic design
• R.B. Helzer; metalsmithing
• S. Newman; graphic design
• M.H. Feed; ceramics
• N.R. Pope; ceramics
• H.A. Schlotzhauer; painting/printmaking

Associate Professors
• H.E. Hamburgh; art history
• T. Larkin, art history

Assistant Professors
• R. Beamin; painting/drawing
• N. Beltjens, sculpture
• R. Gee, art history
• G. Janzen, printmaking
• S. Mast, foundations/painting
• M. Newhouse, graphic design

Degree Offered
M. of Fine Art

The School of Art, accredited by the National Association of Schools of Art and Design, offers a Master of Fine Arts (MFA) degree. The MFA degree requires 60 credits of coursework including a minimum of 15 credits of thesis. This degree is designed for the professional artist or craftsman including those who plan to teach art at the college level, with specialization in the following areas: drawing, painting, sculpture, ceramics, printmaking and metalsmithing. The School of Art does not offer a MFA degree in either graphic design or photography. The School of Art no longer requires the GRE for entrance. We are also proud to announce that in 2003 we completed a major renovation project for a graduate art studio building which includes 12-14 private studios and gallery.

Admission

Students applying to the School of Art should submit a portfolio of 20 slides or digital images in jpg format on a cd (preferred), application, official transcripts, artist statement, current resume and three letters of recommendation, along with a statement if you wish to apply for a teaching assistantship. Completed applications for the following academic year must be received by February 15.

Qualified students may be admitted to the College of Graduate Studies on a regular or provisional basis. Provisional acceptance is usually based on undergraduate deficiencies.

Program Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Studio area</td>
<td>15</td>
</tr>
<tr>
<td>Other Studio area(s)</td>
<td>15</td>
</tr>
<tr>
<td>Art History (to include Art 450)</td>
<td>9</td>
</tr>
<tr>
<td>Thesis</td>
<td>15</td>
</tr>
<tr>
<td>Seminar in Art</td>
<td>6</td>
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<tr>
<td>Total</td>
<td>60</td>
</tr>
</tbody>
</table>

Each student’s progress is reviewed by the School of Art faculty at the end of fall and spring semesters with special emphasis being given to students in their first semester of residence and students beginning their thesis work. Passing of these reviews is required for a student to be considered a degree candidate. Students registered in thesis then work with their committees.

Financial Assistance

Limited numbers of graduate teaching assistantships are usually available within the School of Art and are awarded on a competitive basis to formally admitted graduate students. See the Graduate Assistantships sections for detailed information on appointment criteria. Assistantships are requested from the students home department.

DEPARTMENT OF
MEDIA THEATRE ARTS

Visual Communications Building
Room 202
P.O. Box 173350
Montana State University
Bozeman, MT 59717-3350
(406) 994-2484

naturefilm@montana.edu
http://mta.montana.edu

Contacts:
Dennis Aig, Film Options Administrator
Vicki Miller, Student Coordinator

Department Head
Dr. Walter C. Metz
(406) 994-7588
metz@montana.edu

Professors
• Metz, Walter, Ph.D.
• Aig, Dennis, Ph.D.
• Tobias, Ronald, MFA
• Savoie, Phil, MFA
• Lipfert, Theo, MFA

Degree conferred
M.F.A. in Science and Natural History Filmmaking

The graduate program in Science and Natural History Filmmaking at Montana State University is the first program of its type in the world and remains the largest and the most well-known. Students in the program have had their work broadcast in many major venues such as The Discovery Channel, National Geographic, The Science Channel, CNN, Sixty Minutes II, Larry King, CBS Evening News, and NBC Nightly News. They have produced films for the National Park Service, the National Science Foundation, the Department of Agriculture, NOAA, NASA, and such non-profit organizations including the Wildlife Conservation Society, the Sierra Club, the Audubon Society, and the Nature Conservancy. Students' work have appeared in major museums, schools, and cultural venues too numerous to count. Our students literally travel the world with explorers and scientists to make films from the Pribilof Islands to Easter Island, the Galapagos, Australia, Japan, Mongolia, Africa, Chile, and under the sea as well.
Our mission is to provide new generations of filmmakers with formal education and experience in science, engineering, or technology who have the knowledge to create accurate and interesting programs that advance the public understanding of science. Candidates for the MFA take courses that include the history and theory of science and natural history film, as well as extensive work in film and video production, including cinematography, sound, production management, editing, and writing. The intent of the program is not to prepare students to be cinematographers, editors, sound recordists or writers, but to educate producers and directors who understand the complete production process.

Admission
We seek candidates with at least an undergraduate degree in biological or physical sciences, engineering, technology, or the social sciences, and preferably with some research experience. Candidates are not expected to have any formal education or experience in filmmaking. We also seek candidates with degrees in other disciplines who have at least a minor (or equivalent thereof) in any of the fields mentioned above. A minor is construed as at least thirty hours of concentrated study. Applicants with film experience may be exempted from some or all of the production classes at the discretion of the program director.

Program Requirements
The curriculum consists of a minimum of sixty semester credit hours of study and thesis film. To graduate, you should complete the course of study in good academic standing and produce and defend a thesis film within four years of your admission to the program.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MTA 504</td>
<td>Film and Documentary Theory</td>
<td>2</td>
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<tr>
<td>MTA 505</td>
<td>Survey of Science and Natural History Filmmaking</td>
<td>3</td>
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<tr>
<td>MTA 506</td>
<td>Form and Theory of Science and Natural History Filmmaking</td>
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<tr>
<td>MTA 510</td>
<td>Production Technique I - Lecture</td>
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<td>MTA 511</td>
<td>Production Technique I - Lab</td>
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<td>MTA 512</td>
<td>Production Methods and Studies I</td>
<td>2</td>
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<tr>
<td>MTA 515</td>
<td>Production Technique II - Lecture</td>
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<td>MTA 516</td>
<td>Production Technique II - Lab</td>
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<td>MTA 517</td>
<td>Production Methods and Studies II</td>
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<td>MTA 518</td>
<td>Non-Fiction Writing</td>
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<td>MTA 552</td>
<td>Advanced Production Practices I</td>
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<td>MTA 572</td>
<td>Thesis Prep</td>
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<td>MTA 590</td>
<td>Master's Thesis</td>
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<td>MTA 580</td>
<td>Summer Workshops</td>
<td>1</td>
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</table>

Financial Assistance
Depending on the availability of funds, a limited number of teaching assistantships and research assistantships are available each year.

COLLEGE OF BUSINESS

Richard Semenik, Ph.D., Dean
Bruce Raymond, Ph.D., Associate Dean
Susan Dana, J.D., Interim Associate Dean
for Administration and Finance
for Academic Affairs and Founding
Director, The Bracken Center for
Excellence in Undergraduate Business
Education
Christine Lamb, Ed.D., Assistant Dean
Priscilla Wisner, Ph.D. Director for Master
of Professional Accountancy

Montana State University
P.O. Box 173040
Bozeman, MT 59717-3040

http://www.montana.edu/acct/mpac.html
busgrad@montana.edu

Graduate Programs Available

Master of Professional Accountancy
The College of Business offers the Master of Public Accountancy degree. This highly reputed program (consistently ranked "Top 10" in the nation by NASBA for first-time CPA exam pass rate) should be considered by students who are interested in pursuing CPA certification or advanced financial management positions.

Professors
• Anne Christensen, Ph.D.
• Bonita Kramer Peterson, Ph.D.
• Dennis Schmidt, Ph.D.

Associate Professors
• Marc Giulian, Ph.D.
• Christie Johnson, MBA

Assistant Professors
• Perry Solheim, Ph.D.
• Priscilla Wisner, Ph.D.

Degree Offered
M. of Professional Accountancy

The Master of Professional Accountancy (MPAc) degree is designed to prepare students for professional careers in the field of accounting. With the assistance of an advisor, students will formulate a graduate program which will integrate their educational background, areas of interest and career path.

Mission
The mission of the MPAC program is to prepare students for professional careers in accounting. Candidates for the degree will build on the broad general and business education obtained at the undergraduate level to gain more advanced competencies in the practice and theory of financial accounting, auditing, taxation, law, and other business and professional areas. Students will also be introduced to research methods and resources used by accounting professionals. Goals include:
• To produce graduates who will have long-term success in their accounting careers.
• To prepare our graduates to meet the educational requirements recommended by the American Institute of Certified Public Accountants.
• To provide our students with access to professional opportunities through career placement services

Admission
A bachelor's degree in business provides the best foundation for this program. Students who have non-business undergraduate degrees or undergraduate course deficiencies may be provisionally admitted while attending to subject matter deficiencies. To apply, applicants must submit an application, scores from either the Graduate Record Exam (GRE) or the Graduate Management Admissions Test (GMAT), three letters of recommendation, all prior college transcripts, and a one-page statement of purpose. Applicants must be formally admitted by the Division of Graduate Education.
after the preliminary recommendation for admission is reached by the College of Business. Refer to the Admission Policies and Application Requirements sections for additional information.

Program Requirements
At least 30 credits of acceptable coursework must be completed, including at least 21 credits of coursework from MSU. Elective credits are selected by the student, with approval from the MPAc director. Students are required to maintain a 3.0 semester grade point average, and a 3.0 cumulative grade point average.

Required Courses
- ACCT 521 – Advanced Auditing: 3
- ACCT 525 – Accounting Theory & Complex Issues in Accounting: 3
- ACCT 526 – Advanced Taxation: 3
- ACCT 528 – Legal Issues for Accountants: 3
- ACCT 592 – Research in Accounting: 3
- XXX – Electives: 12
Total: 30

Refer to the For Master’s Students section for additional degree requirements. Students are expected to be familiar with the degree requirements of both the College of Business and the Division of Graduate Education.

Financial Assistance
Graduate teaching and research assistantships, awarded on a competitive basis, may be available to admitted graduate students. See the Graduate Assistantships sections for detailed information on appointment criteria.

DEPARTMENT OF EDUCATION
For information on undergraduate teacher preparation programs, please contact Cyndi Meldahl, Education Advising Center, 127 Reid Hall, MSU Bozeman, MT 59717; phone: (406)-994-1880 or email: cmeldahl@montana.edu

For information on graduate programs, please contact the appropriate Program Leader:
- Educational Leadership: Dr. Joanne Erickson, (406)-994-2290 or email jle@montana.edu
- Adult & Higher Education: Dr. Marilyn Lockhart, (406)-994-6419 or email lockhart@montana.edu
- Curriculum & Instruction: Dr. Jayne Downey, (406)-994-7426 or email jdowney@montana.edu

For graduate programs admissions materials and information contact Trish McCormick, Administrative Assistant: (406)-994-6786 or email trishm@montana.edu

Department Head
Dr. Robert Carson
215 Reid Hall
994-6670 or email rcarson@montana.edu

Professors
- L.J. Bruwelheide; library media.
- R.N. Carson; educational psychology, foundations
- A. deOnis; reading, language arts.
- W.D. Hall; math education.
- M.P. Vogel; Extension Housing Specialist.

Associate Professors
- A. Bangart
- M.J. Brody; science education.
- J. Carizzi; multicultural education
- S.E. Davis; technology education.
- J. Erickson; educational leadership
- J. Herbeck; reading, language arts.
- M. Lockhart; adult & higher education.
- J. Downey; educational psychology, foundations
- P.A. Lund; art education.
- B. Palmer; adult & higher education
- E.H. Swanson; science education.

Assistant Professors
- C. Myers; adult & higher education
- B. Carpenter; social studies education
- M. Redburn
- W. Ruff

Adjunct Faculty
- L.J. Baker; higher education.
- J. Cook; instructional computing.
- W. Freese; instructional media.
- L. Kelting-Gibson; assessment
- R. Shaffer; educational leadership

Professional Faculty
- R. Clemens; field placements & certification

Degrees Offered
M.Ed with majors in:
- Adult and Higher Education
- Curriculum and Instruction
- Educational Leadership

Ed.S. with majors in:
- Curriculum and Instruction
- Educational Leadership

Ed.D. with majors in:
- Adult and Higher Education
- Curriculum and Instruction
- Educational Leadership

The department is divided into three units: Curriculum & Instruction, Educational Leadership, and Adult & Higher Education. Doctoral (Ed.D) programs are offered in three majors: Educational Leadership; Adult and Higher Education; and Curriculum and Instruction. Masters degrees also are available in these three Majors. A specialist degree is available in Educational
Leadership and Curriculum and Instruction. Additional degree requirements are listed in the For Master’s Students and For Doctoral Students sections. 

Application Procedures

Application forms, as well as additional program information, may be obtained from the Graduate Programs in Education Office, 211 Reid Hall, Montana State University, Bozeman, MT 59717. For specific program information contact the Program Leaders (listed above). For admissions Information and forms contact Trish McCormick in the Graduate Programs Office (see above). Admissions materials are reviewed at least three times per year by the individual program screening committees. Successful applicants are accepted into both the department and the Division of Graduate Education.

Adult and Higher Education

This program offers the Master’s of Education and Doctor of Education in Adult and Higher Education to admitted students who have varied academic field/discipline and professional backgrounds. Students focus on the theory, research, and informed professional practice in either higher education (academics, administration, or student affairs) or adult post-secondary education. Coursework is divided into two categories: required and electives, and research and statistics. Doctoral students must conduct research and write an original theory-based dissertation. Courses are offered with working students as a target group and are generally offered evenings and week-ends. Many courses are offered as hybrid courses with a combination of face-to-face and distance delivery. Some courses are offered 100% online.

Subject areas of particular interest and supported by the program’s current faculty’s research agendas include assessment, institutional research, scholarship of teaching, and distance education. In most cases the diversity of learners and institutions represented in adult and higher education is addressed, and students are encouraged to develop specialization via course assignments. Required courses vary by degree and background of the student. Refer to the Adult and Higher Education handbook located at: www.montana.edu/wwweduc for additional and current information regarding courses offered and schedules.

Curriculum and Instruction

The program in Curriculum and Instruction offers three degrees: the Master of Education, Education Specialist, and Doctor of Education. The Master of Education degree is designed to meet the needs of elementary and secondary classroom teachers, subject matter specialists, subject area supervisors, curriculum coordinators, and educational scholars and researchers. The Master of Education (M.Ed.) degree has three options: the Professional Educator option, the Educational Research option, and the Technology Education option.

Teachers or supervisors who desire additional academic preparation above the master’s degree level may select the Education Specialist degree or the Doctor of Education degree. The Education Specialist degree is designed for those who do not need to develop scholarly research skills but desire to prepare for positions such as curriculum director or director of instruction.

The Doctor of Education (Ed.D.) degree is designed to prepare graduates to assume positions as faculty members in teacher preparation programs in College/University settings. Graduates will acquire a rich knowledge base in educational theory and practice and will be equipped with the research and pedagogical knowledge and skills necessary to conduct educational research, teach and supervise preservice teachers, and engage in university service. Students will have multiple opportunities for induction in college teaching and guided research projects in connection with the pursuit of a concentration in the academic area of their choice.

Refer to the Curriculum and Instruction program guide located at www.montana.edu/wwweduc/# for additional and current information regarding courses offered and schedules.

Educational Leadership

The program in educational leadership offers three degrees: Master’s in Education, Education Specialist, and Doctor of Education. Within these degree programs students may choose K12 school administration, elementary school administration, secondary school administration, or the superintendent. At the doctoral level, a general school administration focus is also available.

Student programs are developed on an individual basis after a review of previous experience as well as future goals. Programs include courses required for Montana certification leading to a class 3 administrative certificate for elementary principals, secondary principals, or the superintendent. Certification requirements of other states can be incorporated into the programs. Students can select a minor or supporting area to enhance specific areas of interest. An internship is required as a part of each of the above degrees, and understanding and applying research is an integral part of the doctoral program.

Refer to www.montana.edu/ehhd/educ/edleadership for additional and current information regarding courses offered and schedules.

Admissions

Refer to the Admission Policies and Application Requirements sections for specific application requirements and instructions. Successful applicants must be accepted into both the department and the Division of Graduate Education. The Education Specialist degree must meet the minimum requirements under the For Doctoral Students section with the following two exceptions: 1) no research classes and dissertation are required, and 2) courses over seven years old may not be included in the graduate program. Additional requirements for the Ed.S. degree are available through the Department of Education. All Ed.S. degree candidates are expected to be familiar with both departmental and College of Graduate Studies requirements.

While many requirements for the Education Specialist degree are the same as those for the Doctor of Education degree, it must be clearly understood that admission to one program does not imply admission to the other. Transfer from doctoral to Education Specialist status will be possi-
ble only if the applicant has: 1) earned at least a 3.0 grade point average in all prior work applicable toward the doctorate degree, and 2) has not failed the doctoral comprehensive exam.

Graduate Program

The major program field is selected from one of the degree options in the College of Education, Health and Human Development. However, all candidates must become competent in each of three areas: 1) major area of study, 2) foundations of education, and 3) research and statistics. Refer to the departmental brochures on each of the three areas for minimum credit requirements.

Additional Doctor of Education Requirements

The Doctor of Education degree must meet the minimum requirements in the For Doctoral Students with the following exception: only fourteen (14) credits of dissertation are required. Additional requirements for the Ed.D. degree beyond these minimums are available through the Department of Education. All Ed.D. degree candidates are expected to be familiar with both the College of Graduate Studies and Department of Education degree requirements.

Comprehensive Examination

Near the completion of course requirements, the student must pass a comprehensive examination covering the major area of study, foundations of education, and research and statistics. This examination is both written and oral. The comprehensive examination must be taken on the MSU campus. Exceptions are granted only after a written request from the student's advisor is approved by the department head. The department is responsible for making all arrangements for comprehensive examinations. Refer to the section For Doctoral Students for additional requirements.

Dissertation and Final Examination

An individually written thesis is required. It must be an original contribution to knowledge in the field of education, worthy of publication in the field of education. Refer to the section For Doctoral Students for additional information.

NORTHERN PLAINS TRANSITION TO TEACHING (NPPT)

P.O. Box 172940
Bozeman, MT 59717-2940
nppt@montana.edu
Tel: (406) 994-5662
Fax: (406) 994-7900
Location: 210 Reid Hall

Director
Jamie O'Callaghan
P.O. Box 172940
Bozeman, MT 59717-2940
jamie.ocallaghan@montana.edu
Tel: (406) 994-5662

Professors
Rotating Professors

Degree Offered
- Certificate leading to Secondary Teacher Licensure
- Master of Education

Curriculum and Instruction

This program serves the needs of professional adults such as career military personnel and civilians holding baccalaureate degrees, and with a proven career track record (five years preferred), in content areas and related fields where the standard university core requirements have been met and most, if not all, coursework requirements have been satisfied relative to the state and university standards for secondary teaching in a particular subject area (please see Teacher Education TEPP forms).

Admissions:
The Northern Plains Transitions to Teaching (NPPT) Program at Montana State University is a graduate-level program designed to prepare mature candidates for the teaching profession at the secondary school level (middle school and high school only). Eligible candidates must have an earned baccalaureate degree in a teachable subject area (or a bachelor's degree and the equivalent coursework in a teachable content area), must have a documented history of productive engagement in the workforce, and must have a demonstrated capacity and the willingness to engage in serious, concentrated study and preparation in order to move rapidly through this demanding, highly concentrated course of study.

Program Requirements:
The total program consists of eighteen course credits plus six credits of resident teaching internship, for a total of twenty-four credits. Upon completion, this twenty-four credit program leads to recommendation for licensure in Montana, South Dakota or Wyoming, a license that is convertible by reciprocity agreement with most other states in the U.S. with little or no additional coursework.

Qualification Courses

EDCI 552 — Human Development & the Psychology of Learning............3
EDCI 553 — Diversity, Special Needs, and Classroom Discipline........3
EDCI 554 — Curriculum Design, Pedagogy, and Assessment...............3
Courses include structured observation in 6 or 7 settings covering a variety of age groups.

In Service/Internship Courses:
EDCI 558 — Internship I Methods of Teaching............3
EDCI 559 — Internship II Equity, Special Needs, Diversity........3
EDCI 555 — Technology, Instructional Design, and Learner Success.....3
* EDCI 558 will be taken during the Fall semester of the "internship" year. EDCI 559 will start towards the end of the Fall semester and conclude towards the middle of the Spring semester of the "internship" year. EDCI 555 will occupy the remainder of the Spring semester.

Continuing Preparation

EDCI 556 — The Legal, Social, and Practical Basis of Schooling........3
EDCI 557 — Brain Science, Educational Research, and Teaching........3
Summer courses, no field experiences available.
Total 24 (Includes internship)

In addition, for those candidates who desire it and are academically qualified, an additional sequence of six credits (typically two courses) in professional development beyond the structure of this certification program is offered which will complete requirements for a master's degree in education (Curriculum & Instruction option).

Master of Education Course Offerings
EDCI 540 — American Indian Studies for Educators
EDCI 564 — The Comprehensive Portfolio (required)

Financial Assistance:
Financial assistance is available to Northern Plains Transition to Teaching students in for form of student loans during most semesters enrolled in the program.
Graduate programs in the Department of Health and Human Development lead to a Master of Science degree in Health and Human Development. The Master of Education degree is given to those completing the school counseling program. Graduation is determined by the respective graduate coordinators and the College of Education.

Graduate Coordinator - Exercise and Nutrition Sciences, Family Studies, and Health Promotion and Education
Dr. Mary Miles, 402 Romney Gym, 406.994.6678
mmiles@montana.edu

Graduate Coordinator - Counseling
Dr. Mark Nelson
121B Hsaeus Recreational Sports Facility
406.994.3810
markn@montana.edu

Professors
• J.C. Christopher; counseling
• S. Christopher; community health
• T. Dunnagan; health promotion
• M. Nelson; school counseling
• L. Paul; extension specialist, food and nutrition
• C. Stewart; adaptive physical education, sport pedagogy, coaching

Associate Professors
• S. Bailey; extension specialist, family and human development
• C. Campbell; clinical nutrition
• D. Haynes; family and consumer sciences
• H. Hunts; family and consumer sciences
• L. Massey; early childhood education/child services
• M. Miles; exercise science/nutrition
• S. Osborne; family and consumer sciences
• L. Owens; health enhancement teaching K-12
• A. Smith; counseling
• J. Thornogren; marriage and family counseling

Assistant Professors
• N. Colton; health enhancement teaching K-12
• M. Hahn; kinesiology/biomechanics
• B. Letiecq; family health
• G. Olson; health enhancement teaching K-12
• R. Pitcher; health enhancement teaching K-12
• E. Rink; health education

Adjunct Faculty
• C. Blank; counseling
• L. Collins; counseling
• P. Donahoe; counseling
• C. Blank; counseling

Degree Offered
M.S. in Health & Human Development with options in:
• Counseling
• Exercise and Nutrition Sciences
• Family & Consumer Sciences
• Health Promotion and Education
M.Ed. in School Counseling

Graduate programs in the Department of Health and Human Development offer a Master of Science degree in Health and Human Development with options in counseling, exercise and nutrition sciences, family and consumer sciences, and health promotion and education. The Master of Education degree is given to those completing the school counseling degree.

Graduates are coordinated by a graduate coordinator for the counseling program or by a graduate coordinator in exercise and nutrition sciences, family studies, and health promotion and education. General descriptions of the graduate options are included below. More detailed information regarding curricula and requirements may be obtained from the respective graduate coordinators listed above. Information may also be obtained on the Department of Health and Human Development web site at www.montana.edu/hhd.

A minimum of 30 credits is required for the Master of Science degree in exercise and nutrition sciences, family and consumer sciences, and health promotion and education. Both thesis and non-thesis plans are available. Because of professional licensure requirements, a minimum of 60 credits is required for the counseling programs. The school counseling program requires a minimum of 48 credits. Transfer credits may not exceed the limit of nine set by the Division of Graduate Education and must be assessed by the respective graduate coordinator before acceptance to the program.

Admission
In addition to the requirements listed in the Application Requirements and Admission Policies sections, admission requirements for specific options can be obtained from the department web site at www.montana.edu/hhd or by calling (406) 994-3242.

Provisional admission as a graduate student is possible if there is a deficiency in one or more of these areas. Students accepted provisionally will be required to: 1) successfully complete the undergraduate prerequisites for graduate-level classes, 2) successfully complete the specific undergraduate or graduate classes needed for acceptance, and/or 3) take a required course load and earn a specific grade point average while on a provisional status.

Counseling Program Options
The Department of Health and Human Development offers a Master of Science degree with an option in counseling (marriage and family counseling or mental health counseling) and a Master of Education degree with an option in school counseling. All three programs, marriage and family counseling, mental health counseling, and school counseling are accredited by the Council for Accreditation of Counseling and Related Educational Programs (CACREP). The Marriage & Family and mental health counseling programs are 60 credits and require a minimum of two years of study. The school counseling option is 48 credits. All programs are designed to meet Montana licensure requirements for professional counselors. Students obtain up to 1,500 hours supervised counseling experience and training in core counseling areas. Completed applications must be filed by February 15 as students are expected to begin their graduate program the following summer session. Applications are screened only once each year following the February 15 deadline. A maximum
of 25 students shall be admitted into the
counseling areas each year.

Interested students may obtain more
descriptions by visiting the department
web site at www.montana.edu/hhd or
by calling (406) 994-3241.

Marriage and Family Counseling

The 60-credit marriage and family
counseling area prepares counselors
to address mental health and relation-
ship problems from a family systems
perspective. Students are taught a
conceptual framework for assessment
and intervention which focuses on the
multiple systems and family context of
individual development. Emphasis is
on a positive, competency-based view
of individual and family strengths. This
approach examines the larger environ-
ments in which individuals and families
interact and the plethora of influences
(i.e. social, cultural, and economic)
that affect human growth and develop-
ment. Relationship issues between fam-
ily members and the family and outer
environmental systems is highlighted.

In addition to family systems theory,
students are well grounded in indi-
vidual and group counseling theories.
Collaboration between marriage and
family counselors and other mental
health care providers is emphasized.

Graduates of the program qual-
ify for certification through The
National Academy for Certified
Family Therapists (an affiliate of the
International Association of Marriage
and Family Counselors). Upon comple-
tion of this program and additional
licensing requirements, graduates are
eligible to apply for clinical privilege
with Montana's mental health centers.

Summer
HDCO 523 – Theory of Addictions ............2
HDCO 551 – Appraisal ..........................2
HDCO 571 – Prof Counseling Practicum .........3

Fall
HDCF 554 – Developmental Theory & Concept ....3
HDCO 569 – Multicultural Awareness ..........3
HDCO 576 – Internship ..........................3
HDCO 577 – Internship ..........................3

Spring
HDCO 569 – Developmental Theory & Concept ....3
HDCO 576 – Internship ..........................3
XXX – Electives .................................5
Program Total 60

Partial List of Electives
EDCI 502 – Educational Stats II ................3
HDCO 525 – Counseling Ethics/Orientation .......3
HDCO 576 – Internship ..........................3
HDCO 571 – Prof Counseling Practicum .........3

Mental Health Counseling

Mental health counseling involves the
application of principles of psycho-
therapy, human development, learn-
ing theory, group dynamics and the
etiology of mental illness and dysfunc-
tional behavior to individuals, couples,
families and groups for the purposes
of treating psychotherapy and promot-
ing optimal mental health. (Definition
of Mental Health Counseling adopted
by the board of the National Academy
of Certified Clinical Mental Health
Counselors Association, April 1986.)

The mental health counseling area
of study provides students with 1,200
hours of supervised experience in
appraisal, individual, family and group
counseling, and consultation in clin-
ics, agencies, schools and/or hospitals.
Mental health counseling graduates
meet the Association for Specialists in
Group Work guidelines for training in
group guidance, counseling and
therapy. They are eligible for national
certification as Clinical Mental Health
Counselors and have equivalent
status to persons from “core provider
professions” (psychiatry, clinical psychol-
ogy, clinical social work and psychiatric
nursing) when applying for clinical
privilege with Montana’s mental health
centers.

School Counseling

The Master of Education in School
Counseling is a 48-credit program
designed to prepare students to work in
public or private schools as professional
counselors. Upon completion, students
are eligible to apply for certification as
a school counselor with the Montana
Office of Public Instruction. School
counselors in Montana can be certified
with a class 6 (specialist) certificate (for
those without a Montana teaching cer-
dificate), or certified with a Guidance
and Counseling endorsement on a
Montana teaching certificate. In addi-
tion, graduates may apply for licen-
sure as a licensed professional coun-
selor with the Board of Social Work
Examiners and Professional Counselors
after completing 2000 hours (post-grad-
uate) of supervised counseling experi-
ence in the field.
School Counseling students take a common core of counseling and human development courses. This core of course work provides all students with the knowledge and skills necessary to be a professional counselor and follows the standards developed by CACREP. In addition, students in the School Counseling option also study aspects of counseling germane to the school setting. The program focuses on a comprehensive and developmental approach to designing and implementing a school counseling program, and follows the standards developed by the American School Counselor Association. The program emphasis strives to provide the necessary self-awareness, knowledge, and skills for counseling students to become competent and capable professional school counselors.

**Summer Credits**
- HDCO 502 — Counseling Ethics/Orientation: 2 credits
- HDCO 508 — Counseling Theories I: 3 credits
- HDCO 558 — Career Counseling: 2 credits

**Fall Credits**
- EDCI 506 — Educational Research: 3 credits
- HDCO 510 — Counseling Theories II: 3 credits
- HDCO 521 — Counseling Skills Lab: 1 credit
- HDCO 522 — Group Counseling: 3 credits

**Spring Credits**
- HDCO 523 — Theory and Practice of Addict: 2 credits
- HDCO 525 — Counseling Children/Adolescents: 3 credits
- HDCO 571 — Prof Counseling Practicum: 3 credits

**Summer Credits**
- HDCO 506 — School Counseling Programs: 3 credits
- HDCO 551 — Appraisal: 3 credits
- HDCO 592 — Adventure Counseling: 3 credits

**Fall Credits**
- HDCO 554 — Developmental Theory & Concept: 3 credits
- HDCO 565 — Multicultural Awareness: 3 credits
- HDCO 505 — Prof Issues School Counseling: 3 credits

**Spring Credits**
- HDCO 576 — Internship: 6 credits
- XXX — Electives: 2 credits

**Program Total Credits**: 48

**Family and Consumer Sciences Option**

The Department of Health and Human Development offers a Master of Science degree with an option in family and consumer sciences. The option offers an area of study in early childhood education/child development and family science. Students must successfully complete a 36-credit minimum course of study. Interested students may obtain descriptions by visiting the department web site at www.montana.edu/hhd.

**Early Childhood Education/Child Development Program**

The Early Childhood Education/Child Development master’s program requires 36-credits of course work and offers both a non-thesis and thesis option. A non-thesis requires the completion of a professional paper or project that is designed by the student. A thesis is recommended for individuals interested in pursuing scholarly research or continuing on in a Ph.D. program. The early childhood program emphasizes the advanced study of education, care, and development of children within the context of families, educational and human service settings, communities, and societies. The program focuses on early education, child development, families in social context, and research methods and design. Flexibility within the program enables students to select supporting courses in the areas of specialized early childhood education, working with adults, business, administration, program evaluation and policy, research, internship and individual studies. Students are encouraged to be creative in the development of their program to help them accomplish their professional goals. Students develop skills necessary for working with diverse children and families, planning, implementing, and evaluating programs for children and families, and conducting research. The program prepares students for a variety of careers in early childhood settings, child care related programs and businesses, child-related community, state or federal agencies, non-profit settings, early intervention settings, public policy, parent education, and teaching adults.

**Thesis Option (Plan A)**
- EDCI 402 — Edu. Statistics I: 3 credits
- HDCF 555 — Perspect Child & Adol Dev: 3 credits
- HDCF 565 — Ind Fam Soc Context: 3 credits
- HDCF 576 — Internship: 3 credits
- HDCF 590 — Master's Thesis: 10 credits

**OR**
- Take one of the following:
  - EDCI 506 — App Educ Research: 3 credits
  - EDCI 507 — Qualitative Methods: 3 credits
  - HDPE 512 — Research Des in HHD: 3 credits
  - XXX — Supporting Courses: 11 credits

**Total Program Credits**: 36

**Family Science Program**

This program is structured to prepare scholars in the field of family science. Students have the opportunity to develop skills necessary for professional achievement in basic and applied research settings and in public and private organizations. The strength of this master’s program is based on its focused study of the health and well-being of families. One goal of the program is to facilitate student proficiency in producing and consuming research. Curriculum development, program, evaluation, and policy analysis are also emphasized. Non-thesis and thesis plans are available. A non-thesis plan requires the completion of a professional paper and additional course work. Students can also choose to do an internship in a professional setting to further enhance their understanding of the family field. Students must successfully complete a 36-credit minimum course of study. Interested students may obtain more information about the program by visiting the department web site at www.montana.edu/hhd or by contacting Bethany Letiecq at 406.994.7396 or via e-mail at bletiecq@montana.edu.

**Non-Thesis Option (Plan B)**
- HDCF 555 — Perspect Child & Adol Dev: 3 credits
- HDCF 565 — Ind Fam Soc Context: 3 credits
- HDCF 576 — Internship: 3 credits
- HDCF 590 — Master's Thesis: 10 credits

**OR**
- Take one of the following:
  - EDCI 506 — App Educ Research: 3 credits
  - EDCI 507 — Qualitative Methods: 3 credits
  - HDPE 512 — Research Des in HHD: 3 credits
  - XXX — Supporting Courses: 11 credits

**Total Program Credits**: 36
Exercise and Nutrition Sciences Option

The Department of Health and Human Development offers a Master of Science degree with an option in exercise and nutrition sciences with the following programs of study: exercise physiology, biomechanics, nutrition and exercise, nutrition science, or community nutrition/sustainable food systems. The exercise physiology program allows students to focus on understanding the determinants of physical activity, energy expenditure, and the limits of human work performance. Students in the biomechanics area will focus on mechanical analysis of human movement, blending theoretical modeling with clinical application. The exercise and nutrition program of study integrates both disciplines to develop a combined application of these sciences. A student may approach this concentration from an undergraduate major in nutrition or in exercise science. Students studying in the area of nutrition science will focus on the application of nutrition metabolism and chronic disease prevention and/or treatment in the laboratory, clinical, or community setting. Students wishing to study community nutrition or sustainable food systems will take graduate-level nutrition courses supplemented by independent study or courses in related fields such as agriculture or policy. Although not required, a graduate student in nutrition-related programs may simultaneously complete course work needed to become a Registered Dietitian. Interested students may obtain descriptions by calling (406) 994-3242, or by visiting the department web site at www.montana.edu/hhd. Depending on the student's goals, undergraduate degree, and course work, additional courses may be added or deleted to supplement the curriculum.

Required Courses for all Exercise and Nutrition Sciences options:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>HHD 501 - Professional Comm Skills</td>
<td>2</td>
</tr>
<tr>
<td>HHD 512 - Research Design in HHD</td>
<td>3</td>
</tr>
<tr>
<td>STAT 401 - Stat for Researchers</td>
<td>3</td>
</tr>
<tr>
<td>OR</td>
<td></td>
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<tr>
<td>EDCI 402 - Educ Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>

Exercise Physiology emphasis:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>HDPE 465 - Exercise Test &amp; Prescrip</td>
<td>4</td>
</tr>
<tr>
<td>HDPE 540 - Graduate Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 545 - Grad Exercise Phys</td>
<td>3</td>
</tr>
</tbody>
</table>

Biomechanics emphasis:

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<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>I&amp;ME 413 - Ergonomics &amp; Safety</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 540 - Graduate Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 541 - Instrument in Biomech</td>
<td>3</td>
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</tbody>
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Nutrition and Exercise emphasis:

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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HDRN 411 - Nut for Sport &amp; Exer</td>
<td>3</td>
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<tr>
<td>HDFN 511 - Exercise Metab &amp; Nutr</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 514 - Nutrition and Disease</td>
<td>3</td>
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<tr>
<td>OR</td>
<td></td>
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<tr>
<td>HDFN 521 - Metab Roles of Nutr</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 545 - Grad Exercise Phys</td>
<td>3</td>
</tr>
</tbody>
</table>

Nutrition emphasis:

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>HDFN 401 - Nutr Asses &amp; Counseling</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 425 - Medical Nutr Therapy I</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 426 - Medical Nutr Therapy II</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 514 - Nutrition and Disease</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 521 - Metab Roles of Nutrients</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 551 - Global Food Perspectives</td>
<td>3</td>
</tr>
</tbody>
</table>

Health Promotion and Education Option

The Department of Health and Human Development offers a Master of Science degree in Health and Human Development with an option in health promotion and education. Programs of study are developed with the approval of a graduate faculty committee depending on the student's interest. Programs of study are available in community health and health enhancement K-12. Interested students may obtain descriptions by calling (406) 994-3242, or by visiting the department web site at www.montana.edu/hhd.

This option requires a minimum of 39-36 graduate credits including a required class, Research Methods in Health and Human Development, at least one graduate-level statistics course and either a thesis or project. Additional course work will be individually determined based on the student's interests and goals and the availability and interests of graduate faculty. Depending on the student's goals, undergraduate degree, and course work, additional courses may be added or deleted to supplement the curriculum.

Financial Assistance

Teaching assistantships may be available within the Department of Health and Human Development. Assistantships are typically nine-month appointments. Counseling assistantships can include a summer appointment in addition to the academic year appointment. Research assistantships may be available with individual faculty members who have funded grants or contracts. Stipends vary depending on the type of appointment, the requirements of the job, the experience of the applicant, and available funding.

See the Graduate Assistantship sections for detailed information on appointment criteria. Assistantships are requested from the student's home department.

DEPARTMENT OF CIVIL ENGINEERING

Montana State University
P.O. Box 173900
Bozeman, MT 59717-3900
Tel: (406) 994-2111
www.coe.montana.edu/ce
cedep@ce.montana.edu

Department Head
Dr. Brett W. Gunnink

Professors
- E.E. Adams; engineering mechanics, continuum and snow mechanics.
- A.K. Camper; water quality and treatment, environmental engineering.
Assistant Professors
- B.W. Gunnink; construction engineering.
- JJ. Fedock; structural engineering.
- S.W. Perkins; geotechnical and pavement engineering.
- O.R. Stein; water quality management, hydraulics, erosion and sedimentation.
- J.E. Stephens; structural engineering, blast-resistant structures.
- R.D. VanLuchene; structural engineering, computer analysis of structures.
- D.E. Smith (adjunct); surveying engineering.
- A. Larsson (adjunct); structural engineering.
- W.A. Lutey; construction management.
- P.T. McGowen; travel modeling, transp. safety, highway-wildlife interactions, adv. tech. in transportation.
- R.L. Mokwa; soils, foundations, soil-structure interaction, transportation.
- D.J. Peterson; construction management.
- D.E. Smith (adjunct); surveying engineering.

Associate Professors
- J.E. Cahoon; overland flow, soil-plant-water relationships, soil physics, hydraulics, river engineering.
- W.L. Jones; environmental engineering.
- R.G. Oakberg; engineering mechanics.

Instructors
- C.L. Crayton (adjunct); environmental engineering.
- S.A. Keller (adjunct); transportation engineering.
- L.R. McKittrick (research, adjunct); engineering mechanics.
- S.C. Morrical (adjunct); concrete engineering.
- S. Sadik (adjunct); engineering mechanics.

Degree Offered
- M.S. in Civil Engineering
- M.S. in Environmental Engineering
- M.S. in Land Rehabilitation
- Master of Construction Engineering Management (MCEM)
- Ph.D. in Engineering

Options:
- Applied Mechanics
- Civil Engineering
- Environmental Engineering

The department offers graduate study leading to the Master of Science degrees in Civil Engineering, Environmental Engineering, and an interdisciplinary Master of Science degree in Land Rehabilitation. The department also participates in the Doctor of Philosophy degree in Engineering through the College of Engineering.

The M.S. program is also available following a concurrent schedule of undergraduate and graduate classes starting the senior year, allowing a Bachelor of Science degree and a Master of Science degree to be obtained in a total of ten semesters of study. This program is intended for qualified students interested in an advanced degree for practitioners, for which the civil engineering work place is currently seeing an increased demand. Contact the department for further information on this program.

In addition, a Master of Construction Engineering Management (MCEM) degree is available (see description below).

For the M.S. and Ph.D. degrees, major study is offered in various combinations of the subject areas of transportation engineering, geotechnical engineering, fluid mechanics, hydraulic and hydrologic engineering, structural engineering, engineering mechanics, and environmental engineering.

Admission
A bachelor’s degree in a similar engineering field is normally required for admission to the graduate programs in the department, although graduates in the physical and life sciences may be accepted. In certain cases a student may be required to make up subject area deficiencies.

For admission to the Ph.D. program in engineering, the student is required to have earned an M.S. degree in engineering at an accredited college or university or have successfully completed an equivalent amount of advanced study acceptable to the faculty in civil engineering.

For more detailed information, interested students are referred to the Division of Graduate Education.

Program Requirements

MS Degree

Students may pursue the M.S. degree in any of the programs offered in this department under either Plan A or Plan B. Plan A requires a minimum of thirty (30) credits of acceptable coursework, including a thesis. Plan B requires a minimum of thirty (30) credits of acceptable coursework, including a maximum of six (6) credits of CE 575 and ENYE 575 (Professional Paper). In addition, one (1) credit of CE 500 (Seminar) is required for both Plans A and B.

Some research experience, acceptable to the student’s graduate committee, is required of all M.S. students. A Plan A student prepares a thesis that is submitted to the student’s graduate committee and defended at the oral comprehensive examination. A Plan B student prepares a professional paper that is submitted to the student’s advisor and presented at a CE 500 seminar.

Candidates for the M.S. degree must pass a written comprehensive examination near the completion of their graduate program. A Plan A student must pass an oral comprehensive examination as well. Students are expected to be familiar with the degree requirements of both the department and the College of Graduate Studies. Refer to the For Master’s Students section.

Curriculum requirements are highly individualized and established in consultation with and approved by the student’s graduate committee.
Six professional electives are required from approved multi-disciplinary areas. Electives must be 400/500 level and approved by the department head.

This multi-disciplinary graduate construction management curriculum is structured to mesh with the Construction Engineering Technology (CET) undergraduate curriculum. Students applying for admission to the MCEM program from disciplines other than CET must complete or have the equivalents of thirty-six (36) semester credits of required preparatory undergraduate coursework prior to entrance into the MCEM program.

Program course requirements, as well as other detailed information, are available from the department. Students are expected to be familiar with both department and Division of Graduate Education degree requirements (see the For Master’s Students’ section).

Research Facilities

The research facilities of the department include well-equipped laboratories for bituminous materials, concrete, hydraulics and irrigation, fluid mechanics, structures, stress analysis, computer analysis, photogrammetry, geotechnical engineering, and environmental engineering. Civil Engineering students also frequently utilize the research facilities of the Center for Biofilm Engineering (CBE), the Western Transportation Institute (WTI) and the Subzero Science and Engineering Laboratory.

Financial Assistance

A number of teaching and research assistantships are available in the department for students who qualify. Teaching assistantships involve assisting professors with the conduct of classes including preparation and grading. Research assistantships provide the opportunity for work on a research project under the direction of a faculty member. Results of the research done on an assistantship may form the basis for the graduate student’s thesis or professional paper. See the Graduate Assistantships sections for detailed information on appointment criteria.

Ph.D. Degree

Refer to the College of Engineering and For Doctoral Students sections.

Interdisciplinary M.S. Degree in Land Rehabilitation

The Department of Civil Engineering participates in the interdisciplinary M.S. degree in Land Rehabilitation. This program offers advanced study in disturbed land rehabilitation, site revegetation, soil remediation, riparian zone restoration, stream channel restoration, investigation of impacted geologic resources, and remediation of contaminated sites. Students wishing to obtain an M.S. in Land Management (MCEM) and For Doctoral Students sections.

Master of Construction Engineering Management (MCEM)

The MCEM program is designed to provide education for entry into the construction industry and the background for continuing education and advancement in the industry. It has a structured curriculum, with emphasis on oral and written communications and team skills.

Students with a GPA of 3.0 or above may apply for this program at the start of their senior year. With advanced curriculum planning that schedules interdisciplinary courses taught in alternate years, early admission should allow a student to complete both the remaining Bachelor of Science degree requirements and MCEM degree requirements in two years. A capstone construction project course provides a creative dimension and allows for integration and application of the skills a student has acquired. Successful applicants are accepted into both the department and the College of Graduate Studies.

The following thirty (30) credits are required for completion of the Master of Construction Engineering Management degree:

Ph.D. Degree

Refer to the College of Engineering and For Doctoral Students sections.

Interdisciplinary M.S. Degree in Land Rehabilitation

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The following thirty (30) credits are required for completion of the Master of Construction Engineering Management degree:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 504 - Construction Productivity</td>
<td>3</td>
</tr>
<tr>
<td>CE 505 - Qual Assur/Risk Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>CE 506 - Adv Construct Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>CE 575 - Prof Paper &amp; Project</td>
<td>3</td>
</tr>
<tr>
<td>XXX - Professional Electives</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

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Admission (M.S. and Ph.D.)

Students may enter the Master of Science or Doctoral programs with a bachelor's degree in chemical engineering or other engineering or science discipline. Non-chemical engineering students wishing to pursue a master's program may require limited remedial coursework. Students may be admitted directly to the doctoral program without a master's degree. The Chemical and Biological Engineering department has an on-line Preliminary Application process, found on the CHBE website at www.chbe.montana.edu. For further information, refer to Admission Policies and Application Requirements sections.

Program Requirements
(M.S. and Ph.D.)

The Master of Science program requires 30 credits total (including a minimum of 10 credits of CHBE 590: Masters Thesis). One half of total credits required for the degree must be at the 500 level. The chemical engineering program for students from other disciplines requires appropriate background remedial coursework in addition to the previously listed requirements. Refer to the For Master's Students section.

 credits
CHBE 500 – Graduate Seminar ... 1 (May be taken twice)
CHBE 508 – Thermodynamics ... 3
CHBE 510 – Reaction Engineering ... 3
CHBE 525 – Numerical Analysis ... 3
CHBE 530 – Transport Phenomena ... 3
CHBE 590 – Masters Thesis ... 10 (min)

The Ph.D. program requires specific coursework, depending on the option, 60 total credits (18 thesis credits)

Doctoral candidates will register for dissertation research in one of the five departments offering the above options. Course requirements for the Engineering Ph.D. include completion of 2 credits of ENGR 600, ENGR 610, two courses in mathematical systems, a minimum of eighteen (18) credits of doctoral dissertation, and other courses chosen to support the proposed doctoral program that are approved by the candidate's committee. All doctoral candidates will be required to pass three examinations: a Ph.D. Qualifying Examination taken during the first year of the student's doctoral program, a Ph.D. Comprehensive Examination taken within two years of qualifying for the doctoral program, and a Ph.D. Dissertation Defense. Students are expected to be familiar with the individual program degree requirements as well as those of the Division of Graduate Education. For more information, see the For Doctoral Students section.

Research
- Coordinating Departments: Chemical and Biological Engineering. This degree involves research in transport phenomena in complex systems, materials, biofilms, biochemical transformation, biotechnology, remediation of hazardous wastes, and environmental engineering. Research topics include extremophilic bioprocessing, in situ biocatalyzed heavy metal biotransformations in natural and engineered biological systems, biomaterials, biochemistry, colloidal system dynamics, durability of materials, surface interactions, membrane materials, composite materials, separations, metabolic engineering, metabolic systems analysis, biofuels processing.

- Some departmental research is conducted in collaboration with the Center for Biofilm Engineering, the Thermal Biology Institute and MSU's Surface Science Program. Research also includes materials science and engineering for energy applications including: high temperature corrosion and corrosion protection, advanced physical vapor deposition (PVD) technologies, and sustainable energy.

Financial Assistance
Research and teaching assistantships and scholarships are available on either a 9-month or a 12-month basis; only MS and Ph.D. candidates are eligible. The research done under an assistantship may form the basis for the thesis. See the Graduate Assistantship section for detailed information on appointment criteria.

ENVIRONMENTAL ENGINEERING

Contact Civil or Chemical and Biological Engineering Departments
http://www.chbe.montana.edu or http://www.coe.montana.edu/che
che_b@coe.montana.edu or cedept@ce.montana.edu

Participating Faculty
Civil Engineering
- J. E. Cahoon; hydraulics, river engineering, soil physics, porous media and overland flow.
- A. K. Camper; water treatment and distribution.
- A.B. Cunningham; groundwater contamination.
- W.L. Jones; biological treatment processes, hazardous waste.
- Z. Lewandowski; water/wastewater treatment, instrumentation.
- O.R. Stein; water quality management, hydraulics, erosion and sedimentation.

Chemical and Biological Engineering
- R.P. Carlson; biochemical engr., systems biology, metabolic engr., biofilm physiology and control
- B.M. Peyton; extremophile bioprocessing, biofilms, bioremediation
- R. Gerlach; biofilm barriers, bioremediation, bacterial transport in porous media, extremophilic biofilms, biofuels
- D.L. Shaffer; hazardous waste.
- P.S. Stewart; biofilm process engineering.
- B. Tyler; biomaterials.
- J. Duffy; water chemistry, remediation of hazardous waste.
- J.T. Sears; biofilms, remediation.

Degree Offered
M.S. in Environmental Engineering

The Environmental Engineering program is an integrated effort of the Departments of Civil and Chemical and Biological Engineering. The vision of the program is to educate students who will develop solutions to environmental and industrial needs for physical/chemical/biological treatment, environmental restoration, and waste management using a cross-disciplinary approach.
The degree of Master of Science in Environmental Engineering is awarded through either the Civil or Chemical and Biological Engineering departments, depending on the student's background, academic program and research work. Areas of specialty within the program include water quality management, design of water and wastewater facilities, and chemical/microbial process analysis and design. Environmental Engineering is also one of the options for the Doctor of Philosophy in Engineering.

Admission

Students entering the Environmental Engineering program must meet the admission requirements for either Civil or Chemical and Biological Engineering. Generally, students with undergraduate degrees in Civil or Chemical and Biological Engineering will apply to the department of their undergraduate discipline. Students with degrees in disciplines other than engineering may be admitted to the program through either department, but may be required to complete remedial coursework. Successful applicants are accepted into both the department and Division of Graduate Education. For further information, refer to the Admission Policies and Application Requirements sections.

Program Requirements

Candidates for the M.S. degree in Environmental Engineering must meet the degree requirements of either Civil or Chemical and Biological Engineering, depending on the focus of the student's program, as well as the requirements of the Division of Graduate Education.

The coursework carrying the Environmental Engineering rubric (ENVE) is listed in the Course Description section of this Bulletin. Additional courses in Civil, Engineering, Chemical and Biological Engineering, Chemistry, Microbiology, Biology, and other disciplines may form part of the student's academic program.

Curriculum requirements for the M.S. degree in Environmental Engineering in the Civil Engineering Department are highly individualized and established in consultation with and approved by the student's graduate committee.

Master of Science in Environmental Engineering degree requirements through the Chemical and Biological Engineering Department are:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHBE 500</td>
<td>Graduate Seminar</td>
<td>1</td>
</tr>
<tr>
<td>CHBE 503</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 550</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 560</td>
<td>Environmental Engr Processes</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 561</td>
<td>Environmental Engr Reactor Theory</td>
<td>3</td>
</tr>
<tr>
<td>OR</td>
<td>CHBE 510 - Reaction Engineering &amp; Reaction Modeling</td>
<td>3 cr.</td>
</tr>
<tr>
<td>OR</td>
<td>ENVE 502 - Water Treatment Theory</td>
<td>3 cr.</td>
</tr>
<tr>
<td>OR</td>
<td>ENVE 565 - Wastewater Treatment Processes &amp; Design</td>
<td>3 cr. *</td>
</tr>
<tr>
<td>OR</td>
<td>CHBE 590 - Masters Thesis credits</td>
<td>(10 cr.)</td>
</tr>
</tbody>
</table>

(*Substitution for this course requirement may be approved by the committee after carefully considering the professional goals of the student.)

Additional Recommended Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 529</td>
<td>Groundwater Contamination</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 534</td>
<td>Environmental Engineering Investigations</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 560</td>
<td>Environmental Engr Processes</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 510</td>
<td>Reaction Engineering &amp; Reaction Modeling</td>
<td>3 cr.</td>
</tr>
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</tr>
</tbody>
</table>

Research

Research is considered a vital part of the Environmental Engineering program. Many of the students do their research work through the Center for Biofilm Engineering, although avenues through Civil or Chemical and Biological Engineering are also available. Research is used as the basis for a thesis or professional paper, one of which is required for graduation. Current research within the program focuses on both the fundamentals and application of chemical and biological processes relating to water quality management, water and wastewater treatment processes, the remediation of contaminated soils, and groundwater and biofilm processes of industrial relevance.

Financial Assistance

A number of teaching and research assistantships are available in both the Civil and Chemical and Biological Engineering Departments. Additionally, research assistantships are available in the Center for Biofilm Engineering. Students should apply directly to the appropriate department and/or to the Center for Biofilm Engineering for financial assistance. See the Graduate Assistantships sections for more information.
M.S. Degree Program
A Bachelor's degree in Computer Science is recommended. Students with non-computer science degrees at the Bachelor's level or above are also encouraged to apply, such students will generally be required to take appropriate courses while enrolled at MSU to make up computer science and related subject matter deficiencies prior to full acceptance into the computer science Master's program. Factors that the department uses in its admissions process include GRE scores, TOEFL scores (for non-native English speakers), reference letters, GPA and previous coursework. For more information, please refer to http://www.cs.montana.edu/masters.php.

Details about applying can be found at www.montana.edu/gradstudies/apply.shtml. The Computer Science Department encourages applicants to use the online application procedure.

Ph.D. Degree Program
It is recommended that applicants for the Ph.D. program have a Master's degree in computer science. Exceptional applicants with a Bachelor's degree in computer science may apply directly to the Ph.D. program.

Admission to the doctoral program follows the requirements of the College of Engineering and the Division of Graduate Education. Factors that the department uses in its admissions process include GRE scores, TOEFL scores (for non-native English speakers), reference letters, GPA and previous coursework. For more information, please refer to http://www.cs.montana.edu/phd.php.

Details about applying can be found at www.montana.edu/gradstudies/apply.shtml. The Computer Science Department encourages applicants to use the online application procedure.

Program Requirements

M.S. Degree
Students may pursue the Master's degree under either Plan A or Plan B. Plan A requires the completion of 20 credits of acceptable coursework and 10 credits of thesis. Under Plan B, a 4 credit project and 26 credits of acceptable coursework must be completed.

For more information, please refer to http://www.cs.montana.edu/masters.php.

Master's candidates must take an oral comprehensive exam near the completion of their graduate program. Required courses include:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 510 - Computability (Plan A and Plan B)</td>
<td>5</td>
</tr>
<tr>
<td>CS 515 - Algorithms (Plan A and Plan B)</td>
<td>3</td>
</tr>
<tr>
<td>CS 575 - Master's Project (Plan B Only)</td>
<td>4</td>
</tr>
<tr>
<td>CS 590 - Master's Thesis (Plan A Only)</td>
<td>10</td>
</tr>
</tbody>
</table>

Ph.D. Degree
A Ph.D. student must complete a minimum of 60 credits of coursework beyond the Bachelor's degree or a minimum of 36 credits of coursework beyond the Master's degree. The degree requirements for the Ph.D. degree are found at http://www.cs.montana.edu/phd.php. Required courses include:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 690 - Doctoral Thesis</td>
<td>18</td>
</tr>
<tr>
<td>2 Courses from the following theory courses.</td>
<td></td>
</tr>
<tr>
<td>CS 510 - Computability</td>
<td>3</td>
</tr>
<tr>
<td>CS 515 - Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>2 Courses from the following systems courses.</td>
<td></td>
</tr>
<tr>
<td>CS 518 - Advanced Operating Systems &amp; Systems Programming Research</td>
<td>3</td>
</tr>
<tr>
<td>CS 540 - Distributed Computing</td>
<td>3</td>
</tr>
<tr>
<td>CS 545 - Parallel Computing</td>
<td>3</td>
</tr>
<tr>
<td>2 Courses from the following applications courses.</td>
<td></td>
</tr>
<tr>
<td>CS 525 - Graphics &amp; Scientific Visualization</td>
<td>3</td>
</tr>
<tr>
<td>CS 530 - Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>CS 535 - Advanced Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 536 - Advanced Artificial Intelligence</td>
<td>3</td>
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</tbody>
</table>

Research Experience
Plan A (thesis option) Master's degree students gain research experience through their thesis and are expected to submit the results of their thesis work to at least one journal or conference. Plan B (project option) Master's degree students gain some research experience in the context of their project. Ph.D. students will gain research experience through their doctoral work, journal or conference submissions, and attending conferences.

Research Facilities
Graduate research and coursework can be performed on systems owned and operated by the Computer Science Department. On-campus work is typically performed in laboratories or graduate student offices. A typical machine is a dual boot (Linux / Windows) PC. Intel-based Macs running OSX are also available. Outside the department, the MSU Information Technology Center provides additional computing infrastructure.

Computer Science is completely housed in MSU's high technology Engineering and Physical Sciences building.

Financial Assistance
A number of research and teaching assistantships are available for qualified graduate students. These appointments are normally for half-time assignments (20 hours per week) during the academic year. Some appointments may also be available during the summer. Assistantships will only be offered to formally admitted graduate students. See the appropriate CS M.S. degree or Ph.D. degree website for more information.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
610 Cobleigh Hall
PO Box 173780
Bozeman, MT 59717-3780
Telephone: (406) 994-2505
Fax: (406) 994-5958
Email: ecedept@ece.montana.edu
Web site: www.coe.montana.edu/ee/

Department Head
Dr. Robert C. Maher, Associate Professor

Graduate Coordinator
Dr. Joseph Shaw, Associate Professor

Professors
- Bruce McLeod; electromagnetic fields in biological materials.
- M. Hashem Nehrir; alternative energy distributed power generation systems, load management, power system stability, fuel cells.
- Richard Wolff, Gilhousen Telecommunications Chair; optical networks, packet switching, wireless systems, satellite communications, rural ad hoc networks, telematics.

Associate Professors
- James Becker; silicon micromachining for millimeter wave applications, microwave and millimeter-wave electronics applications.
• David Dickensheets; optical microscopy and tissue imaging, silicon micro- 
machining and Micro-Opto-Electro-Mechanical Systems (MOEMS), 
miniature imaging and spectroscopy instruments.
• Todd Kaiser; Micro-Electro-Mechanical Systems (MEMS).
• Robert Maher; digital signal processing, audio engineering, and acoustics.
• Joseph Shaw; optical remote sensing system design and application, lidar, 
  radiometry, polarimetry, optical phenomena in nature.
• Steven Shaw; fuel cells, signals and systems, system identification, control, 
  modeling, optimization, Instrumentation and circuit design.
• Ross Snider; signal processing, speech recognition, real-time systems, auditory 
  and visual neuroscience.

Assistant Professors
• Hongwei Gao; electric motor drives, power electronics, electric vehicles, 
  renewable energy.
• Brock LaMeres; high speed digital design, programmable logic, inter-
  connect systems, microprocessor and microcontroller based systems.
• Wataru Nakagawa; near-field optical Interactions in nanostructures, scan-
  ning near-field optical microscopy (SNOM), and novel photonic devices 
  based on nanostructures and near-field optical phenomena.
• Kevin Repasky; laser research and development, laser remote sensing, 
  electro-optics, feedback and control, optical technology development for 
  communications.

Research and Adjunct Faculty
• Robert Gunderson; controls and robotic systems.
• Yikun Huang; Wireless communications, smart antennas, adaptive signal 
  processing, computational biology.
• Randy Larimer; embedded systems, computer engineering.
• Andy Olson; communications, communications electronics, active and 
  passive microwave circuits.
• Tia Sharpe; electromagnetic interference and compatibility, fuzzy logic, 
  higher order statistics.

Degrees Offered
• M.S. in Electrical Engineering
  • Ph.D. in Engineering, Electrical & 
    Computer Engineering option.

  The department offers graduate study and research leading to the 
  Master of Science degree in Electrical Engineering and the Doctor of 
  Philosophy degree in Engineering, Electrical & Computer Engineering 
  option. Fields in which the student may specialize include communication 
  systems, computation systems, energy and materials, Micro-Electro-Mechanical 
  Systems (MEMS), optical systems and photonics, and sensors and systems.

Admission
  Admission to our graduate program requires a bachelor’s degree in electrical 
  or computer engineering or a closely related field (for example, physics, computer science, mathematics, etc.). 
  Students with bachelor’s degrees in fields other than electrical and computer engineering (ECE) complete several 
  additional courses to gain proficiency in key undergraduate ECE areas.

  All applicants are required to submit scores from the General Test of the 
  Graduate Record Examination (GRE) along with other application materials. A minimum quantitative GRE score of 
  680 is required, and most students in our program score significantly higher. 
  A minimum verbal GRE score of 480 is recommended.

  International students must have a minimum TOEFL score of 600 on the 
  paper-based test, or 250 on the computer-based test, or 100 on the 
  internet-based test to be considered for admission with full standing.

Degree Requirements
  Students may pursue the MS degree under either Plan A (thesis) or Plan B 
  (professional paper). Plan A requires the completion of at least 20 credits of 
  acceptable coursework and a 10-credit thesis. Under Plan B, a thesis is not 
  required, but at least 27 credits of acceptable coursework and a 3-credit 
  professional paper must be completed. Master’s candidates must take an oral 
  comprehensive examination near the completion of their graduate program.

  It is typical for a Ph.D. student to earn 20-24 course credits above the 
  M.S. level, in addition to an 18-credit dissertation. In progressing toward this 
  degree, the student must pass the following examinations:

  1. A written and oral qualifying examination usually given in March to all 
     doctoral students in their first year of work beyond the Master’s degree.
  2. A comprehensive examination to be taken within two years of the 
     qualifying examination and after completing two-thirds of their total 
     coursework.
  3. A final oral examination and defense of a dissertation based on the 
     student’s research.

  There is no foreign language requirement for either degree.

EE Master’s degree with Thesis
(Plan A): 30 credits total:
• 10 credits EE 590, Master’s Thesis
• 20 course credits:
  ≥ 10 500-600-level credits
  ≤ 10 400-level credits
  ≤ 4 credits Individual Problems 
  (EE 570)
  ≤ 10 credits 570 + seminars 
  (500, 576)
  ≤ 3 credits pass/fail 
  (excluding thesis)
  ≤ 6 credits challenged

EE Master’s degree with Professional 
Paper (Plan B): 30 credits total:
• 3 credits EE 575, Professional Paper
• 27 course credits:
  ≥ 17 500-600-level credits
  ≤ 10 400-level credits
  ≤ 6 credits Individual Problems (EE 570)
  ≤ 10 credits 570 + seminars 
  (500, 576)
  ≤ 3 credits pass/fail
  ≤ 6 credits challenged

P.D. in Engineering, Electrical & 
Computer Engineering option:
• A minimum of 60 total credits
• All courses no more than ten (10) 
  years old at time of graduation
• 3 credits Research & Experimental 
  Methods in Engineering (ENGR 610) 
  in 1st semester
• 2 credits Seminar (ENGR 600), taken 
  just before the comprehensive exami-
  nation
• 3 credits Advanced Math (committee 
  approved)
• 31 additional course credits (400 and graduate level), distributed as follows:
  ≥ 2/3rds of course credits at 500 level or above (strongly recommended)
≥ 12 new credits in major area after master’s degree
≤ 24 graded course credits from M.S. Degree (with committee approval, M.S. credits can be used to satisfy the advanced math and numerical methods Ph.D. requirements)
9 additional credits (beyond 60) for Ph.D. students who do not first earn an M.S.
≤ 6 credits Individual Problems (EE 570)
≤ 9 credits pass/fail (excluding dissertation)
≤ 9 credits challenged
No credits of 400, 470, 476, 489, 490, 575, 588, or 589 are allowed

Research Experience
Research experience is required of all Master’s students. This requirement is met by students in the Plan A program through their thesis work, whereas students in the Plan B program must fulfill this requirement through satisfactory participation in an acceptable research or practice-oriented project approved by the student’s advisor. Each student in Plan B must register for EE 575 (Professional Paper) for three credits.

Research
Faculty and graduate students participate in research in the following main areas, which are continually developing:
• Communication Systems: wireless communication systems, ad-hoc networks, fiber optic communication components and systems, micro-machined mm-wave components, antennas, and atmospheric propagation.
• Computation Systems: biologically inspired signal processing, DSP hardware, novel computational techniques using FPGAs, micro-controllers and embedded systems, digital signal processing, optimal filtering, spectral envelope estimation, compression, audio and acoustical signal processing, and acoustic animal detection and recognition.
• Energy and Materials: fuel cells, fuel cell materials, fuel cell modeling and control; renewable resource and fuel cell distributed generation systems; fuzzy logic and neural network applications to power system control; load management; reduced-component power electronic design and motor drives.
• Optical Systems and Photonics: Micro-Optical-Electro-Mechanical Systems (MOEMS), micro-machined mirrors and applications in confocal microscopes, spectrometers, and sensors; optics of nanostructures and near-field optical interactions; optical remote sensing systems and applications; lidar development and applications to measuring atmospheric aerosols, clouds, and gases; radiometric and polarimetric imaging system development and calibration; optical sensors for detecting explosives and biological species; optical communication components, systems, and networks.
• Sensors and Systems: MEMS sensors and components; micro-machined sensors; lidars, laser sensors, radiometric and polarimetric imagers (see Optics section above); electronic sensors and systems for data acquisition and optical system control; acoustic and audio sensing of environmental noise and wildlife.

Research facilities in the department include: state-of-the-art electronics laboratories; optics laboratories with a variety of lasers, imagers, and electro-optical measurement tools; the Montana Microfabrication Facility with class 100, 1000, and 10,000 capabilities; a machine shop; a microwave and millimeter-wave electronics laboratory; a power and power electronics research laboratory, fuel cell characterization facilities; an audio and acoustics laboratory; and roof-port and roof-top facilities for optical remote sensing. Students have access to all the leading electronics, electromagnetic, and optical design and analysis software resources.

Financial Assistance
A number of research and teaching assistantships are available for qualified graduate students. All applicants are considered automatically for financial support and do not need to apply separately.

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
http://www.coe.montana.edu/mie/

• Application Deadlines:
  Fall: July 1 (March 1, if applying for teaching assistantship)
  Spring: November 15

  Note: International applicants must submit their applications two months prior to the above dates.

Department Head
C.H.M. Jenkins, Ph.D., P.E.
220 Roberts Hall; (406) 994-2203
cjenkins@me.montana.edu

Graduate Program Coordinator - Industrial and Management Engineering
D.K. Sobek II, Ph.D.
306C Roberts Hall; (406) 994-7140
dsobek@ie.montana.edu

Graduate Program Coordinator - Mechanical Engineering
D.S. Cairns, Ph.D.
320 Roberts Hall; (406) 994-6050
dcairns@me.montana.edu

Industrial and Management Engineering Professors
• R.J. Marley; human factors/ergonomics, applied statistics, engineering management.
• J. Stanislao (Adjunct); engineering economics, manufacturing, process engineering.
• N.J. Ward; traffic safety, driver behavior, system interface design, product design and usability analysis, human factors, ergonomics.
Associate Professors
- E.L. Mooney; discrete optimization, scheduling, systems modeling, operations research.
- D.K. Sobek II; management engineering, product development, production engineering and management, lean manufacturing.

Assistant Professors
- M.H. Cole; facilities planning, transportation, logistics, production systems, optimization, engineering ethics.

Mechanical Engineering Professors
- M.R. Amin; heat transfer, fluid mechanics, numerical methods, fire phenomena energy systems.
- D.S. Cairns; materials, composites, numerical modeling, solid mechanics, mechanics of materials and structures.
- V. Cundy; combustion, heat transfer, incineration of waste, fluid mechanics.
- G.H.M. Jenkins; computational and experimental mechanics, analysis and design of compliant structures, continuum and solid mechanics, theoretical and experimental structural dynamics, mechanical design.
- A. Vinogradov; solid mechanics, mechanics of materials and structures, composites, materials.

Associate Professors
- A.H. George; heat transfer, measurements and instrumentation.

Assistant Professors
- S. Codd; magnetic resonance microscopy studies of ceramics, fluid dynamics in hydrogels, biofilms, and polymer electrolyte membranes.
- A. Mian; microsystems (MEMS and BioMEMS) design, fabrication, reliability, and packaging.
- D. Miller; experimental mechanics of materials, structures/property relationships to strength and damage, shape memory alloys, dynamic properties of materials.
- S. Sofie; innovative ceramic processing, microstructure/nano structure engineering, solid oxide fuel cells, high-temp piezoelectrics, high-temp superconductors, thermoelectrics, and photoluminescent ceramics.

Degrees Offered
- M.S. in Industrial and Management Engineering
- M.S. in Mechanical Engineering
- Ph.D. in Engineering – Industrial Engineering and Mechanical Engineering options

The department offers the Master of Science degree in Industrial and Management Engineering and the Master of Science degree in Mechanical Engineering. These degrees may be accomplished under Plan A (thesis required) or Plan B (project or professional paper). Under either plan, a program of study is arranged for each student according to his/her particular goal. The department also participates in the Doctor of Philosophy in Engineering degree coordinated through the College of Engineering (refer to the College of Engineering section).

Admission
Industrial and Management Engineering
The minimum requirement for admission is a Bachelor of Science degree and evidence of an ability to maintain a minimum 3.0 grade point average while pursuing a graduate degree. Applicants without a degree in Industrial Engineering (or similar) are eligible to apply, but may be required to make up subject matter deficiencies upon admission. For complete information, refer to the Admission Policies and Application Requirements sections. Successful applicants are accepted into both the department and the Division of Graduate Education.

Mechanical Engineering
Normally, applicants must present evidence of graduation with a bachelor's degree in engineering with ability to maintain a "B" average. Graduates in other fields may be accepted, but generally these students have to make up background material in certain subject areas. Refer to the Admission Policies and Application Requirements sections for detailed admission and application requirements. Successful applicants are accepted into both the department and the College of Graduate Studies.

Research Requirements

Industrial and Management Engineering
A research experience is required for the M.S. degree in Industrial and Management Engineering, Plan A only. Areas of study include operations research, engineering economy, computer modeling, applied statistics, simulation, logistics, management engineering, human factors, ergonomics, computer integrated manufacturing, quality control, and production planning and scheduling.

Master's students following Plan B (project or professional paper) choose additional coursework and a graduate project in lieu of completing a thesis. Plan B students complete a graduate project, under the supervision of a professor, in the student's particular area of interest, and demonstrate their ability to define, organize, and follow through on a small research investigation. The project requires both oral and written reports.

Plan A - Thesis Option
| Industrial Engineering Undergraduate Degree | 12 |
| I&ME 500-level courses | 12 |
| I&ME 400-level or non-I&ME courses | 12 |
| I&ME 590 Thesis | 12 |

Plan B - Non-Thesis Option
| Industrial Engineering Undergraduate Degree | 18 |
| I&ME 500-level courses | 12 |
| I&ME 400-level or non-I&ME courses | 12 |
| I&ME 575 Research or Professional Paper/Project | 12 |

Non-Industrial Engineering Undergraduate Degree
| 9 |
| I&ME 500-level courses | 9 |
| I&ME 400-level courses | 9 |
| I&ME 575 Research or Professional Paper/Project | 9 |

Students may use a 500-level course to meet a 400-level course requirement. Plan B students may elect to substitute two courses (at least one of which is a 500-level course) for I&ME 575.

Mechanical Engineering
For a M.S. in Mechanical Engineering, research is required in Plan A only. Students following Plan B are not required to write a thesis, but are required to complete a graduate project under the supervision of a professor.
DIVISION OF GRADUATE EDUCATION

Plan A - Thesis Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 510 – Engineering Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>ME 511 – Engineering Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>EM 525 – Continuum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>5 Graduate course credits outside the student’s emphasis</td>
<td>5</td>
</tr>
<tr>
<td>ME 560 – Seminar (two semesters)</td>
<td>2</td>
</tr>
<tr>
<td>ME 590 – Thesis</td>
<td>10</td>
</tr>
<tr>
<td>Elective Courses (Maximum of 3 cr. ME 570)</td>
<td>9</td>
</tr>
</tbody>
</table>

Plan B - Non-Thesis Option

The Plan B option substitutes a professional paper (3-4 credits) and additional coursework in lieu of the 10 thesis credits.

Research Facilities

The laboratories of the department are well equipped for research in all areas supported by the department. Flexible manufacturing systems, robotics, machine vision, and computer-aided manufacturing are supported by a computer integrated manufacturing laboratory. Extensive facilities for destructive and non-destructive testing of advanced materials and structures are available. Advanced manufacturing facilities for composite materials and structures are continually expanding. An ergonomics/human factors laboratory concentrates on industrial ergonomics with equipment to address biomechanical and physiological aspects of industrial tasks. Facilities for decision support systems, facilities design, and expert systems are undergoing expansion. Arrangements can also be made for graduate students to use the research facilities of other University departments. State-of-the-art computer facilities are available at the department, college, and university levels. Research is sponsored by industry and governmental agencies.

Examinations

All Mechanical Engineering and Industrial and Management Engineering master’s degree students must follow the degree requirements listed in the For Master’s Students section.

Doctoral candidates are required to pass three examinations: Ph.D. qualifying examination, Ph.D. comprehensive examination, and Ph.D. thesis defense. Refer to the For Doctoral Students and Ph.D. in Engineering sections for additional information.

Students are expected to be familiar with department, college and Division of Graduate Education requirements.

Financial Assistance

Both teaching and research assistantships are available on a competitive basis. Teaching assistantships involve assisting professors with the conduct of their classes, including preparation and grading. Research assistantships provide the opportunity for work on a research grant or industry sponsored project under the direction of a faculty member. Interested applicants should make inquiry directly to the Graduate Program Coordinator in I&ME or ME.

See the Graduate Assistantships sections for detailed information on appointment criteria.

COLLEGE OF ENGINEERING

http://www.coe.montana.edu/  

Dean  
Robert Marley

Associate Dean  
Anne K. Camper

Assistant Dean  
Heidi Sherick

Degrees Offered

- Master’s Degrees (refer to the individual engineering departments on the following pages).
- Ph.D. in Computer Science (refer to the Computer Science Department document for further information)

The Doctor of Philosophy in Engineering degree is offered through the College of Engineering. The most current information on requirements for the degree can be found at http://www.coe.montana.edu/graduate_programs.html

Candidates will be admitted to both the College of Engineering and the College of Graduate Studies under one of seven options:

Applied Mechanics

This option involves research in areas central to engineering mechanics including solid mechanics, fluid mechanics, thermal mechanics, geo-mechanics, and structures.

Coordinating Departments: Chemical and Biological Engineering, Civil Engineering, and Mechanical and Industrial Engineering. Typical Research Areas: solid mechanics, fluid mechanics, biomechanics, thermal sciences, structural mechanics.

Civil Engineering

This option involves research in geotechnical engineering, structural engineering, transportation engineering, environmental engineering, water resources engineering, and construction management.

Coordinating Departments: Civil Engineering and Mechanical and Industrial Engineering. Typical Research Areas: geosynthetics, seismic response of structures and foundations, innovative structural materials, intelligent transportation systems, transportation operations, recycled pavements and base materials, road ecology, and constructed wetlands.

Chemical Engineering

This option involves research in transport phenomena in complex systems, biofilms, biological materials, and the chemical and biochemical transformation of materials.

Coordinating Department: Chemical and Biological Engineering. Typical Research Areas: extremophilic bioprocessing, in situ biocatalyzed heavy metal biotransformations in natural and engineered biological systems, biomaterials, bioremediation, colloidal system dynamics, metabolic engineering, metabolic systems analysis, biofuels processing, composite materials, durability of materials, surface interactions, catalysis, membrane materials, separations.

Electrical and Computer Engineering

This option involves research in electronic component and system hardware, design, development and theory.

Coordinating Department: Electrical and Computer Engineering. Typical Research Areas: communications, digital electronics, computer engineering, microelectromechanical systems, optics
and optical electronics, power systems and power electronics, signal processing, systems and controls.

**Environmental Engineering**

This option involves research in all areas of the environment including soil, water, and air, with emphasis on microbial interactions with natural and engineered systems.

Coordinating Departments: Chemical and Biological Engineering and Civil Engineering. Typical Research Areas: bioremediation, wetlands, water treatment, wastewater treatment, solid and hazardous waste treatment, biofilm engineering.

**Industrial Engineering**

This option involves research related to areas of Industrial Engineering.

Coordinating Department: Mechanical and Industrial Engineering. Typical Research Areas: operations research, transportation modeling, simulation, quality engineering, engineering management, ergonomics, and human factors.

**Mechanical Engineering**

This option involves research in advance structures and materials, fluid dynamics, and energy systems.


**Application and Admission (M.S. and Ph.D.)**

For M.S. students, applications should be made through the graduate coordinator of the appropriate engineering department. Applications can be initiated through traditional mail or through electronic pre-applications using e-mail or online Web forms. Each department has a World Wide Web page that can be accessed from the College of Engineering web page whose URL is http://www.coe.montana.edu.

For Ph.D. students, the following procedures apply:

1. Contact College or Department for application materials and submit for review.
   a. Minimum College Requirements for Full Admission:
      - at least a 3.0 undergraduate GPA
      - Verbal + Quantitative + Analytical GRE scores \( >1700 \)
      - Favorable letters of recommendation from three references
      - Graduate GPA (if applicable) of 3.2 or better
      - TOEFL scores of 580 (237 for computer test version) or greater for international students or a minimum International English Language Testing System (IELTS) band score of 7.
      - A personal statement of the applicant’s objectives
   b. Provisional admission - Determine conditions that candidate will be accepted and notes actions to be taken, then forwards to Associate Dean.
   c. Reject admission because of academic qualifications.
   d. Reject admission based on lack of fit with COE research programs or the lack of a potential advisor.

2. Department/s attach summary admission form and circulate application to match students with research needs.

3. Department Head reviews application in conjunction with faculty recommendation, and exercises one of the following options.
   a. Full admission - Forward to Option Coordinator.
   b. Provisional admission - Determine conditions that candidate will be accepted and notes actions to be taken, then forwards to Associate Dean.
   c. Reject admission because of academic qualifications.
   d. Reject admission based on lack of fit with COE research programs or the lack of a potential advisor.

4. Associate Dean for Research and Graduate Studies in the College of Engineering reviews applications, returns to department for submission to the Division of Graduate Education (DGE).

5. DGE reviews application to ensure DGE standards are met with the following possible options.
   a. Accept
   b. Reject
   c. Return to Department Head and Associate Dean with recommendation for further consideration.

Applicant is informed of acceptance or rejection letter by DGE.

Acceptance into the program is not always a guarantee of funding (tuition or stipend). Students should establish a dialogue with their chosen department to determine the availability of funding.

If there are course deficiencies that are identified in the student’s educational background, these must be completed prior to full admission (matriculation).

In most cases, students will be admitted to the program only if a suitable advisor has already been identified. For those entering without having an advisor/major professor previously identified, students should secure an advisor as early as possible, but no later than the end of the third semester of registration in the Ph.D. program. During the selection process, there should be discussions with the student that include an understanding of funding available to the student and the term of commitment.

**Program Requirements (M.S. and Ph.D.)**

Master’s degree candidates should refer to the appropriate engineering department for detailed degree requirements. See the For Master’s Students section for additional program requirements. Students are expected to be familiar with both departmental and College of Graduate Studies degree requirements.

To satisfy the requirements for the Ph.D. in Engineering, the student will take a minimum of 60 credits beyond the bachelor’s degree according to the table below. Different options within the Ph.D. in Engineering and individual graduate student committees may require additional coursework beyond the minimum requirements (see Declared Option Coursework section later in this document).

For students entering with a Masters degree, up to 24 graded credits may be applied (see below). However, the ENGR 600 and ENGR 610 requirements and a minimum of 18 additional graded course credits must still be taken at Montana State University. Depending on option requirements, students may have the option (with approval of the committee) of using some of their M.S. credits toward the advanced math and numerical methods requirements.
**Minimum Degree Requirements for Ph.D. in Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Minimum Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 610</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 600$^*$</td>
<td>2</td>
</tr>
<tr>
<td>Advanced Math$^*$</td>
<td>see declared option coursework</td>
</tr>
<tr>
<td>Numerical Methods$^*$</td>
<td>see declared option coursework</td>
</tr>
<tr>
<td>Other Graded Courses - see declared option coursework</td>
<td>34</td>
</tr>
<tr>
<td>Dissertation</td>
<td>18</td>
</tr>
<tr>
<td>Additional Dissertation or Course credits</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

$^*$ENGR 600 will be taken once as a two credit class by students enrolling as of August, 2007. For students entering the program under these guidelines, ENGR 600 should be taken the semester prior to scheduling the comprehensive exams. All previous students who have already taken one credit of ENGR 600 will enroll for one subsequent credit. The second credit should be taken the semester prior to the student's comprehensive exam.

*Course content must be above and beyond that typically required for an undergraduate degree in the student's Ph.D. option area.

**Examination Requirements**

Ph.D. candidates within the College of Engineering at Montana State University must pass a qualifying examination, a comprehensive examination, and a defense of dissertation. The general rules governing these follow. Different options may have more specific requirements; see the specifics under option requirements below.

**Ph.D. Qualifying Examination:**

The purpose of the qualifying examination is to determine whether the student has sufficiently mastered the core topics within their chosen area of study. It will be a written examination on undergraduate engineering topics determined by the student’s Ph.D. option area chosen by the student and administered by that option's committee.

Each Ph.D. Option Committee will offer a qualifying examination annually to students in that option. The qualifying examination will be completed within three semesters but typically within two semesters of matriculation into the Ph.D. program. Failure to take the examination in that time period may result in suspension of Ph.D. candidacy, including stipend. The committee will document the results of the examination in a letter to the student, and in the student's file.

**Ph.D. Comprehensive Examination:**

The purpose of the Ph.D. comprehensive examination is to determine whether the student is ready for independent research in their chosen area of study. The comprehensive examination is administered by the student's graduate committee (including the Graduate Representative assigned by the Division of Graduate Education), and must be completed within two years after passing the qualifying examination. It is also recommended that the student has taken 2/3 of their graded coursework. In addition, students should have completed ENGR 600 prior to taking the exam; the course is designed to assist the student in preparing their proposal.

The Ph.D. comprehensive examination is comprised of:

- A written proposal for the student’s Ph.D. dissertation, and
- An oral presentation of the proposal and oral examination.

The candidate will prepare a written proposal associated with the research topic for the Ph.D. dissertation, in a format designated by the Ph.D. Option. The successful proposal will include a significant literature review, preliminary research to date, and the research proposed to complete the Ph.D. The written proposal will be presented to the student’s graduate committee in advance of the oral presentation, by a date agreed to by the student and graduate committee.

The student will then present the dissertation proposal as a public research seminar. This will be followed by a closed-section oral examination by the student’s graduate committee on:

- the candidate’s current and proposed research;
- the candidate’s graduate level understanding of option specific engineering principles; and
- additional topics relevant to the proposed research, including fundamentals of other disciplines drawn upon in the research.

The student’s graduate committee will inform the student of the results of the comprehensive examination immediately following the oral examination and committee deliberation, and will document the results on the appropriate form filed with the Division of Graduate Education. A student not passing the comprehensive will have one opportunity to retake the comprehensive after a span of six months has passed. Failure to pass the examination on the second attempt is grounds for dismissal from the Ph.D. program.

There may be additional requirements for these exams specified in the option requirements.

**Dissertation Defense:**

The dissertation defense will consist of two parts: an open seminar of the research results and a closed session with the student’s committee and the graduate representative. Written notification of the results within one week of the defense must be delivered to the Division of Graduate Education and the student. Committee members must approve the dissertation, along with the Department Head, and Vice Provost for Graduate Education. Deadline for the dissertation approval is 14 working days before the end of the term for a given semester.
DIVISION OF GRADUATE EDUCATION

If failure occurs at the first attempt, a second defense must be held. At least six months must elapse before the second examination takes place, with the time period not to exceed nine months. Failure of the second exam will result in suspension from the program.

Graduation Application:
An application to graduate is prepared by the student, approved by the major professor, and submitted to the Division of Graduate Education through the student's academic department. Applications are due to the DGE September 20th for a Fall Semester graduation, February 5th for a Spring Semester graduation and June 10th for Summer semester graduation.

Declared Option Requirements:
Civil Engineering:
Students must meet the overall requirements for the Ph.D. in Engineering. The student’s committee may require additional credits of study based on the student’s background and needs. Specific course selections will be determined by the student and his/her committee to support the student’s area of study. Up to 24 graded course credits can be applied from an M.S. Degree in meeting the Ph.D. credit requirements, at the discretion of the student’s Ph.D. committee.

Applied Mechanics:
Requirements include:

- M525 – Continuum Mechanics.............................................5
- EM510 – Elastic and Inelastic Analysis..................................5
- ME530 – Advanced Fluid Mechanics..................................5
- EM560 – Finite Elements Analysis

The remaining credits are to be established by the student and the Major Professor in consultation with the graduate committee.

Qualifying Examination
The qualifying assessment will be a written examination on relevant undergraduate level topics. In the Applied Mechanics Option these areas include: Statics, Dynamics, Mechanics of Materials, Fluid Mechanics, Mathematics, Thermodynamics and an Area of Undergraduate Focus (e.g. Structures, Hydraulics, Geotechnology, Material Science, Heat Transfer) - as specified by the candidate prior to the exam. The exam will be one hour per topic area in an open book, open notes format. Students must satisfactorily address four of the submitted topics. Problems will be graded by the faculty member who presented that topic. Students will be provided an opportunity to examine their results, however, in order to protect the questions from dissemination they will not be permanently returned. A grade for the qualifying examination of Pass (P), Fail (F) or Remediate (R) will be given for each candidate. In cases where remediation in certain topic areas is required, the Ph.D. advisor will develop a problem solving based plan with the Ph.D. candidate to prepare for a retest on the identified topic areas. The retest must occur prior to completion of the following semester and will be overseen by the Ph.D. Advisor.

Comprehensive Examination
In the Applied Mechanics Option there are two distinct oral examinations: one associated with the Dissertation Proposal and a separate one pertaining to the candidate’s graduate level understanding of Engineering Mechanics principals.

Chemical Engineering:
The advanced math and numerical methods classes are specified:

- ChBE 522/ME 510 – Advanced Math
- ChBE 525/ME 511 – Advanced Numerical Methods

Requirements include:

- ChBE 503 – Thermodynamics
- ChBE 530/ME 533 – Transport
- ChBE 510 – Reactions

These requirements leave the remaining credits to be established by the student and the major professor in consultation with the graduate committee.

Qualifying Examination
The qualifier will be a written examination on undergraduate Chemical Engineering including: mass and energy balances, thermodynamics, separations (mass transfer), heat (energy) transfer, fluids, transport phenomena and chemical reaction engineering. The exam will be one hour per topic area question in an open book, open notes format and students will choose 4 subjects which they will solve the problems for, from the 7 problems provided. Each question will be graded by the Faculty member that submitted the question. Students will not be given the test back in order to protect the questions from dissemination. The results will be analyzed by a Committee composed of all Faculty and a grade of Pass (P), Fail (F) or Remediate (R) given each candidate. In cases where remediation in certain topic areas is required, the Ph.D. advisor will develop a problem solving based plan with the Ph.D candidate to prepare for a retest on the identified topic areas. The retest must occur prior to the next fall semester and will be overseen by the Ph.D. Advisor. The qualifying exam must be completed within two semesters of matriculation into the Ph.D. program. Failure to take the exam in that time period may result in suspension of Ph.D. candidate status, including stipend. The exam will be administered on the second Tuesday in February of the Spring semester to all students required to take the exam in a year.

Comprehensive Examination
The comprehensive exam is required of all Ph.D. candidates, and will be composed of a written NSF-style proposal associated with the research topic for the Ph.D. The proposal should include significant preliminary data on the research to date and the research proposed to complete the Ph.D. The exam will be administered by the student’s Ph.D. Advisor and graduate committee. The proposal will be in the NSF format, in compliance with the current year’s grant proposal guidelines (gpg) at www.nsf.gov. A written exam on graduate level thermodynamics, transport phenomena, mathematical methods, and kinetics and reactor engineering will be required of graduate students who have a GPA in graduate coursework of less than 3.5. A public oral seminar of 40 minutes plus 10 minutes of public questions, on the research to date and proposed research to complete the Ph.D., will be given by the Ph.D. candidate. This will be followed by a closed-session oral examination of 45-90 minutes by the student's Ph.D. committee on the research and graduate level understanding of Chemical and Biological Engineering principles and any topics relevant to the research including fundamentals of other disciplines drawn on in the research.
**Electrical and Computer Engineering:**

Students are required to complete 65 credits. Within the course credits, students must take courses in at least 3 of the following 6 areas: Digital Systems, Signals and Controls, Electromagnetic Fields and Optics, Communications, Power and Power Electronics, and MEMS and Electronics.

**Mechanical Engineering:**

Students are required to take:
- Advanced Math
- ME510, Advanced Engineering Analysis 1 (3 credits)
- Numerical Methods
- ME511, Advanced Engineering Analysis 2 (3 credits)

Additional Coursework:
- EM525 Continuum Mechanics 3 credits
- Thermo-fluids Mechanics 3 credits (min)
- Solid Mechanics 3 credits (min)

**Industrial Engineering:**

- ME509, ME558, or other course approved by the ME Graduate Studies Committee to satisfy the Advanced Math requirement.
- ME509, ME558, or other course approved by the ME Graduate Studies Committee to satisfy the Numerical Methods requirement.
- Two courses in the management/quality area: I&ME 434, I&ME 477, I&ME 525, I&ME 548, I&ME 574, I&ME 577.

Candidates can meet the above requirements with courses from a prior Master's degree, though not using independent study, project, thesis, or dissertation credits. The student's graduate committee will determine course equivalency as needed, and document such in the student's file.

**Qualifying Examination**

The exam will be administered on the second Tuesday in February of the Spring semester.

The undergraduate Mechanical Engineering topics will include:
- Thermodynamics
- Heat (energy) transfer
- Fluid Mechanics
- Structural Mechanics
- Materials
- Dynamics and Vibrations
- Mathematics

Students will solve problems in 4 of the 7 topic areas. The exam will be 8 hours duration in an open book, open notes format. Each problem set will be graded by the faculty member that submitted the set. The results will be analyzed by the Mechanical Engineering graduate studies committee, and each candidate will receive a grade of Pass (P), Fail (F) or Remediate (R). Students will not be given the test back in order to protect the questions from dissemination. In cases where remediation in certain topic areas is required, the Ph.D. advisor will develop a problem-solving-based plan with the Ph.D. candidate to prepare for a retest on the identified topic areas. The retest must occur prior to the next fall semester and will be overseen by the Ph.D. Advisor.

**Comprehensive Examination**

The public research seminar will include 40 minutes for the student's presentation and 10 minutes for questions from the audience. This will be followed immediately by a closed-session oral examination and additional remediation may be required at this point.

**Environmental Engineering:**

- ENVE443 - Air Pollution Control (3 credits)
- ENVE444 - Hazardous Waste Management (3 credits)
- ENVE445 - Hazardous Waste Treatment (3 credits)
- CES529 - Groundwater Contamination (3 credits)
- ENVE534 - Environmental Engineering Investigations (3 credits)
- ENVE560 - Environmental Engineering Processes (3 credits)
- ENVE561 - Environmental Engineering Reactor Theory (2 credits)
- ENVE562 - Water Treatment Processes and Design (3 credits)
- ENVE563 - Waste Water Treatment Processes and Design (3 credits)
- ENVE564 - Environmental Engineering Applications Lab (3 credits)
- ENVE565 - Chemical Sensors & Instrumentation for Env. Biotech (2 credits)
- ENVE566 - Fundamentals of Biofilm Engineering (3 credits)

Remaining Credits:
The remaining credits are to be established by the student and the major professor in consultation with the graduate committee.

**EMPower, the College of Engineering Minority Program**

The College of Engineering at Montana State University is committed to equal access to educational opportunities for all students pursuing a graduate degree. EMPower, the College of Engineering Minority Program, helps address issues that led to the serious under-representation of minority women students at the graduate level.
COLLEGE OF
LETTERS AND SCIENCE

Paula Lutz, Dean
Adele S. Pittendrigh, Associate Dean
Melody Zajdel, Interim Associate Dean

Graduate Programs are offered in the College of Letters and Science:
- M.S. in Applied Economics
- M.A. in English
- M.A. History
- M.A. in Native American Studies
- Master of Public Administration (M.P.A.)
- M.S. in Biochemistry
- M.S. in Biological Science
- M.S. in Chemistry
- M.S. in Earth Sciences
- M.S. in Ecological and Environmental Statistics
- M.S. in Fish and Wildlife Management
- M.S. in Mathematics
- M.S. in Microbiology
- M.S. in Neuroscience
- M.S. in Physics
- M.S. in Psychological Science
- M.S. in Statistics
- Ph.D. in Biochemistry
- Ph.D. in Biological Sciences
- Ph.D. in Chemistry
- Ph.D. in Earth Sciences
- Ph.D. in Ecological and Environmental Sciences
- Ph.D. in Fish and Wildlife Biology
- Ph.D. in History
- Ph.D. in Mathematics
- Ph.D. in Microbiology
- Ph.D. in Neuroscience
- Ph.D. in Physics
- Ph.D. in Statistics

ENGLISH DEPARTMENT
Montana State University
P.O. Box 172300
Bozeman, MT 59717-2300

Tel: 406 994-3768
Fax: 406 994-2110
dep@english.montana.edu
Location: 2-176 Wilson Hall

Department Chair
Karell, Linda K., Department Chair
Associate Professor
Ph.D., University of Rochester
Western American Literature, Literary Theory

Professors
- Agruss, David I., Ph.D., Cornell University, Victorian Literature, Popular Culture, Gender and Sexuality Studies, Queer Theory
- Beehler, Michael T., Professor
Ph.D., University of California, Los Angeles
Modern Literature, Literary Theory
- Beehler, Sharon A., Professor
Ph.D., University of California, Los Angeles
English Education, Shakespeare
- Bennett, Robert, Assistant Professor
Ph.D., University of California, Santa Barbara
- Branch, Kirk, Associate Professor
Ph.D., University of Washington, Composition, Rhetorical Theory, Literacy Theory, Pedagogy
- Downs, Doug, Ph.D., University of Utah, Writing Studies, Writing in the Disciplines, Research Pedagogy
- Eckert, Lisa, Assistant Professor
Ph.D., Western Michigan University
English Education, Literacy Pedagogy, Literary Theory
- Gaines, Phillip, Associate Professor
Ph.D., University of Washington
Linguistics, Discourse Analysis, Composition
- Karell, Linda K., Department Chair
Associate Professor
Ph.D., University of Rochester
Western American Literature, Literary Theory
- Keeler, Greg, Professor
D.A., Idaho State University
Creative Writing, Contemporary Literature
- Kollin, Susan, Associate Professor
Ph.D., University of Minnesota
Western American Literature, Environmental Literature
- Lansverk, Marvin D. L., Professor
Ph.D., University of Washington
Eighteenth-Century British Literature
- Minton, Gretchen, Assistant Professor
Ph.d., University of British Columbia, Vancouver, English Renaissance, Shakespeare, Drama, Christian Late Antiquity
- Morgan, Gwendolyn A., Professor
Ph.D., University of South Florida
Medieval Literature, Linguistics
- Sexson, Michael, Professor
Ph.D., Syracuse University
Literature and Religion, Mythology
- Thomas, Amy M., Associate Professor
Ph.D., Duke University
Nineteenth-Century American Literature, History of the Book

Degree Offered
M.A. in English

The Master of Art in English focuses on the interconnectedness of writing, teaching, and literary studies. Students may elect to complete either the Plan A (thesis), or Plan B (professional paper) option. At the heart of the program is a concern for the integrated interests of students and teachers in all branches of the field. Teachers, scholars, and writers in the program gain a better understanding of their own practices by seeing the extent to which each writer is also a literary critic, each teacher is also a writer and reader of literature, and all critics and readers are teachers and writers. The program is designed to extend and deepen the intellectual rigor of customary approaches to literature by examining issues these approaches often leave unaddressed, such as the history and institutionalization of the discipline, the relationship between theory and the practices of writing, teaching, and textual studies; and the process by which knowledge in the field of English has been and is constructed.

Program Requirements
The Master of Arts degree requires the minimum completion of 30 course credits. Students will select one of two options, either the professional paper or the thesis. The first option involves 24 hours of course work and 6 hours of professional paper, the latter 21 hours of course work and 10 hours of thesis. Students are expected to have completed the equivalent of a baccalaureate degree in English. Students with undergraduate degrees other than English are encouraged to apply; however, they may be required to take additional English courses as a condition of their acceptance.
Required Core Courses  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 510 — Studies in Critical Theory and Practice</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 530 — Studies in Writing Theory and Practice</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 540 — Studies in Theory and Practice of Literary History</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 575 — Professional Paper (Plan B Only)</td>
<td>Max 6</td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>ENGL 590 — Master’s Thesis (Plan A Only)</td>
<td>1-10</td>
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Electives:

<table>
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<tr>
<th>Course</th>
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<tr>
<td>ENGL 550 — Focused Research Seminar</td>
<td>Max 6</td>
</tr>
<tr>
<td>ENGL 570 — Individual Problems</td>
<td>Max 6</td>
</tr>
<tr>
<td>ENGL 576 — Internship</td>
<td>1-12</td>
</tr>
<tr>
<td>ENGL 580 — Special Topics</td>
<td>Max 9</td>
</tr>
</tbody>
</table>

Financial Assistance

Teaching assistantships, awarded on a competitive basis, may be available to formally admitted graduate students. See the Graduate Assistantship sections for detailed information on appointment criteria. Assistantships are requested from the student’s home department.

DEPARTMENT OF HISTORY AND PHILOSOPHY

Montana State University  
2-155 Wilson Hall  
Bozeman, Montana 59717

Tel: (406) 994-4395  
www.montana.edu/history/

Department Chair  
Brett L. Walker, Chair

Graduate Program Director  
Michael Reidg

Graduate Program Coordinator  
Diane S. Cattrell  
406-994-4396  
dscattrell@montana.edu

Professors

- James Allard; History of Philosophy, Nineteenth Century Philosophy, History of Logic.
- David Cherry; Ancient History, Comparative Frontiers.
- David Large; Modern Europe, Germany, Intellectual History.
- Mary Murphy (Michael P. Malone Professor); American Women, American West, Labor.
- Lynda Saxson; Religion and Culture, Literature, Nature, Gender, Text and Image.
- Billy G. Smith; Early America, Class, Race, Slavery.
- Brett L. Walker; Japan, East Asian Civilizations, Environmental, Science and Medicine.

Associate Professors

- Prasanta S. Bandyopadhyay; Philosophy of Science, Epistemology, Philosophy.
- Susan Cohen; Syro-Palestinian Archaeology, Hebrew Bible, Political Economy of the Ancient Near East.
- Daniel Flory; Aesthetics, Philosophy and Film, Philosophy and Critical Race Theory.
- Sanford Levy; Ethics, Biomedical Ethics.
- Michelle Maskiell; Modern South Asia, Asian Women.
- Michael Reid; Science, Britain.

Assistant Professors

- Robert B. Campbell; U.S. Environmental, Nineteenth Century U.S. History, American Indian History.
- Kristen Intemann; Ethics, Applied Ethics, Philosophy of Science, Feminist Philosophy.
- Timothy LeCain; History of Technology and Environment, Modern U.S., American West.
- Carla Nappi; History of Chinese Science and Medicine, Ming and Qing History, Natural History in Early Modern Europe.
- Yanna Yannakakis; Latin America.

Degrees Offered

- MA in History
- PhD in History

The Department of History and Philosophy is dedicated to providing quality education in History for two graduate degree programs, the MA and the PhD. The Department offers concentrated training in three particular areas: the history of science, technology, and society; environmental history; and the history of the American West and Montana. While the degrees offered by the Department are grounded in American history, the faculty is committed to familiarizing students with World history, critical theoretical concerns, the history of women in a multi-cultural context, and to encouraging students to think about the history of the United States in a global context.

Admission

Prospective graduate students should follow the guidelines in the Admission Policies and Application Requirements sections. The GRE General Exam is required; the GRE advanced test in history is not required. Successful applicants are accepted into both the department and the Division of Graduate Education.

Program Requirements

Master of Arts in History

The MA degree requires a total of 30 credit hours. The following required courses have been created to serve as the core of each graduate student’s program. Students may also take 400-level courses in history or in related disciplines, such as historical geography. Internships at museums and historical societies may also count for credit.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HIST 500 — History of America Before 1860</td>
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<tr>
<td>HIST 505 — U.S. History 1860 to the Present</td>
<td>4</td>
</tr>
<tr>
<td>HIST 512 — Topics in World History</td>
<td>3</td>
</tr>
<tr>
<td>HIST 540 — Historical Methods</td>
<td>3</td>
</tr>
</tbody>
</table>

Doctor of Philosophy Degree in History

The PhD in History requires a minimum of 25 course credit hours above the MA degree and a minimum of 18 credits of History 690 (Dissertation Writing). Note that the precise credit/course requirement will be determined by the student’s doctoral committee chair in consultation with the student and the other committee members.

All students will declare a Major Field of emphasis and two minor areas. Major Fields include:

- History of Science and Technology;
- Environmental History;
- U.S. History.

Minor Fields include:
- gender
- race
The PhD program in History offers students the opportunity to obtain an area of concentration in Public History. To obtain the area of concentration, students are expected to take an additional 15 credits that include History 502 (Public History and Material Culture). Students are normally expected to complete at least 9 credits of History 576 (Internship).

Financial Assistance
The primary form of financial support available through the Department is the teaching assistantship, which is awarded on a competitive basis. There are sometimes other opportunities available for financial support, such as grading, research assistantships with individual faculty members, and tutoring positions.

Teaching assistantships are awarded on a competitive basis each semester. To be considered for a teaching assistantship, MA students’ applications to the graduate program must be received by Nov. 1st for the following Spring, by March 15th for the following Fall, and by January 15th for PhD students. Current graduate students and GTAs may indicate their interest by submitting a brief letter or email to Diane Cattrell. Under typical circumstances, teaching assistants will teach 4, 50-minute sections of discussion for a history 100-level course. Discussion sections normally have 20 students each.

DEPARTMENT OF
NATIVE AMERICAN STUDIES
Montana State University
Po Box 172340
Bozeman, MT 59717-2340
Tel: (406) 994-3881
www.montana.edu/wwwnas
zna7001@montana.edu.

Department Head
Walter C. Fleming, Ph.D.
Department Chair and Professor
Graduate Coordinator
Kristin T. Ruppel

Professors
• Walter C. Fleming; American Indian cultural studies, American Indian history
• Wayne J. Stein; higher education, Indian studies.

Assistant Professors
• Lawrence W. Gross; economic development, agriculture, Native culture and humor
• Matthew D. Herman; Native American literatures, local tribal histories, and indigenous political theory
• Kristin T. Ruppel; Federal Indian law and policy, Indian land tenure, ethnoecology

Staff
• Jim Burns; American Indian Student Advisor
• Saralyne Sebern; Assistant Graduate Student Coordinator
• Julie Satterwhite; Administrative Associate

Montana State University has an American Indian enrollment of approximately 315 students. There is an active American Indian Student Council (AIC) as well as chapters of the American Indian Science and Engineering Society (AISES) and the American Indian Business Leaders (AIBL). NAS houses the Native American Student Center and the MSU counselor for Native students who provides academic advising, counseling, and mentoring. The Student Center offers tutorial assistance, telephone and fax access, and a computer lab

Degree Offered
M.A. in Native American Studies

Native American Studies offers a Master of Arts (MA) degree in Native American Studies with an interdisciplinary approach which makes the best possible use of university resources. The program allows each graduate student the opportunity to select a course of study that combines Native American Studies and a student’s particular area of interest (e.g., history, business, literature, political science). The 31-credit program is designed so that each graduate student could complete the program within three to four semesters of concentrated work. Students will be expected to attend at least two full semesters on campus. The program’s mission, purpose, and objective emphasis is to graduate, in a timely manner, knowledgeable professionals and academicians well grounded in Native American issues and scholarship.

The Master’s program offers two plans: Plan A – Thesis Option or Plan B – Non-thesis Option.

Plan A requires course work, a written thesis, and an oral defense of the thesis. This option is preparation for doctoral work in Native American Studies or a related field of study.

Plan B requires course work, a professional paper, and a comprehensive oral examination. The non-thesis option is preparation for employment in tribal, state, or federal government, a small or large business, and/or a tribal college.

Admission
Candidates are not required to complete the Graduate Record Examination (GRE) General Test, but may do so if they feel it will strengthen their applications. The closing date for receipt of completed applications is February 1. For detailed College of Graduate Studies requirements, visit the Graduate Catalog online (www.montana.edu/gradstudies). Successful applicants must have their applications accepted by the College of Graduate Studies (with departmental endorsement) before an individual is considered a graduate student at MSU.

A Bachelor’s degree or equivalent from an accredited institution is required for admission to the Master's
program in Native American Studies. The College of Graduate Studies recommends that prospective applicants send a letter of interest to the Native American Studies Department in order to ascertain the suitability of the program for the applicant.

Each applicant must submit the following:
1. application to the MSU-Bozeman College of Graduate Studies and a non-refundable $50 application fee
2. Graduate Record Exam (GRE) optional for students who feel it may strengthen their application
3. TOEFL score of 550 for international students where English is not their first language
4. official transcripts from all institutions attended (students must have a minimum GPA of 3.00 for the last two years of undergraduate study)
5. two writing samples
6. a statement of purpose and goals which includes applicant’s experience and knowledge of historical and contemporary American Indian issues, work background, and how the M.A. in NAS will help the applicant reach long range goals
7. three letters of recommendation, signed and sealed in envelopes (in addition to College of Graduate Studies recommendation forms)
8. a current curriculum vita

Limited slots are available, and admissions are competitive. Prospective students may also apply electronically at http://www.montana.edu/wwwdg/apply.shtml.

For students applying for teaching assistantships, the application deadline is March 1 for the following academic year. For international students, the deadline is May 15 for fall and October 1 for spring semester. For all other applicants, the deadline is July 1 for fall and November 1 for spring semester. Applicants must be formally accepted by the Division of Graduate Education with departmental endorsement from Native American Studies.

Degree Requirements
- Thirty-one (31) credits minimum.
- Plan A – Thesis Option: 10 credits (min.) thesis credits
- ½ of total credits must be at 500 level
- Maximum of four (4) 570 credits
- Plan B – Non-thesis: 15 credits (min.) at 500 level
- Maximum of six (6) 570 credits
- Pass/Fail – Maximum of 3 credits allowed (excluding thesis)
- 400, 470, 476, 489, 490, 588 589 credits – Not allowed on the program
- 500, 570, 576 credits – May not exceed 1/3 of total credits required for degree
- 575 credits – Maximum of six (6) credits (Plan B students only)
- Non-Degree/Reserved credits – Maximum of six (6) to nine (9) credits allowed depending upon admisibility at the time the course(s) were taken. (See graduate catalog)
- Course work may not be more than six (6) years old at time of graduation.
- Transfer credits – May not exceed 1/3 of total credits on program.
- Grade performance for courses on Program of Study – Grades below “C” must be repeated. “I” grades must be resolved before graduation.
- 3 credits (minimum) Registrar Registration required during term of comprehensive exams, defense of thesis, and graduation.
- 5 credits (minimum) Registrar Registration required for continuous enrollment. Continuous enrollment applies to all master’s students who have passed a comprehensive examination or students who have completed program content coursework (excludes thesis credits).

Required Content

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAS 530 – Federal Indian Law &amp; Policy</td>
<td>3</td>
</tr>
<tr>
<td>NAS 540 – Theoretical Positions in Native American Studies</td>
<td>3</td>
</tr>
<tr>
<td>NAS 541 – A Critical Approach to Native American Studies Methodologies</td>
<td>3</td>
</tr>
</tbody>
</table>

Financial Assistance
Graduate Teaching Assistantships, awarded on a competitive basis, are available in NAS to formally admitted graduate students. Selected graduate students will teach a section of Introduction to Native American Studies and/or other NAS courses. See the Graduate Assistantship sections for detailed information on appointment criteria.

Further Information
For further information regarding the program, contact Native American Studies at 406/994-3884 or e-mail Saralyn Sebern at saralyns@montana.edu. In addition, you may refer questions to the Division of Graduate Education or find the graduate catalog and policies on-line at www.montana.edu/wwwdg or www.montana.edu/wwwdg/catalog. Students are expected to be familiar with the degree requirements of both the department and the Division of Graduate Education. Also see www.montana.edu (the university home page) or www.montana.edu/wwwnas (the home page for Native American Studies).

DEPARTMENT OF POLITICAL SCIENCE

Department Head
Dr. Jerry Johnson
2-143 Wilson Hall, (406) 994-4141
jjd@montana.edu

Professors
- Jerry Johnson - Administrative law, public lands and natural resource policy.
- Franke Wilmer - International organization, international law, human rights, ethnic conflict, peace studies.

Assistant Professors
- Eric Austin - Organization Theory, Public Policy, Management, Administrative Ethics
- Elizabeth Shanahan - Public Administration Theory, Research Methods, Public Budgeting, Policy Analysis, and Environmental Politics.
- Sarah Rushing - Political Theory, feminist theory.
- Linda Young - International political economy, globalization and politics, the politics of food and hunger, research methods.

Degree Offered
M. in Public Administration

As part of a statewide program of education for the public service, the department grants the Master of Public Administration (MPA) degree.

The MPA degree is a professional degree designed to prepare candidates for management and policy making positions in public sector agencies at the local, state and federal levels. The program stresses sound preparation
in public management, personnel and financial administration. Further coursework is available in administrative law, leadership, program evaluation, local government, and ethics. Specializations in local government, administration of Native American affairs, education leadership, planning and other subspecialties are available. Practical experience is obtained through a supervised internship with a public or quasi-public agency. A minimum of 36 semester credits, including a research paper and internship, is required.

Admissions

Program Requirements

Full time students should be able to graduate in two academic years. The MPA degree requires completion of 36 credits.

Core Required Courses:
- PolS 551: Quantitative Research Methods
- PolS 554: Foundations of Public Administration
- PolS 555: Human Resources Management
- PolS 557: Public Budgeting and Finance
- PolS 558: Organization Theory
- PolS 559: Program Evaluation/Policy Analysis
- PolS 562: Local Government Administration or PolS 500: Leadership and Government Administration
- PolS 560: Ethics and Public Service
- PolS 574: Professional/Directed Research Project

Financial Assistance

The Political Science Department offers a limited number of teaching assistants which are usually reserved for second year students. Outstanding first year students, however, may receive a teaching assistantship as well. Teaching assistants receive a monthly stipend as well as a tuition and fee waiver. The Local Government Center periodically offers one research assistant position which carries a tuition waiver.

DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

Montana State University
Po Box 179400
Bozeman, MT 59717
Tel: (406) 994-4801
Fax: (406) 994-5407
www.chemistry.montana.edu/

Interim Department Head
Professor David Singel

Professors
- J.B. Broderick; bioinorganic chemistry, mechanisms of metalloenzyme-mediated reactions, mechanisms of biological radical reactions, bioremediation
- P.R. Callis; physical chemistry, quantum chemistry, biophysical chemistry, electron structure and photo-physical processes in molecules, solvent-solute interactions
- D.M. Dooley; bioinorganic chemistry, structure, mechanism, molecular biology and function of metalloproteins, inorganic spectroscopy
- T. Douglas; Biominalerization, bio-materials and nano-materials chemistry
- E.A. Dratz; biophysical chemistry, biochemistry, NMR, mass spectrometry, and molecular modeling studies of membrane receptors and protein-protein interactions
- P.A. Greco; natural products total synthesis and medium effects in organic chemistry
- T.S. Livinghouse; applied organometallic chemistry, homogeneous catalysis, organic synthesis
- T.K. Minton; physical chemistry, gas-surface interaction dynamics, surface modification, and photochemistry via molecular beam methods
- J.W. Peters; enzyme structure and mechanism
- D.J. Singel; physical and biophysical chemistry, high field EPR and DNP biochemistry of NO, laser materials

Associate Professors
- M.J. Cloninger; bioorganic and macromolecular chemistry, organic synthesis
- V. Copiè; biophysical chemistry, protein structures and dynamics as probed by nuclear magnetic resonance

- C.M. Lawerence; membrane protein structure and function, protein/RNA interactions, macromolecular X-ray crystallography, structure assisted design of ligands and inhibitors
- C.K. McClure; synthetic organic chemistry, new synthetic methods, organophosphorus chemistry, alka-loid synthesis and natural product synthesis
- L.H. Spangler; physical chemistry and materials, spectroscopy
- M. Teitzite; biochemistry of membrane proteins, protein-protein interactions, protein engineering, HIV vaccines

Assistant Professors
- B. Bothner; proteomics, protein dynamics, supramolecular complexes
- H.M. Nguyen; organic and organometallic chemistry
- R. Szilagyi; synchrotron-bases spectroscopic and computational studies of bioinorganic and organometallic systems

Degrees Offered
- M.S. in Chemistry
- M.S. in Biochemistry
- Ph.D. in Chemistry
- Ph.D. in Biochemistry

The Department of Chemistry and Biochemistry offers research-oriented programs culminating in the Doctor of Philosophy degree. The faculty in the department have expertise over a broad range of specialty areas including synthesis, structure, spectroscopy, and mechanism. In each of these fields, the strength of MSU Chemistry and Biochemistry Department has been recognized at the international level. MSU is a dynamic university of 12,000 students with the Department of Chemistry and Biochemistry being the strongest and best-funded department in the University. Doctoral students who emerge from our program have superb career opportunities.

Graduate programs in chemistry and biochemistry are designed to provide students with a solid and broad foundation on which to base their careers. An appropriate combination of coursework and independent investigation is planned with individual faculty advisors. In consultation with their graduate advisor, graduate students can
tailor their program to their own needs and interests. We believe that at the conclusion of their graduate education at Montana State University, students should have a professional command of the fundamentals of their disciplines. We cultivate the ability to think independently and to critically analyze scientific problems that span disciplinary boundaries. A high level of creativity and originality in research is expected of candidates for the Ph.D.;

**Program Requirements**

All entering graduate students are required to demonstrate proficiency in three of the five chemistry areas (analytical, inorganic, biological, organic, and physical) within the first year of residence. Passing exams in these areas does this. The exams are offered during August, November, February and April. A student is permitted three attempts in each area.

Each student, after due consideration, will choose a major advisor, who in turn will assist the student in selecting other faculty members for the student's special committee. This committee will offer the major guidance and direction to the student's degree program and bears the prime responsibility for decisions that affect that program.

Attendance and participation in the departmental seminars are required of all chemistry graduate students. All students will register for BCHM/CHM 500 each semester.

For the Master of Science Plan A in chemistry or biochemistry, the minimum requirements are twenty (20) credit hours of appropriate courses, an acceptable thesis based on the student's research and a satisfactory oral defense of the thesis. Plan A candidates must present either a thesis proposal seminar or a literature reporting seminar in addition to the final thesis defense which constitutes the comprehensive examination. For the Master of Science Plan B in chemistry or biochemistry, the requirements are thirty (30) credit hours of appropriate courses, a literature reporting seminar, and satisfactory performance in an oral comprehensive examination during the last term of residency for the degree.

For the Doctor of Philosophy in chemistry or biochemistry, the requirements necessary to qualify for candidacy, in addition to the proficiency requirement, are a modest core program of coursework and a comprehensive examination consisting of written and oral exams.

During the second year, students will take exams designed to test their cumulative knowledge in their chosen field of specialization (one of the five core areas). The candidate is required to pass written exams, which have a variety of formats depending on the core area, and an oral examination based on the candidate's proposal of planned research. The student is admitted to Ph.D. candidacy upon completion of these requirements.

The Division of Graduate Education minimum requirement of eighteen (18) thesis (690) credits applies to the Ph.D. degree. The seminar requirement for Ph.D. candidates includes a thesis progress seminar and the final thesis defense. The Ph.D. degree is completed by the presentation and defense of an acceptable thesis based on the student's research.

**Course Requirements**

To earn a Ph.D. in Chemistry or Biochemistry, a student must successfully complete at least six three-credit courses, maintaining a "B" average or better. Four of these must be Department of Chemistry and Biochemistry courses and at least three must be in the student's area of specialization.

The Graduate Program Committee will advise entering students on course selection. The listed courses can provide guidance in planning the first year's courses.

<table>
<thead>
<tr>
<th>Biochemistry</th>
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<tbody>
<tr>
<td>BCHM 504 — Mass Spectrometry</td>
<td>3</td>
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<tr>
<td>BCHM 520 — NMR Spectroscopy</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 534 — Proteins</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 544 — Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 545 — Advanced Physical Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 547 — Bioinorganic Chemistry</td>
<td>3</td>
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<tr>
<td>BCHM 550 — X-ray Crystallography</td>
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<tr>
<th>Inorganic</th>
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<tr>
<td>CHEM 515 — Structure and Bonding in Inorganic Chemistry</td>
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<tr>
<td>CHEM 516 — Mechanism and Dynamics in Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 547 — Bioinorganic Chemistry</td>
<td>3</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Organic</th>
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<tr>
<td>CHEM 525 — Organic Reaction Mechanisms</td>
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<tr>
<td>CHEM 533 — Physical Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 535 — Reagent Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 540 — Organic Synthesis</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 551 — Organic Structure Elucidation</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 554 — Organometallic Chemistry</td>
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<thead>
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<tr>
<td>CHEM 557 — Quantum Mechanics</td>
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<tr>
<td>CHEM 558 — Classical and Statistical Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 559 — Kinetics and Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 564 — Advanced Quantum Chemistry</td>
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</tr>
</tbody>
</table>
Research Facilities

The Department of Chemistry and Biochemistry at Montana State University understands the important role of instrumentation in research and training. Our department is committed to providing students, faculty, and staff with the instruments they require to stay at the forefront of research. The mass spectrometry and proteomics facility now boasts six instruments including nanoflow chip MS/MS, accurate mass TOF, MALDI-TOF, and GCMS. Proteomics is well supported, and in addition to the new mass spectrometers, a Typhoon scanner with Decyder software are available for the analysis of protein expression experiments.

Structural Biology is well represented in our department and both NMR and X-ray equipment are available. Chemists and Biochemists alike benefit from the excellent NMR Instrumentation: 600, 500, 300, and 250 MHz NMR spectrometers. These instruments are used in routine analysis of small molecules and also protein structural determination. The center for X-ray crystallography has both a small molecule service facility and a macromolecular X-ray program. The determination of protein structures is supported by 12 SGI workstations. Computational chemistry is being served by a 64 processor Linux cluster with Intel 32-bit and 64-bit processors organized into 14 nodes. These nodes are equipped with the latest versions of a broad spectrum of molecular modeling and electronic structure calculation software, such as Gaussian, Jaguar, Amsterdam Density Functional, MOPAC2000, MacroModel, and Tinker. Intel and Portland Group compilers are available for software development.

The Department also boasts high frequency CW and pulsed EPR instrumentation, a dynamic light scattering instrument, an isothermal titration microcalorimeter, an ultrafast femtosecond laser system, 3 tunable high resolution Nd: YAG pumped pulsed dye laser systems, and a quartz crystal microbalance capable of monitoring dissipation. Investigations of high energy gas-phase and gas-surface molecular interaction are conducted using a molecular beam apparatus that was originally designed by Nobel Laureate, Y. T. Lee, for crossed-beam studies of elementary reaction dynamics, and is one of the premier machines in the world for this purpose. Employing a pulsed hyperthermal atomic-oxygen beam, produced by laser detonation of O2, a wide range of high energy reactions are conducted with this apparatus.

We have spectrometers for Raman, FTIR, fluorescence, CD/MCD, and X-ray photoelectron spectrometry. In addition to the equipment housed in our department, campus microscopy capabilities include transmission electron microscopy (TEM), scanning electron microscopy with cryogenics (SEM), atomic force microscopy (AFM), confocal imaging, and laser micro dissection and capture.

Center for Biofilm Engineering

The National NSF Center for Biofilm Engineering is located at Montana State University. Several faculty and students have collaborative research projects with staff associated with this Center. For more information visit the Center's website.

Center for Bio-inspired Nanomaterials (CCB)

The CCB is an interdisciplinary academic unit supporting research, training and technology transfer in the general area of Computational Biology, combining state-of-the-art experimental techniques with state-of-the art computer-based analysis and modeling capabilities. The research and training environment in the CCB encourage partnerships between experimentalists, theorists and engineers in diverse fields, providing opportunities to establish genuine research partnerships between students and scientists at many different institutions around the world. For more information, refer to Special Programs & Centers or visit the Center's website.

MSU Optical Technology Center (OpTeC)

OpTeC is an interdisciplinary center with research groups from three university departments: Physics, Chemistry & Biochemistry, and Electrical & Computer Engineering. Each of the ten research groups is led by a faculty principal investigator and specializes in a different area of optical research. Collaborating teams profit from a multidisciplinary approach to problems. The primary goals of OpTeC are to foster collaboration with local industry and economic growth of the state. OpTeC promotes research on optical materials, lasers and optoelectronic devices, sensors, micro-optical systems, holography, and coherent optics. For more information, visit the Center's website.

Thermal Biology Institute

The Thermal Biology Institute conducts and promotes research and education focused on the biology and interrelated physical and chemical processes of geothermal environments in the Greater Yellowstone Ecosystem. For more information visit the Institute's website.

Center for Bio-inspired Nanomaterials (CBIN)

The Center for Bio-inspired Nanomaterials (CBIN) at Montana State University is a multidisciplinary research and education center focused on utilizing and expanding our fundamental understanding of the formation and hierarchical construction of biological materials such as viruses, cells, and biominerals (bones, teeth, seashells, etc.). One extension of this fundamental work is the use of biological macromolecular assemblies as templates for the construction of novel functional nano-materials. However, the goal of the Center is to study a wide range of materials, beyond those of biological origin, to achieve unique physical properties by design. For more information, visit the Center's website.

NASA Astrobiology Biogeocatalysis Research Center

The major research theme of the ABRC is in the area of prebiotic chemistry and specifically the role for iron-sulfur mineral motifs in the transition between the non-living and the living world. The project has three major thrusts including 1) iron-sulfur mineral catalysis, 2) iron-sulfur enzyme catalysis, and 3) biomimetic approaches to bridging iron-sulfur mineral and iron-sulfur enzyme structure and reactivity. These projects are highly integrated and the characterization of the unique iron-sulfur centers of nitrogenase and
hydrogenase provide the inspiration to examine the structure determinants for effective nitrogen reduction and reversible hydrogen oxidation catalysis. For more information visit http://www.chemistry.montana.edu/john.peters/research.html#abrc

**Molecular Biosciences Program**

The Molecular Biosciences Program offers numerous graduate research and training opportunities in Basic and Applied Life Sciences. Internationally recognized interdisciplinary research programs and Research Centers of Excellence provide students excellent career development opportunities.

The MB Program provides students with the opportunity to view faculty involved in life science research divided into research areas. The new approach should be easier for the prospective student to find a faculty conducting the research of most interest to them. For more Information visit http://www.mbprogram.montana.edu/index.asp

**Financial Assistance**

A number of research and teaching assistantships are available. The stipends vary somewhat depending on duties. Teaching assistantships, currently $18,000 to $22,000 per year (subject to normal progression through the graduate program, including joining a research group) normally involve teaching, grading, proctoring, and other student-assistance tasks.

For further information, refer to the Graduate Assistantships sections.

**DEPARTMENT OF ECOLOGY**

Montana State University
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Bozeman, MT 59717-3460

www.montana.edu/ecology/ecology@montana.edu

Tel: (406) 994-4548
Fax: (406) 994-3190

**Department Head**

Dr. David Roberts

**Professors**

- Scott Creel Ph.D.; Behavioral endocrinology; conservation biology; population biology; social evolution; and biology of carnivores.
- Daniel Goodman Ph.D.; Applied mathematical demography; evolutionary demography theory; environmental statistics; and environmental modeling.
- Andrew J. Hansen Ph.D.; Landscape ecology and management; land use effects on biodiversity; sustaining greater park ecosystems; conservation biology.
- Thomas McMahon Ph.D.; Wild trout management; fish-habitat relationships; winter ecology; conservation biology of salmonids.
- David W. Roberts Ph.D.; Vegetation ecology; ecological modeling; and multivariate analysis of ecological data.
- Jay J. Rotella Ph.D.; Ecology; population dynamics; habitat relationships; and management of avian species.
- T. Weaver Ph.D.; Physiological, community and ecosystem ecology of the Northern Rocky Mountains; and long-term field experiments.
- Alexander V. Zale Ph.D. (Affiliate); Applied aquatic ecology; effects of hydropower and reservoirs on fish populations; fisheries management.

**Associate Professors**

- Christopher Guy Ph.D. (Affiliate); Applied fisheries science; population ecology; predator-prey interactions; and fisheries management.
- Billie L. Kerans Ph.D.; Behavior, ecology and evolution of freshwater macro invertebrates; and assessing the impact of human disturbances on freshwater ecosystems.
- Mark L. Taper Ph.D.; Scientific evidence; statistical ecology; spatial ecology; and co-evolution theory.

**Assistant Professors**

- Wyatt Cross, Ph.D.; Aquatic food webs and ecosystems, ecological stoichiometry, cross-ecosystem material subsidies.
- Steven Kalinowski Ph.D.; Conservation and evolutionary genetics.

**Degree Offered**

- M.S. in Biological Sciences
- M.S. in Fish and Wildlife Management
- M.S. in Land Rehabilitation (Intercollege: Land Resources & Environmental Science – please see College of Agriculture)
- M.S. in Ecological & Environmental Statistics (please see interdisciplinary programs)
- PhD in Fish and Wildlife Biology
- PhD in Biological Sciences
- PhD in Ecology and Environmental Sciences (Intercollege: Ecology, LRES, ESCI, ARNR, and PSPP)

The department offers advanced work leading to Master of Science degrees in biological sciences, fish & wildlife management, land rehabilitation, and ecological and environmental statistics. The Master’s degree may be taken under either Plan A (thesis) or Plan B (without thesis). At the doctoral level, the Doctor of Philosophy degree is offered in ecology and environmental sciences, Biological Sciences and in fish and wildlife biology. At both the Master’s and Doctoral level the following areas of study are available: terrestrial and aquatic ecology, fish and wildlife management, evolutionary biology, quantitative ecology, and conservation biology.

Successful applicants are accepted into both the department and Division of Graduate Education.

**Admission**

Only a limited number of graduate students are admitted to our program each year. There is an excellent article written by Dr. Al Zale, Director of the
Fishery Cooperative Research Unit, "How to Surpass the Competition," which you may find helpful as you think about applying for admission. Go to http://www.montana.edu/mtcfru/MTCFRU_main/pdfs/zalejob.pdf. We accept students into the program based on their academic performance, graduate record examination scores, recommendation letters, experience, and potential for scientific and professional excellence. Students must meet the minimum entrance requirements to be considered by an advisor. Qualified students must secure an agreement from a faculty member who is willing to serve as major professor, or graduate academic advisor. We do not accept students into the program unless an advisor has agreed to supervise the student. Generally, the major professor will identify a research project and possible sources of funding as part of the admission process. We highly recommend that you formally apply only after a faculty member indicates that he or she is willing to serve as your graduate advisor.

Program Requirements
The minimum credit requirement for a master's degree is 30 credits, and at least 20 credits must be from coursework other than thesis work. A minimum of 10 thesis credits must be successfully completed. Minimum thesis registration is one (1) credit for a semester.

The minimum credit requirement for a Doctoral degree is 60 credits beyond the bachelor's degree, and at least 42 credits must be from coursework other than thesis work. A minimum of 18 thesis credits must be successfully completed. A maximum of 30 credits from a previously earned Master's degree may be applied toward the 60 credit requirement.

No specific courses are required for graduate degrees. The program of study is determined by the graduate committee following Division of Graduate Education guidelines.

Financial Assistance
Graduate Teaching Assistantships (GTAs) are chosen in the semester before the next academic semester, and reflect teaching needs and financial assistance needs. GTA's carry tuition fee waivers, and in 2007/08 the stipend was a total of $1140.89 per month during the nine-month academic year. This includes money to be used for medical insurance which is not provided directly by the department. (For further graduate school expenses, consult the MSU fee schedules as provided in the Graduate Catalog.) Graduate Research Assistantships (GRAs) are research project-specific and are awarded by individual faculty as funds are available. GRA stipends are comparable to those of GTAs but often cover the calendar year or multiple years. Some fee waivers may be available with GRAs depending upon funding sources.

DEPARTMENT OF EARTH SCIENCES
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http://www.montana.edu/wwwes/earth@montana.edu

Department Head
Stephan (Steve) G. Custer

Emeritus Professors
• J.K. Hansen; climatology; physical geography, mountain systems, biogeography.
• J. Montagne; geology of the Rocky Mountains, snow avalanches, glacial and Quaternary geology.
• R. Taylor; urban geography and cartography.

Professors
• J.R. Horner (Regents Professor; Curator of Paleontology, Museum of the Rockies); paleobiology, distribution and systematics of Jurassic and Cretaceous dinosaurs, histological structure of various extinct vertebrates with implications for physiologic, metabolic, and ontogenetic processes.
• D.R. Lageson; structural geology and regional tectonics of the Northern Rocky Mountains, earthquake geology, crustal extension of the northern intermountain region.
• W.W. Locke; Earth surface processes, natural hazards, glacial geology, soil development and paleo-climate, post-glacial volcano-tectonic deformation in Yellowstone.
• D.W. Mogk; evolution of the Archean crust of SW Montana, petrogenetic processes in the middle crust, chemistry and isotopic studies of the Archean rocks, surface chemistry of minerals, geoscience education.
• C. Whitlock; Quaternary environmental change, vegetation fire, and climate history of the western U.S. South America, and New Zealand.
• W.K. Wyckoff; cultural and historical geography of the United States, evolution of western American cultural landscapes, rural and urban settlement geography.

Associate Professors
• J.M. Ashley, Jr.; physiography, physical geography, small towns.
• S.G. Custer; ground and surface water hydrology, stream morphology, water quality, snow dynamics (snow-melt runoff, wet and dry snow avalanche processes; snow distribution).
• T.C. Feeley; volcanology, volcanic hazards, geochemistry of continental magmatism.
• M.H. Gardner; stratigraphy, sedimentology, subsurface geology, ancient ocean systems, petroleum geology.
• J. Liu; economic-urban geography, China.
• J.G. Schmitt; tectonics and sedimentation in foreland and extensional basins, alluvial fan sedimentology, vertebrate taphonomy.

Assistant Professors
• M.L. Skidmore; biogeochemistry and geomicrobiology of glaciated systems.
• D.J. Varricchio; dinosaur paleoecology, taphonomy and anatomy.

Adjunct Assistant Professors
• S.R. Challenger; geographic information science instruction, database structures, geographic information analysis.

Research Associate Professor
• D.W. Bowen; sedimentary basins, stratigraphy of basin fill deposits.
Research Assistant Professors
- C. Shaw; structural geology, metamorphic petrology, field geology micro structural analysis, thermochronology.
- F.D. Jackson; paleontology, taphonomy and reproductive paleobiology of dinosaurs.

Affiliate Professor
- K. Birkeland (U.S. Forest Service); Geosynergies, Climatology, Avalanche Analysis
- J. Childs (private consultant); Economic Geology
- R.L. Lawrence (Land Resources and Environmental Science); remote sensing, forestry, hydrothermal and ecological change in Yellowstone National Park.
- K.L. Pierce (US Geological Survey, NRMSC) Quaternary Geology, Geomorphology
- R. Stands-Over-Bull (private consultant); Petroleum Geology, Coal Geology

Degree Offered
- M.S. in Earth Sciences
- M.S. in Land Rehabilitation (Interdisciplinary degree)
- Ph.D. in Earth Sciences

Earth Sciences offers M.S. and Ph.D. degrees in Earth Sciences (Geography, Geology, and Geobiology content areas). We stress independent thesis research with some supporting course work. Our expertise spans most of the subfields of Earth Sciences. Our Geography faculty includes specialties from settlement geography through bioclimatology to GIS and snow science, while the interests of our Geology faculty range from petrogenesis to palaeobiology to applied hydrogeology and from dinosaur taphonomy and stratigraphy to geomorphology and snow science. Our Geobiology faculty have research Interests in vertebrate paleontology, paleoecology, biogeography, palaeoclimatology, and geomicrobiology. Our program strengths are in basin analysis and energy resources, dinosaurs paleontology, geology of the northern Rocky Mountains, architecture and composition of the lithosphere, snow science and cryospheric processes, and climate change. Examples of thesis titles can be found on the Department of Earth Sciences web page (see above).

Admission
The department generally expects applicants to have a GPA of 3.0 or higher and GRE Scores better than the 50th percentile and a strong academic background in Earth Sciences (Geography, Geology, or Geobiology). Foreign students must have a TOEFL score better than 550 for the paper test and 231 for the computer test. The Department does not accept general applicants to our graduate program. An applicant should identify a major advisor from the list of faculty above, contact that individual, and determine whether there is space available in that advisor’s program.

For students who wish to study geography, the department requires the equivalent of a geography minor (eight semester geography courses including map skills, world regional, human, and physical geography) as background. A geography undergraduate degree is preferred and coursework and practical experience involving geographic skills such as cartography, field methods, aerial photograph interpretation, remote sensing, GIS and quantitative methods are considered a desirable part of an applicant’s background.

For students who wish to study geology, the department expects an applicant to have a year each of calculus, physics and chemistry as well as physical geology, mineralogy, petrology, historical geology, geomorphology, sedimentation, stratigraphy, structural geology, and a field geology course which emphasizes mapping. These requirements are typically met by an undergraduate degree in geology. A student who has not completed all requirements may be admitted but is expected to make up deficiencies during the first year of graduate study.

For students who wish to study geobiology, the department expects an applicant to have a degree in geology, biology or a closely related field. The most competitive students have significant upper-division course work in both geology and biology.

For optimum course scheduling, applicants are accepted into the graduate program only at the start of Fall semester. However, a student desiring to take courses to strengthen qualifications for the graduate program may be admitted as a non-degree student at the beginning of either the Spring or Summer term. Successful applicants must be accepted both by the department and by the Division of Graduate Education.

Program Requirements
Students are expected to develop a solid curricular foundation in geography, geology or geobiology. All graduate students in the Earth Sciences Department are required to take Earth Science 500 Section 01 Thesis Design for one credit in the fall of their first year. Graduate programs include a core of geography, geology, or geobiology courses and are further tailored in consultation with the advisor and graduate committee to the specific talents and interests of the individual student.

Coursework in disciplines outside the department is encouraged to support and enhance specific research areas in the Earth Sciences.

Graduate and 400-level (senior) courses in earth science include: surface-water resources, ground-water resources, snow dynamics, physiography, geobiology, geomicrobiology, Quaternary Environments of the Western US, Quaternary paleoecology, and Quaternary environments.

Graduate and 400-level (senior) courses of study in geography include: historical geography, geographic thought, aerial photo interpretation, mountain geography, applied GIS and spatial analysis, tourism planning, mountain geography, regional geography, East Asia in the global system, GIS research fundamentals, settlement geography, bioclimatology, and land use planning. Graduate and 400-level (senior) courses of study in geology include: glacial geology, sedimentology, applied geological hydrology, advanced stratigraphy, clastic sedimentology, ancient ocean systems, tectonics of sedimentary basins, petroleum geology, depositional systems, vertebrate paleontology, macroevolution and the fossil record, taphonomy, comparative vertebrate anatomy, Hell Creek paleontology, geology of the northern Rocky Mountains, structural analysis, tectonics, igneous geochemistry, igneous geochemistry, and volcanology.
The Marathon Center of Research and Teaching Excellence in Earth Science

M-CORTES is a partnership between Marathon Oil and Earth Sciences funded through the MSU Foundation. This center is designed to support students, education and research related to oil and gas. This center includes general department support, scholarships, training opportunities, internships and travel grants.

Mountain Research Center

The Earth Sciences Department cooperates with the multidisciplinary graduate program in the Mountain Research Center. This program fosters multidisciplinary team approaches to understand complex interrelationships among the biological, economic, and socio-political processes that operate in mountain environments. Refer to Special Programs and Centers listings for a more detailed description.

Facilities

The primary research facility is the northern Rocky Mountain field laboratory which includes Yellowstone National Park, and the Greater Yellowstone GeoEcoSystem. Field work is also done in China, Argentina, Chile, and New Zealand. Field-based research in the Rocky Mountains is a component of many Earth Sciences graduate students' study. Field equipment includes tools for location and altitude (from conventional compasses and altimeters to auto levels, a total station and GPS ground stations), sampling devices including suspended and bedload sediment samplers, current meters paleomagnetic rock drills, hammer seismograph, auto level, total station, snow density kits, U.S. Federal Snow samplers, ram sondes, shear frames, lake-sediment coring equipment and the like. Field work is supplemented by laboratory analysis in several facilities across campus. The Department has crushers, Franz magnetic-susceptibility separator, balances, rock saws, lap wheels, and a paleontology preparation laboratory. The Department also has several high-quality (Leitz and Nikon) transmitted and reflected light research petrographic microscopes with photo microscopy and cathode luminescence capability and computer-driven image analysis capabilities. There is an MSU Paleocology Lab under the direction of Cathy Whitlock, a geomicrobiological/geochemical laboratory under the direction of Mark Skidmore, a structural geology laboratory under the direction of David Lageson, and the stratigraphic and basin analysis laboratory under the direction of Michael Gardner.

There are other laboratories on campus that Earth Scientists use. The MSU Spatial Sciences Center under the direction of Rick Lawrence provides instruction and research opportunities for faculty and students interested in Global Positioning Systems, GIS and remote sensing. This center supports ARC/INFO and ERDAS on workstations, pARC/INFO and IDRISI and IMAGINE on PCs, and a variety of digitizers, scanners, printers and plotters for data input and output.

The Imaging and Chemical Analysis Laboratory (ICAL) contains analytical equipment which includes a scanning electron microscope (with EDS, BSE, and CL spectrometers), automated powder X-ray diffraction, X-ray photoelectron spectroscopy, Auger electron spectroscopy, and time-of-flight SIMS.

The Subzero Science and Engineering Laboratory under the direction of Ed Adams has a variety of cold rooms for research on snow and ice including a flume laboratory for the study of ice in streams and lakes, and laboratories with radiation and thermal pulses to examine snow and ice properties under varying weather and climatic regimes.

The vertebrate (dinosaur) paleontology laboratory of the Museum of the Rockies, under the curation of Jack Horner, contains state-of-the-art microscopic and computerized image-enhancement equipment for the study of dinosaur bones, as well as other chemical and mechanical equipment for the preparation and analysis of fossilized vertebrates.

Graduate students in Earth Sciences have been successful with National Science Foundation Fellowships and research grants from Geological Society of America, the American Association of Petroleum Geologists, the Society for Sedimentary Geology, the U.S. Forest Service, and Sigma Xi, and have won University-wide and regional awards for thesis research.

Financial Assistance

Teaching and research assistantships are available each year. Graduate scholarships are awarded annually on a competitive basis in the second year of residence to assist with thesis research. See the Earth Sciences web page or contact the department for more information.

DEPARTMENT OF MATHEMATICAL SCIENCES

PO BOX 172400
Wilson Hall 2-214
Office Number 406-994-3601

Department Head
Dr. Kenneth Bowers

Professors
• M.M. Barge; dynamical systems.
• R.J. Boik; linear models, multivariate analysis.
• J.J. Borkowski; experimental design, response surface methodology sampling, quality control.
• K.L. Bowers; applied mathematics, numerical analysis.
• M.J. Burke; mathematics education.
• J.D. Dockery; applied mathematics.
• W.W. Esty; stochastic processes, probability, mathematics education.
• T. Gedeon; applied dynamical systems.
• I. Klapper; applied mathematics.
• J. Kwapisz; dynamical systems, ergodic theory.
• J.R. Lund; numerical analysis.
• R.C. Swanson; global analysis, dynamical systems.
• C.R. Vogel; numerical analysis, inverse problems.
• R.B. Walker; dynamical systems.

Associate Professors
• J.D. Banfield; statistical computation, pattern recognition.
• J.S. Cherry; spatial statistics, linear models ecological and environmental statistics.
• L.G. Davis; sensitivity analysis, optimal design, numerical analysis.
• J. Luebeck; mathematics education.
• M.C. Pernarowski; applied mathematics.
• J.F. Robison-Cox; statistical computing, graphics, mixed effects models.
Assistant Professors
- E. Burroughs; mathematics education.
- L. Geyer; dynamical systems, complex analysis.
- M. Greenwood; functional data analysis, time series, model selection criteria.
- M. Higgs; ecological and environmental statistics, bayesian hierarchical models, spatial statistics, computational statistics.
- K. Irvine; bayesian graphical models, spatial statistics, ecological and environmental monitoring.
- D. Yopp; mathematics education.
- T. Zhang; applied mathematics, numerical analysis.

Degrees Offered
- M.S. in Mathematics
- M.S. in Mathematics (Mathematics Education option)
- M.S. in Statistics
- M.S. in Ecological and Environmental Statistics (Please refer to Interdisciplinary Programs)
- Ph.D. in Mathematics
- Ph.D. in Statistics

The department offers graduate study leading to the degree of Master of Science in either Mathematics, Statistics, or Ecological and Environmental Statistics. The M.S. in Mathematics degree is available with two options: Mathematics and Mathematics Education. The Doctor of Philosophy degree is offered in Mathematics, Statistics, and Mathematics Education.

Admission
For regular admission to either the M.S. or the Ph.D. degree program, a student should have completed at least eighteen (18) credits of mathematics beyond calculus. For mathematics majors, this should include a year of advanced calculus. For statistics majors, it should include a year of statistical theory and a year of probability and statistical methods. Admission to the mathematics education program is determined on an individual basis. Refer to the Admission Policies and Application Requirements sections for additional information. Successful applicants are accepted into both the department and the Division of Graduate Education.

Master of Science Requirements
The Master of Science degrees are offered under Plan A (Thesis) and Plan B (Non-thesis). Of the required thirty (30) credit minimum, at least eighteen (18) credits of 500-level course work must be taken under either plan.

Available under Plan B is a comprehensive master's degree in either mathematics or statistics. Although no thesis is required in this plan, a sound knowledge of several areas of mathematics and/or statistics is expected. Also available under Plan B is a master's degree in mathematics with an option in mathematics education. This option is designed primarily for secondary or junior college teachers and is offered as a combination of on-line academic year course work and summer sessions. The requirements for this degree are flexible and an attempt is made to tailor each program to the individual needs of the student. The mathematics education option requires completion of a capstone research project.

For further information, refer to the For Master's Students section. Students are expected to be familiar with both the departmental and the Division of Graduate Education degree requirements.

MS in Mathematical Sciences
The Master of Science degree in mathematics at Montana State University is designed to prepare students for further graduate work or for employment in academic, industrial, business, or government forums. Upon entrance, each student meets with the department's Graduate Program Committee to discuss career objectives and first year course work. During the second semester in the program each student forms a Graduate Committee and together, they outline the student's degree program. The prerequisites for the master's degree program in mathematics consist of the following courses or their equivalent: Linear Algebra (MATH 533) and Advanced Calculus (MATH 561-62). Students who have not completed these courses or their equivalent may still enter the master's program but it is suggested that these courses then be taken.

Both non-thesis and thesis plans are offered for the M.S. degree:

Non-thesis Plan
Requires both course work and passing the written comprehensive exam. At least 30 credits of course work are required. Of these, at least 18 credits must be numbered 500 or higher. Regardless, all of the following core courses must be completed:
- MATH 503 Advanced Linear Algebra (every Spring)
- MATH 504 Abstract Algebra (every Spring)
- MATH 505 Mathematical Analysis (every Fall)
- MATH 511 General Topology (every Fall)

Additionally students must fulfill a breadth requirement by completing at least two of the following courses:
- MATH 441 Numerical Linear Algebra & Optimization (every Fall)
- MATH 450 Applied Math I (Fall odd numbered years)
- MATH 454 Dynamical Systems I (Fall even numbered years)
- STAT 420 Probability (every Fall)
- STAT 424 Mathematical Statistics (every Spring)

Either or both of these two required courses may be replaced by the corresponding semester of the appropriate 500 level course: MATH 581 (numerical analysis), MATH 560 (applied mathematics), MATH 595 (dynamical systems), STAT 501 (probability) or STAT 502 (mathematical statistics), respectively. Any other exceptions to the course requirements must be approved by the student's graduate committee and adhere to the minimum policy requirements set forth in the Graduate Catalog (Plan B). Requirements for the written comprehensive exam are listed separately below.

Thesis Plan
Requires course work, passing the written comprehensive exam, writing a thesis and an oral defense of the thesis. At least 30 credits must be completed of which 10 must be thesis credits. Students must also complete both the core and breadth course requirements described in the Non-Thesis Plan above. Any exceptions to the course requirements must be approved by
the student’s graduate committee and adhere to the minimum policy requirements set forth in the Graduate Catalog (Plan A). Thesis and oral defense requirements must be arranged with and approved by the student’s graduate committee. Requirements for the written comprehensive exam are listed separately below.

**M.S. Comprehensive Exam**

The M.S. comprehensive exam is a written exam administered in disjoint 3 hour components. Though you have 3 hours to do each exam the exams are written in such a way that if you know the material well you only need two hours. This is done so you are under no time pressure to complete the topic and demonstrate what you know rather than what you do not know.

Each component is graded as pass or fail. To pass the comprehensive exam a student must pass four different components within two examination periods. At least two of these components must be from the following list:

- Linear Algebra (MATH 503)
- Abstract Algebra (MATH 504)
- Real Analysis (MATH 505)
- Topology (MATH 511)

The other two required components may be from the list above or from the following list:

- Numerical Analysis (MATH 441-442)
- Applied Mathematics (MATH 450-451)
- Dynamical Systems (MATH 454-455)
- Probability and Statistics (STAT 420, 424)

The first examination period occurs in January with the specific dates and times for each component determined by the department.

Students must attempt at least four components the first examination period after 3 semesters of study.

Typically, these four 3 hour components will be administered in a morning and afternoon of two different days. If the student fails one or more components in the first examination period, a failure will be reported to the Division of Graduate Education. The student must then pass the remaining required components in a second examination period administered either during spring semester (at least two months after the first examination) or the following January. No more than four components may be taken in the second examination period. If the student has not passed the remaining required components after the second examination period a second failure of the comprehensive exam will be reported to the Division of Graduate Education.

**MS in Math Education**

**Entrance Requirements**

A typical MSME applicant will have (1) a BS or BA with a major or minor in mathematics, (2) certification to teach mathematics, and (3) at least two years of successful mathematics teaching experience at the secondary level. Applicants who do not have the above qualifications (e.g., those teaching at a private school or in a two-year college not requiring certification) will be reviewed on a case-by-case basis. Normally students will be considered for admission only if their undergraduate GPA is higher than 3.0.

**Program Requirements**

The MSME program requires 30 semester hours of course work. The program of study typically includes courses in analysis, foundations of mathematics, geometry, statistics, math modeling, linear algebra, discrete mathematics, and mathematics education courses in assessment, standards, and institution. Each student’s program is individually designed to take into account the student’s background, interests, and career goals.

**Advising**

Each student is advised by a three-person faculty committee charged with oversight of the student’s program and with administering the student’s capstone project and oral examination. The committee must include at least two faculty members from the Department of Mathematical Sciences. Students will be assigned a committee upon admission.

**Capstone Presentation & Comprehensive Examination**

**Overview**

All students must present (1) a capstone project and (2) pass a follow-up oral examination in order to complete the MSMME program. These require-
each student must be enrolled in at least three (3) credits of coursework (of which 577 qualifies) during the semester they present their capstone project and during the semester they intend to graduate.

M.S. in Statistics - Program Guidelines

The Master of Science degree in statistics at Montana State University gives students a solid background in the applications as well as the theory of statistics. Students in this program prepare either for further graduate work or for academic, industrial, business, or government employment. Upon entrance, each student meets with the department's Graduate Program Committee to discuss career objectives and first year course work. During the second semester in the program each student forms a Graduate Committee and together, they outline the student's degree program. The prerequisites for the master's degree program in statistics consist of the following semester courses or their equivalent: Multivariable Calculus (MATH 224), Linear or Matrix Algebra (MATH 224), Probability (STAT 402), and Mathematical Statistics (STAT 424). Students who have not completed these courses may still enter the master's program. It is suggested that these courses then be taken after enrolling.

Either Plan A (thesis and 20 credits of course work) or Plan B (30 credits of course work) can be chosen. In either case, all courses on a graduate program must be numbered 400 or higher, and STAT courses must be numbered 410 or higher. The specific program of study depends on the student's previous training and experience. Regardless of the plan chosen, (i) at least half of the required non-thesis credits must be STAT courses, (ii) at least two-thirds of the required non-thesis credits must be numbered 500 or higher, and (iii) the following 14 semester core course credits are required:

Statistics M.S. Required Courses (15 semester credits)
- STAT 501-502 Intermediate Prob and Math Stat - 6 credits
- STAT 505-506 Linear Stat Models, Adv Regression - 6 credits
- STAT 510 Statistical Consulting - 2 credits
- STAT 575 (Plan B below) 1 or 2 credits

Additional requirements
1. The M.S. degree requires completion of either a thesis or a writing project.
   a. Thesis (Plan A): The Plan A thesis typically requires 450-500 hours of work. The student must register for at least 10 thesis credits (STAT 590) in addition to the required 20 credits of course work. The student must give an oral defense of his/her thesis.
   b. Writing Project (Plan B): The Plan B writing project typically requires at least 90 hours of work, for which the student earns 2 credits of STAT 575. With permission from the student's committee, additional credits of STAT 575 (no more than 4 total) may be earned. Students should enroll in Stat 575 in their final Spring semester, and must give a seminar on the writing project before graduating.
2. Experience in data collection - either through a course such as Sampling or Design of Experiments, or a course taken in a former degree program, or real-life experience.
3. For either Plan A or Plan B, the student must pass a comprehensive examination.

M.S. in Statistics Comprehensive Exam
The M.S. comprehensive exam is a four-hour written exam over material from (1) the M.S. core courses listed below and (2) electives selected by the student and approved by the student's graduate committee.
1. M.S. Core Courses for the M.S. Comprehensive Exam (12 semester credits)
   a. STAT 501-502 - Intermediate Probability & Statistics
   b. STAT 505 - Linear Models
   c. STAT 506 - Advanced Regression (retakes only)
2. Elective Courses for the M.S. Comprehensive Exam (6 semester credits from Stat 446, Stat 431, or 500 level electives)

The exam is given each January with the specific date determined by the department. The exam is graded as PhD pass, M.S. pass, or fail. Examinees will be informed of the results within three working days of taking the exam. The M.S. comprehensive exam may be repeated once. If reexamination is needed, the student's committee will indicate which topics are to be repeated.

Ph.D. Requirements

Students in mathematics are expected to develop competence in real and complex analysis and at least two areas chosen from applied mathematics, dynamical systems, functional analysis, numerical analysis, partial differential equations, probability, topology or other topics the student's committee may approve.

Students in statistics must demonstrate proficiency in the Ph.D. core (linear models, probability, and mathematical statistics) as well as in two areas of additional study approved by the student's committee. Potential areas include the following: modeling, multivariate statistics, spatial statistics, sampling, experimental design, time series, statistical computing, and nonparametric statistics. Proficiency is demonstrated by passing a PhD qualifying exam.

Students in mathematics education must demonstrate competence in three areas: (1) at least one topic Ph.D. level mathematics as described above; (2) current theory in mathematics curriculum, assessment, and instruction; and (3) educational statistics and research methods.

Doctor of Philosophy programs in the Department of Mathematical Sciences must include a supporting course area which may be taken within the department. A minor field of study is optional. Comprehensive examinations will cover approved areas. The student's graduate committee determines additional requirements. Refer to the For Doctoral Students section for additional information. Degree candidates are expected to be familiar with both departmental and Division of Graduate Education degree requirements.
Ph.D in Mathematics

Described below are the Department of Mathematical Sciences requirements for the Ph.D. degree in Mathematics. These departmental requirements supplement those set out by the Division of Graduate Education (DGE) in the Graduate Catalog for Ph.D. Students.

There are no foreign language requirements or qualifying exam for a Ph.D. in Mathematics.

1. Ph.D. Committee

a. The Ph.D. committee must include a minimum of five members excluding the DGE-assigned Graduate Representative.
b. A committee must be formed before the end of the student's second semester of study.
c. The Committee Chairperson (Advisor) must be a faculty member within the Department of Mathematical Sciences.
d. The first three committee members listed on a candidate’s Program of Study listing their intended coursework must be approved by all committee members.
e. The committee members must have access to a dissertation draft at most five years to submit a draft of their dissertation to their committee prior to their final defense. The first three committee members listed on a candidate’s Program of Study must be given a dissertation draft at least two weeks prior to the Final Defense. Regardless, all committee members must have access to a dissertation draft at least one week prior to the Final Defense. The dissertation should embody the results of extended research by the candidate, be an original contribution to knowledge, and include new material worthy of publication. The dissertation must be submitted as an electronic dissertation, in final form to the Division of Graduate Education not later than 14 working days before the end of the term in which graduate work is completed.

2. Course Requirements

a. A minimum of 30 credit hours are required (see the Graduate Catalog for Ph.D. Students for details).
b. A minimum of 18 credit hours must be dissertation credits (M690).
c. The Ph.D. student’s Program of Study listing their intended coursework must be approved by all committee members.
d. The student must take a minimum of 4 credits of the Math 500 seminar series.

Typically, a Ph.D. student takes 18 credits of mathematics in courses numbered 500 or higher to prepare for their comprehensive examination. Students are encouraged to begin some form of doctoral reading or research (either informally or in the form of M689 credits) with a committee member by their second year of study.

3. Ph.D. Comprehensive Exam

The Ph.D. Comprehensive examination consists of both a written and an oral comprehensive examination. The candidate must pass the written comprehensive exam before taking the oral comprehensive examination.

Written Comprehensive Exam:

How a student may choose and retake exam components is determined by (a)-(f):

a. The written comprehensive exam consists of 4-hour exam components graded as Pass or Fail.
b. The candidate must pass three components to pass the written comprehensive examination though they may attempt more.
c. If a candidate fails a component it may be attempted at most one more time.
d. The candidate must pass the following "required" components:
i. MATH 547, MATH 551 Real and Complex Analysis
ii. MATH 511-512 Topology
iii. MATH 595-596 Dynamical Systems
iv. MATH 584-585 Functional Analysis
v. MATH 581-582 Numerical Analysis
vi. MATH 544-545 Partial Differential Equations
vii. MATH 560-561 Applied Mathematics
viii. MATH 547, 586 Probability
f. At most one "nonstandard" component not from (i)-(viii) may be taken. To take such a component the following petition form must be completed.

Oral Comprehensive Exam:

After passing the written comprehensive exam the candidate must pass an oral comprehensive exam at a date agreed upon by the candidate's committee. Normally the oral comprehensive exam is a thesis topic proposal where the candidate's ability to conduct research on the proposal is assessed. When this is not the case, the candidate will be informed of the nature of the oral comprehensive exam by their committee. The candidate has at most two attempts to pass the oral comprehensive examination.

4. Dissertation Requirements:

Once the Ph.D. candidate has passed the comprehensive exam (both written and oral parts) the student has at most five years to submit a draft of their dissertation to their committee prior to their final defense. The first three committee members listed on a candidate's Program of Study must be given a dissertation draft at least two weeks prior to the Final Defense. Regardless, all committee members must have access to a dissertation draft at least one week prior to the Final Defense. The dissertation should embody the results of extended research by the candidate, be an original contribution to knowledge, and include new material worthy of publication. The dissertation must be submitted as an electronic dissertation, in final form to the Division of Graduate Education not later than 14 working days before the end of the term in which graduate work is completed.

5. Final Defense:

Department policies on the final defense and all other administrative procedures regarding the degree completion are exactly those as set out by Division of Graduate Education (DGE).

Ph.D in Math Education

At Montana State University, there are two paths to a doctoral degree emphasizing mathematics education.

Path #1 is designed for candidates with research interests focused on university mathematics and mathematics education. This path leads to a Ph.D. in Mathematics specializing in Mathematics Education from the Department of Mathematical Sciences, College of Letters and Science. Graduates of this program generally seek employment in a university Mathematics Department.

Path #2 is designed for candidates with research interests focused on junior/senior high school mathematics teaching and teacher education. This path leads to a Ed.D. in Curriculum & Instruction, Secondary Education Emphasis with a Mathematics Minor from the Department of Education, College of Education, Health & Human Development. Graduates of this program generally seek employment in a university Education Department.
Ph.D. in Statistics - Program Requirements
The Ph.D. program in statistics at Montana State University prepares students for academic, industrial, business, or government employment. To earn a Ph.D. in statistics, a student must pass the Ph.D. qualifying exam, pass the Ph.D. comprehensive exam, and write and defend a Ph.D. dissertation. The exams are described below. The dissertation must be an original contribution to statistical science and must include new material worthy of publication. There is no departmental foreign language requirement for the Ph.D.

A Ph.D. student typically takes at least 24 credits of statistics in courses numbered 500 and higher and six credits of mathematics (MATH 505 & MATH 586). Additional course work in statistics and/or mathematics may be necessary, depending on the candidate's chosen area of specialization and background. For instance, a Ph.D. student is expected to have completed all courses required for the M.S. degree in statistics and may need to make-up one or more of these courses. Also, it is expected that a Ph.D. student will take directed study courses (STAT 689) in his/her area of specialty. Stat 690, dissertation credit requirements, are listed in the Graduate Catalog. Two credits of Stat 510, Statistics Consulting Seminar are required.

Ph.D. in Statistics - Qualifying Exam
The Ph.D. qualifying exam is identical to the core course portion of the statistics M.S. comprehensive exam except that the exam must be passed at the Ph.D. level (i.e., Ph.D. pass). A student who earned an M.S. in Statistics from MSU need not take the PhD qualifying exam if the M.S. comprehensive exam was passed at the Ph.D. level. Other students are expected to take the Ph.D. qualifying exam during their first post-master's semester at MSU or as soon as course work in the M.S. core has been completed. Two attempts to pass the qualifying exam are allowed.

Ph.D. in Statistics - Comprehensive Exam
The written comprehensive exam for the Ph.D. in Statistics consists of an 8-hour exam. It is given in August at a time determined by the department, and has been split into a session emphasizing methods and another emphasizing theory. At the discretion of the student's committee, the format might be changed, and the exam could be split so that half is taken one year and the remainder taken the following year.

The written Ph.D. comprehensive examination covers material in the student's concentration areas and in the Ph.D. core. The Ph.D. core consists of the following material:
- STAT 532 Bayesian Data Analysis
- STAT 550 Advanced Mathematical Statistics
- MATH 586 Probability

Each student must devise at least two areas of concentrated study that are separate from the PhD core. Each area should include an amount of material (and at an appropriate depth) equivalent to two graduate level statistics or mathematics courses. The concentration areas must be approved by the student's committee and must include, in total, an amount of material equivalent to at least 4 graduate level courses. An area could involve course material from outside the department. Some examples are the following:
- Modeling (STAT 539 & 578)
- Multivariate Statistics (STAT 537 & 538 or STAT 537, 538, & 539)
- Design (STAT 526 & 578)
- Real Analysis (MATH 547 & 548)
- Biostatistics/Generalized Linear Models (STAT 524 & STAT 539).

Each session of the written comprehensive examination is graded separately as pass or fail. A failed session may be repeated once. Once the written comprehensive examination has been passed, the student must pass the oral comprehensive examination. The student's committee will inform the student of a timeline to take the oral and will

Financial Assistance
Graduate assistantships are available to qualified graduate students in mathematics, mathematics education, or statistics. Graduate Teaching Assistantships (GTA) usually require teaching one course each semester. Graduate Research Assistantships (GRA) are may also available to qualified students in mathematics and statistics. Time requirements are similar to those for teaching assistantships. See the Graduate Assistantships section for detailed information on appointment criteria.

DEPARTMENT OF MICROBIOLOGY
Montana State University
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www.montana.edu/wwwmb

Department Head
- T.E. Ford; source and drinking water microbiology, environmental health, waterborne disease; microbial cycling and transformation of pollutants, surface microbiology, ecotoxicology.

Professors
- A.K. Camper (affiliate); bacterial attachment to surfaces, biological treatment of drinking water and microbial regrowth in drinking water distribution systems.
- G. Geesey; metal and radionuclide transformations by iron- and sulfate-reducing bacteria in sub-surface environments.
- A.J. Jesaitis; host defense; leukocyte cell biology and biochemistry, chemotaxis, and electron transport.
- M.A. McClure; genomics and computational biology.
- T.R. McDermott (affiliate); soil microbiology focusing on plant-microbe interactions, biological transformations in soils, microbial diversity in extreme thermal soil.
- D.M. Ward (affiliate); microbial ecology, evolution & diversity, bioremediation.
- M. Young (affiliate); spherical virus assembly & disassembly, viral protein cages, unusual archaeal viruses from extreme thermal environments.

Associate Professors
- M.J. Franklin; molecular genetics, biofilms, microbial exopolymer production, physiology of sessile bacteria, alginate biosynthesis.
Instructors
• H.M. Miettinen (research); signal transduction in leukocytes, inflammation, cell adhesion and migration, function of inflammatory receptors.
• B. Peyton (affiliate); extremophilic bioprocessing, in situ biocatalyzed heavy metal biotransformations.
• B.H. Pyle (research); environmental microbiology, biofilms, microbial ecology, gravitation microbiology, water microbiology.
• J.R. Starkey (research); biology of cancer metastasis, cell mobility, angiogenesis & tissue invasion, structure based design of anti-metastatic drugs.

Assistant Professors
• J.B. Burritt; protein topological analysis, phage display methods, neutrophil-mediated inflammation.
• M. Djakic; ribosome synthesis in budding yeast, protein evolution and 3D modeling of proteins, structural polymorphism of DNA, comparative genomics.
• M. Fields; anaerobic microbiology, physiology, ecology, bioremediation, environmental genomics.
• R. Gerlach (affiliate); biofilm processes and bioremediation in contaminated soils and water.
• T. Goins (research); ecology of Mycobacterium spp., gravitational microbiology.
• B.L. Granger (research); DNA vaccines, intracellular membrane traffic, cytoskeleton, host-parasite interactions.
• S. Halonen; intracellular protozoan parasites, immunobiology of Toxoplasma gondii in the central nervous system, cell biology of intracellular parasites.
• G. James (research); medical biofilms.
• J.S. Mills (research); G protein coupled receptors, enzymology, protein chemistry.
• R. Taylor (research); cloning and recombinant expression of monoclonal antibodies, neutrophil cell biology.

Emeritus Professors
• K.E. Cooksey (research); cellular adhesion, marine & freshwater microbial ecology, industrial microbiology, biofilms.
• G.A. McFeters; microbial physiology & environmental microbiology of aquatic ecosystems, indicator bacteria, biofilms.

Degrees Offered
• M.S. in Microbiology
• Ph.D. in Microbiology

Interdisciplinary programs with strong ties to other departments and programs are encouraged. Students interested in environmental sciences can satisfy the requirements for a degree in microbiology while pursuing a broadly based program in areas such as biology, chemistry, entomology, plant, soil and environmental science, and plant pathology, and through interaction with the Center for Biofilm Engineering.

Financial Assistance
Students of high scholastic caliber are encouraged to contact the Department of Microbiology for information about teaching and research assistantships, and fellowships. Most of our graduate students are supported financially throughout their graduate training. Both assistantships and fellowships are awarded for one-year periods but are renewable if the graduate student's progress has been satisfactory. See the Graduate Assistantship sections for detailed information on appointment criteria.

DEPARTMENT OF
CELL BIOLOGY AND
NEUROSCIENCE

513 Leon Johnson Hall
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406-994-5120

Department Head
Thomas Hughes, Ph.D.

Graduate Coordinator
Charles Gray, Ph.D.

Professors
• Charles Gray; neurophysiology of visual perception and cognition.
• Gwen Jacobs; systems neuroscience, informatics and information technology.
• Frances Lefcort; molecular and cellular neural development.
• John Miller; neurophysiology.
Associate Professors
• Roger Bradley; developmental neuroscience.
• Steve Eiger
• Thomas Hughes; biophysics.
• Linda Hyman; yeast genetics, cell biology, biochemistry.

Assistant Professors
• Alexander Dimitrov; theoretical and computational neuroscience.
• Christa Merzdorf; developmental neurobiology.
• Anneke Metz; science pedagogy.

Research Professors
• Sheila Nielsen-Preiss (Associate); molecular microbiology.

Emeritus Professors
• Dwight Phillips (Professor); developmental neuropathology.

Degrees Offered
• M.S. (plan-A and plan-B) in Neuroscience or Biological Sciences
• Ph.D. in Neuroscience or Biological Sciences

The department offers graduate study and research leading to both the Master of Science (M.S.) degree and the Doctor of Philosophy (Ph.D.) degree in either Neuroscience or Biological Sciences. Ph.D. applicants are encouraged to contact faculty in their anticipated research area before applying. The departmental website provides links to detailed descriptions of the degree programs.

Admission

Ph.D. and M.S. Degree Programs
A Bachelor’s degree in an area of Biology, Chemistry, Physics, Applied Math or Psychology is recommended. Students with Bachelor’s degrees outside these areas are also encouraged to apply; such students will generally be required to complete appropriate courses while enrolled at MSU to make up subject matter deficiencies prior to full acceptance into the Ph.D. and Masters programs. Factors that the department uses in its admissions process include GRE scores, TOEFL scores (for non-native English speakers), reference letters, GPA and previous coursework and research experience.

The department of Cell Biology and Neuroscience also participates in the Molecular Biosciences Program at MSU (http://mbprogram.montana.edu/index.asp). This is an interdisciplinary graduate training program that includes faculty from a wide range of departments specializing in aspects of biology on the MSU campus.

For more information, and details about applying, please refer to http://www.montana.edu/wwwdg/ or http://www.montana.edu/cbn/Graduate_Program.html. The department encourages applicants to use the online application procedure.

Program Requirements

M.S. Degree
Students may pursue the Master’s degree under either Plan A or Plan B. Plan A requires the completion of 20 credits of acceptable coursework and 10 credits of thesis. Under Plan B, a 4 credit project and 26 credits of acceptable coursework must be completed. For more information, please refer to http://www.montana.edu/cbn/Graduate_Program.html.

Master’s candidates must take an oral comprehensive exam near the completion of their graduate program. Required curriculum will be tailored to the needs and interests of each student in consultation with their graduate advisor and advisory committee.

Ph.D. Degree
A Ph.D. student must complete a minimum of 35 dissertation credits and a minimum of either 25 credits of coursework beyond the Bachelor’s degree or 10 credits of coursework beyond the Master’s degree. Accepted students will be assigned an advisory committee upon entering the program to assist them in tailoring a curriculum that best fits their educational needs, research interests, and career plans. The degree requirements for the Ph.D. in Neuroscience can be found at http://www.montana.edu/cbn/Graduate_Program.html.

Research Experience

Plan A (thesis option) Master’s degree students gain research experience through their thesis and are expected to submit the results of their thesis work to at least one journal or conference. Plan B (project option) Master’s degree students gain some research experience in the context of their project. Ph.D. students will gain research experience through their doctoral work, journal or conference submissions, and attending conferences.

Research Facilities
Graduate research will be performed primarily in the laboratory of the student’s thesis advisor. Additional facilities will be available from the department and in laboratories collaborating with the student’s advisor.

Cell Biology and Neuroscience is dually housed in the 5th floor of Leon Johnson Hall and in the Center for Computational Biology (http://cns.montana.edu/) located in the basement of Lewis Hall.

Financial Assistance
A number of research and teaching assistantships are available for qualified graduate students. These appointments are normally for half-time assignments (20 hours per week) during the academic year. Some appointments may also be available during the summer. Assistantships will only be offered to formally admitted graduate students. Fellowships are available through MBS program.
DEPARTMENT OF PHYSICS
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Location: EPS Building, Rm 264
physics@montana.edu

Department Head
Dr. William A. Hiscock

Professors
• W.R. Babbitt; laser and solid-state physics.
• J.L. Carlsten; laser physics.
• R.L. Cone; laser and solid-state physics.
• G.E. Francis; physics education.
• W.A. Hiscock; general relativity and gravitational waves.
• Y. Idzerda; magnetic nanostructures; spin electronics.
• B. Link; theoretical astrophysics.
• J. Neumeier; condensed matter; oxides.
• A. Rebane; laser physics.
• V.H. Schmidt (emeritus); solid-state physics.
• R.J. Smith; surface physics.
• S. Tsuruta; theoretical astrophysics.

Associate Professors
• J.P. Adams; astronomy and physics education.
• N. Cornish; general relativity and gravitational waves
• C. Kankelborg; solar physics; experimental space physics.
• D. Longcope; solar physics.
• G. Malovichko; defects in optical materials.

Assistant Professors
• J. Qiu; solar physics.

Research Professors
• L.W. Acton; solar physics.
• R. Avci; surface and biophysics.
• R.C. Canfield; solar physics.
• A. Craig; laser science and technology.
• R. Hellings; general relativity and gravitational waves.
• D. Klumpar; space science.

Research Assistant Professors
• M. Drobijev; laser physics.
• D.E. McKenzie; solar physics.
• D. Nandi; solar physics.

Adjunct Faculty
• C. Riedel; experimental nuclear physics.
• S. Willoughby; physics education.

Degrees Offered
• M.S. in Physics
• Ph.D. in Physics

Admission
Application Requirements: The closing date for Fall admission is June 1st of each year. New graduates are accepted for Fall term only. Applications received before January 31 will be acted upon and notification of admission given by March 15. Applications received after January 31 will be treated individually on a "space-available" basis. Assistantships and fellowships will normally be awarded by March 15th.

All applicants are required to take the Graduate Record Examination General (Aptitude) Test and Subject (Advanced) Test in Physics before submitting their applications.

Program Requirements

Master’s Degree
The Department of Physics grants the Master of Science Degree under two options: Plan-A (thesis required), and Plan-B (without thesis).

Plan-A Requirements: credits
Coursework: A minimum of 20 credits of acceptable course work is required, which shall include the following:
PHYS 500 – Teaching Seminar 1
PHYS 500 – Research Introduction Seminar 1
PHYS 501 – Advanced Classical Mechanics 3
PHYS 506 – Quantum Mechanics I 3
PHYS 519 – Electromagnetic Theory I 3
PHYS 555 – Statistical Mechanics 3
PHYS 566 – Mathematical Physics 3
XXX – Electives 6

Thesis: PHYS 590 – Master’s Thesis 10
Examinations:
A written comprehensive examination is required. A final oral examination is also required, covering the thesis and related areas.

Plan-B Requirements: credits
Coursework: A minimum of 30 credits of acceptable course work is required, which shall be distributed as follows:
PHYS 500 – Teaching Seminar 1
PHYS 500 – Research Introduction Seminar 1
PHYS 501 – Advanced Classical Mechanics 3
PHYS 506 – Quantum Mechanics I 3
PHYS 507 – Quantum Mechanics II 3
PHYS 519 – Electromagnetic Theory I 3
PHYS 555 – Statistical Mechanics 3
PHYS 566 – Mathematical Physics 3
XXX – Electives 10

Thesis Requirements: None
Examinations:
A written comprehensive examination is required.

Financial Assistance
Seifert Scholarships are available to qualified domestic graduate students. A number of graduate teaching and research assistantships also are available. The period of appointment for teaching assistantships is August 15 to May 15. See the Graduate Assistantships sections for detailed information on appointment criteria.

Research Groups
Our research facilities include a new building housing state-of-the-art laboratories and equipment. External collaborations bring national and international experts to the department and open opportunities for research to be conducted at other world-class laboratories around the globe. On-campus, interdisciplinary research programs include the departments of Chemistry and
Astrophysics, Relativity, and Cosmology

The ARC group studies extreme astrophysical phenomena such as black holes, the big bang, and neutron stars, and uses them to further our understanding of fundamental physics. The incredible conditions that occur in these astrophysical environments far exceed those attainable in any Earthbound laboratory. Our research involves many branches of physics, including general relativity, particle physics, fluid dynamics, magnetohydrodynamics and plasma physics. Current research in the ARC group focuses on two areas: gravitational wave astronomy and neutron star interiors. Other areas of study include determining the size and shape of the universe, investigating quantum effects in strong gravitational fields, and energy extraction from rotating black holes. Neutron stars are excellent laboratories for studying matter in extreme environments - a teaspoon of neutron star material has a mass of several hundred million tons. The ARC group studies the role of magnetic fields, superfluidity and crustal rigidity in neutron stars, and how these factors may be related to star quakes and spin glitches. Gravitational wave astronomy is an exciting new area of research that is poised to open a new window on the Universe. The ARC group is investigating how the space-based LISA gravitational wave detector and the ground based LIGO detectors can be used to study violent astrophysical events such as the collision of two black holes.

Biophysics:

The field of biophysics today comprises a wide variety of topics which do not have a single identifiable definition. The topics cover more than the mere application of physical principles to biological systems. Ultimately the field aims to understand life itself, which involves highly dynamic, organized, and collective processes that survive and thrive in highly fluctuating environments. In a sense biophysics is the field of exploration taking place at the boundaries of physics and biology. The Department of Physics has several faculty members with interests in biology, who collaborate with a number of other departments on campus including Biochemistry, Microbiology, Biology, Center for Biofilm Engineering, and Land Resources and Environmental Sciences. Interest in biophysics is growing rapidly in parallel with the growth in the number of undergraduate, graduate and postgraduate students with multidisciplinary backgrounds involving physics and biology. The three groups in the Department of Physics with strong interests in biophysics issues have access to a large number of facilities both in Physics and in the many traditional biology and bio-chemistry laboratories located on campus and to the expertise in these facilities.

Condensed Matter Physics:

The Department of Physics pursues an exceptionally broad spectrum of fundamental and applied research in condensed matter physics. The topics include defect characterization, ferroelectrics and piezoelectrics, fuel cells, interfacial growth, magnetism (bulk and thin film), nanotechnology, phase transitions, spintronics, superconductivity, structural studies using x-ray and neutron diffraction, and specimen synthesis including single-crystal and thin-film growth. State-of-the-art experimental facilities at MSU enable measurements to temperatures as low as 0.3 K. We are leaders in the measurement of thermal expansion, using a novel device developed at MSU that is capable of detecting sub-angstrom length changes of specimens to study phase transitions and critical phenomena with superb resolution. Our Ion Beam Laboratory conducts experiments on thin films and buried solid-solid interfaces to reveal fundamental properties and growth mechanics of importance for fuel cells and electronic devices. Ceramics for fuel cells are fabricated and tested for their electrical properties. The spectroscopy group investigates defects in advanced materials at the atomic level using a host of techniques such as EPR, ENDOR and optical spectroscopy, with the goal of engineering new properties for novel applications in photonics and information technology. The Center of Bio-Inspired Nanomaterials utilizes biological molecules as templates for the synthesis of nanoparticles with unusual physical properties; this interdisciplinary effort thrives on close collaboration among biologists, chemists, and physicists at MSU. Some experiments are also conducted at facilities such as the High Magnetic Field Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, and Pacific Northwest National Laboratory.

Physics Education Research:

The Physics and Astronomy Education Group endeavors to improve teaching and learning at all levels. Graduate Students pursue a Ph.D. in physics with a principal research focus on science education. Students whose primary research is in other areas may pursue a minor in science education. Members in this group have extensive expertise in: improving learning in large lecture courses; research driven curriculum development; WWW-based instructional strategies; K-12 teacher education and authentic student assessment strategies and project evaluation. Working in this group prepares students for continuing research in the growing number of physics education groups across the country, teaching at two and four year colleges and universities and for careers in educational material development.

Optics and Lasers:

Research in optics and lasers at MSU extends from exploring fundamental physics to development of optical instruments and photonic devices. Research areas include: developing and studying new types of optical materials, sensors, and lasers; using optical crystals as novel photonic processing devices; exploring the non-linear
response of molecules to laser pulses shorter than a trillionth of a second; and applying advanced laser and nonlinear optics technologies to remote sensing and medical applications. Collaborations with researchers in the Optical Technology Center, Spectrum Lab, and Bozeman’s growing optics industry provide enhanced research opportunities.

Spectrum Laboratory
The Spectrum Lab was established in 1999 to advance the opto-electronic technologies emerging from the research laboratories of Montana State University and foster their transition to Montana companies, while providing enhanced educational opportunities for our undergraduate and graduate students. Teams of research scientists and students in Spectrum Lab and from science and engineering departments across the campus collaborate on research including photonic signal processing, lidar, quantum computing, laser development and stabilization, and optical material engineering and characterization.

Solar Physics
The MSU solar physics group is engaged in undergraduate and graduate education, public outreach, and solar research, including observation, data analysis, theory, and instrument development. In both research and graduate education, we collaborate closely with the solar group at the Lockheed-Martin Solar and Astrophysics Laboratory, and the Solar & Stellar X-ray Group at the Harvard-Smithsonian Center for Astrophysics. We are actively involved in several international collaborations, including: analysis and operations of the X-ray Telescope for the Japan/US/UK Hinode mission; design calibrations and observations planning for the Atmospheric Imaging Assembly of NASA’s Solar Dynamics Observatory; construction of space experiments for flight on rockets and satellites, using the facilities of MSU’s Space Science and Engineering Laboratory; day-to-day operation and scientific utilization of the NASA Transition Region And Coronal Explorer (TRACE) mission; the Max Millennium program, a key element of NASA’s Ramaty High Energy Solar Spectroscopic Imager (RHESSI) mission; observational studies of solar magnetic fields, using the facilities of the National Solar Observatory and Mees Solar Observatory; scientific utilization and archiving of the results from the Japan/US/UK Yohkoh mission for studies of high-energy solar physics; theoretical and computational studies of solar magnetic fields; and the Yohkoh Public Outreach Project (YPOP), funded by NASA to create high quality public access to the Yohkoh/SXT data and other solar data via the Internet and educational products for the K-12 community.

SSEL
The Space Science and Engineering Laboratory at Montana State University is an interdisciplinary center of expertise with faculty, staff and facilities for space research and space technologies. The laboratory enables students and faculty in the science and engineering disciplines to conduct space science research through the development of space hardware instrumentation. SSEL was started under the auspices of the Physics Department at MSU in November, 2000. SSEL strengthens existing programs at MSU in solar-terrestrial physics, microelectronics, optical mechanisms, composite and ultra-light structures, bio-films and remote sensing.

MSGC
The Montana Space Grant Consortium establishes the goals and objectives established by the National Space Grant Program, working within a national network of colleges and universities to expand opportunities for Americans to understand and participate in NASA’s aeronautics and space programs by supporting and enhancing science, and engineering education, research, and outreach programs. To achieve these goals, the Montana Space Grant Consortium awards fellowships and scholarships to students pursuing aeronautical or space related studies and also awards stipends to students pursuing space-related research at all member campuses.

DEPARTMENT OF PSYCHOLOGY
Montana State University
Graduate Admissions Committee
PO Box175440
Bozeman, MT 59717-3440
Tel: (406) 994-3801
http://www.montana.edu/wwwpy/msprogram.htm

Department Head
Prof. Richard A. Block, Ph.D.

Professors
- R.A. Block; cognitive psychology: memory and attention, temporal information processing, meta-analysis.
- W.C. Lynch; eating disorders, motivation, learning, behavior modification, physiological psychology.
- A.M. Babcock; physiological psychology; cerebrovascular ischemia, neurobiology of learning and memory.

Assistant Professors
- K. A. Hutchison; cognitive psychology: attention, implicit and explicit memory, cognitive aging, psycholinguistics, cognitive neuropsychology.
- J. L. Smith; social psychology; self-regulation of motivation, gender studies, interpersonal and achievement goals, stereotype threat.
- L. M. Handley; social psychology; social cognition, attitudes and persuasion, affect and decision-making.
- M. L. Meade; cognitive psychology; memory, cognitive aging, collaborative memory, individual difference in performance

Degree Offered
- M.S. in Psychology (with an emphasis on psychological science)

We offer a research-oriented Master of Science (M.S.) degree in Psychology. Through advanced coursework, thesis credits, research colloquia, and individual mentoring from faculty, this program is designed to train graduate students to conduct psychological research in the following areas: cognitive psychology, social psychology, learning, health psychology, and physiological psychology. Our M.S. research program in psychological science prepares students for admission into a doctoral program or for employment in applied settings.
Admission

The Graduate Studies application process can be completed on-line at http://www.montana.edu/gradstudies. You must also submit information listed on the Psychology Department's Supplemental Application form. Please note, on this form there is an essay requirement. (Specific instructions for the essay are below.)

Essay requirement: In application materials, applicants must include a 1-2 page letter of intent/personal statement that summarizes your academic background in psychology or related field, career plans, research experience, research interests, and why you are applying to Montana State University's M.S. program in psychological science.

Please be aware that the Psychology Department requires that applicants submit Graduate Record Exam scores (General test, which yields a Verbal and Quantitative score). The GRE Psychology Subject Test is not required, but recommended. Please arrange to have scores sent directly to us. All successful candidates must demonstrate knowledge of the fundamentals of psychology, as well as undergraduate-level training in statistics and research methods. The closing date for receipt of completed applications is February 1. For detailed Division of Graduate Education admission requirements, review the Admission Policies and Application Requirements sections. Successful applicants must have their applications accepted by the Division of Graduate Education (with departmental endorsement) before an individual is considered a graduate student at MSU. Three letters of references are required.

Program Requirements

The Master of Science program requires a minimum of 31 credit hours of graduate level coursework. The required coursework is designed to provide students with a general overview of specific content areas, as well as with research methods and statistics in psychology. Courses we typically require include:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PSY 500</td>
<td>Advanced Research Design &amp; Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PSY 599</td>
<td>Physiological Processes</td>
<td>3</td>
</tr>
<tr>
<td>PSY 541</td>
<td>Cognitive Processes</td>
<td>3</td>
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<td>PSY 542</td>
<td>Learning</td>
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<tr>
<td>PSY 543</td>
<td>Memory</td>
<td>3</td>
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<tr>
<td>PSY 544</td>
<td>Social Psychology</td>
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<tr>
<td>PSY 546</td>
<td>Social Cognition</td>
<td>3</td>
</tr>
<tr>
<td>PSY 550</td>
<td>Master's Thesis</td>
<td>10-15</td>
</tr>
</tbody>
</table>

Financial Assistance

Teaching Assistantships or Research Assistantships, which are awarded on a competitive basis, are usually available to formally admitted graduate students during their two years of study. See the Graduate Assistantships sections for detailed information on appointment criteria. Assistantships are requested by the student's home department.

COLLEGE OF NURSING

Elizabeth Nichols, Dean
A. Gretchen McNeely, Associate Dean
Donna A. Williams, Associate Dean

PO Box 173560
Montana State University
Bozeman, MT 59717-3560
406-994-3500

www.montana.edu/nursing

Degree Offered

Master of Nursing (MN)

Graduate Program Options

- Family Nurse Practitioner (FNP)
- Clinical Nurse Leader (CNL)
- Clinical Nurse Specialist – Adult Health (CNS)

Professors

- Elizabeth Kinion
- Elizabeth Nichols
- Clarann Weinert

Associate Professors

- Rita Cheek
- Barbara Derwinski-Robinson
- Wade Hill
- A. Gretchen McNeely
- Jean Shreffler-Grant
- Christina Sieloff
- Donna Williams
- Charlene Winters
- Karen Zulkowski

Assistant Professors

- Yoshiko Colclough
- Patricia Holkup
- Sandra Kunz
- Susan Luparell
- Maryann Prawdzienski
- Clementine Rice
- Carolyn Wenger

Adjunct Faculty

- Deanna Babb
- Ronda Bales
- Glenna Burg
- Carolyn Caton
- Carolyn Collis
- Rebecca Echeverri
- Laurie Glover
- Steven Glow
- Janice Hausauer
- Helen J. Hendricks
- Teresa Henry
- C. Janine Hester
- Brett Holis
- Laurie Jackson
- Sharon H. Jones
- Laura Larsson
- Elisabeth Lincoln
- Sheila Matye
- Dorothy Mayer
- Carol Moore
- JoAnn Paterson
- Debbie Peterson
- Barbara Prescott
- Julie Pullen
- Susan Raph
- Rachel Rockafellow
- Laura Rodriguez
- June Sargent
- Jane Scharff
- Carolyn Schmidt
- Linda Torma
- Teresa Wicks
- Maria Wines

The College of Nursing’s Master of Nursing (MN) degree program focuses on assessment and management of health needs and delivery of health care services in sparsely populated areas. The program strives to serve the unique health care needs of rural dwellers. It is fully accredited by the Commission on Collegiate Nursing Education (CCNE). Options include Family Nurse Practitioner, Clinical Nurse Leader, and Clinical Nurse Specialist – Adult Health.

The College provides the educational preparation for many exciting opportunities to practice in rural and
Admission

For admission, a student must be a graduate of a nationally accredited, upper division baccalaureate program in nursing which included supervised clinical practice in a variety of nursing settings, including community health and management. Current unencumbered licensure as a registered nurse is required in the state where clinical educational experiences will occur. Students are expected to have completed undergraduate nursing courses in health assessment, research and statistics (including inferential statistics) before admission.

Undergraduate cumulative grade point average, three letters of reference from professional colleagues who have current knowledge of the applicant’s professional and academic abilities, a faculty interview, and a writing sample are used to evaluate applicants for admission. Proficiency in computer skills, including e-mail and Internet access, is required for those admitted to the program. A TOEFL score of 580 or the computer equivalent is required of international applicants.

Applicants must be admitted formally to the Division of Graduate Education. See the Admission Policies and Application Requirements sections for more information.

Program Requirements

Students select one of the MN degree program specialty options (FNP, CNL, or CNS). Each student completes courses in research, advanced health assessment, pathophysiology, pharmacotherapeutics, and finance and budgeting of health care systems. Remaining courses are determined by specialty option. The graduate student’s experience culminates in a master’s thesis or professional project.

Graduate program options are available on a full- or part-time basis. Students may access graduate nursing courses through any of the College’s four campus sites located in Billings, Bozeman, Great Falls or Missoula. All graduate courses are offered via audio teleconference, interactive video or online. Clinical supervision is provided to students by faculty on each campus site. Travel to Bozeman is required for orientation and face-to-face coursework at the beginning of fall semester.

Non-Degree Options

- **Certificate in Nursing Education** - open to all graduate nursing students and to nurses with at least a BSN.
- **Post-Master’s Family Nurse Practitioner Certificate** - designed for registered nurses who already hold a master’s degree in nursing and desire to practice as an advanced practice nurse (APRN).
- **Post-Master’s Clinical Nurse Specialist Certificate** - designed for registered nurses who already hold a master’s degree in nursing and desire preparation as an APRN.

Financial Assistance

Limited financial assistance is available to full-time, degree seeking graduate nursing students. Federal Advanced Education Nursing Traineeship awards, which help defray tuition costs, may be available to full-time students who are U.S. citizens. Nurse Faculty Loan Program funds also may be available to full-time students interested in teaching. For the Loan Program students must complete requirements for the Certificate in Nursing Education along with their specialty option. Teaching or research assistantships are awarded on a competitive basis and may be available to graduate students (see the Graduate Assistantships section of the Graduate for appointment criteria).

Further Information

For further information contact:
Ms. Lynn Taylor, Graduate Program Assistant, College of Nursing, 122 Sherrick Hall, (406) 994-3500, e-mail: lynn@montana.edu

Extended University

Extended University works closely with campus colleges, departments and Montana's K-12 and business communities to nurture and grow face-to-face, online and hybrid learning opportunities for enrolled MSU students and working professionals.

EU works closely with the Division of Graduate Education and MSU's colleges to offer graduate-level credit courses, certifications, degrees and renewal units. EU also collaborates with other four-year institutions to provide interdisciplinary graduate programs.

Extended University's NTEN (National Teachers Enhancement Network) is one of the country's most-established online programs for science teachers, having offered online graduate courses since 1993. (www.scienceteacher.org)

Graduate Program Available

- Master of Science in Health and Human Development-Family Financial Planning

FAMILY AND FINANCIAL PLANNING

College of Education, Health and Human Development
250 Reid Hall
Bozeman, MT 59717-2940
(406)994-6752
lbaker@montana.edu

Dean
Larry J. Baker

Degree Offered
Masters Degree

The Family Financial Planning master's degree is a 42-credit distance degree program that is offered through a consortium of eight mid-western and western land grant universities. The program is registered with the CERTIFIED FINANCIAL PLANNER® Board of Standards and meets the education criteria for individuals who wish to fulfill the education component for obtaining CFP® certification. Students may also take the six core courses to
fulfill this CFP® education require-
ment, rather than the full master’s
program. As a participating university
in this consortium, Montana State
University offers two of the twelve
required courses, in addition to the
three-credit practicum experience and
three-credit professional paper. The
program is designed to be a part-time
program for fully or partially employed
students. Students apply at their home
institution and take approximately two
to three 3-credit courses via distance
delivery from each of the participating
universities, at a uniform tuition rate
determined by the consortium. More
information is available at http://
www.montana.edu/montanagpidea/faq.htm.

Program Requirements:
(subject to change - check with program contact)

HDFP 510 - Fundamentals of
Financial Planning .................................. Fall 3
HDFP 505 - Financial Counseling ................. Spring 3
HDFP 545 - Family Economics ..................... Summer 3
HDFP 505 - Family Systems ......................... Fall 3
HDFP 515 - Insurance Planning
for Families ............................................. Spring 3
HDFP 550 - Housing/Real Estate .................. Summer 3
HDFP 540 - Personal Income Taxation .......... Fall 3
HDFP 550 - Estate Planning
for Families ............................................. Spring 3
HDFP 550 - Professional Practices in
Family Financial Planning ......................... Spring 3
HDFP 525 - Retirement Planning, Employee
Benefits and the Family ......................... Summer 3
HDFP 576 - Professional Practicum
... Spring (offered also in Fall and Summer) 3
HDFP 572 - Financial Planning
Case Studies ........................................... Fall 3
HDFP 575 - Professional Paper
... Spring (offered also in Fall and Summer) 3

Financial Assistance
Currently, financial aid is not avail-
able for courses taken outside the MSU
Extended University program, but work
is underway for solving this problem.

INTERDISCIPLINARY
AND OTHER
PROGRAMS

Graduate Programs Available:
• IGERT: Geobiological Systems
• Master of Science in Ecological and
  Environmental Statistics
• Master of Science in Environmental
  Engineering
• Master of Science in Science
  Education
• Molecular Biosciences Program
• Doctor of Philosophy in Ecology and
  Environmental Sciences
• WWAMI Medical Education Program

NSF-IGERT: Ph.D. Traineeships in
Geobiological Systems

The interdisciplinary IGERT pro-
gram in Geobiological Systems Science
involves over 25 faculty at MSU in 7 dif-
f erent departments and 3 colleges, as
well as additional national and interna-
tional collaborators. Consequently, the
following individuals can serve as initial
contacts for questions, advice and addi-
tional information.
• Dr. Bill Inskoep
  IGERT Director, Thermal Biology
  Institute and Department of Land
  Resources and Environmental
  Sciences
  Research Interests: Geomicrobiology,
  environmental genomics
  binskeepemontana.edu
• Dr. Anne Camper
  Associate Dean, College of Engineer-
  ing Center for Biofilm Engineering
  Research Interests: Waste-water treat-
  ment, biofilms
  anne_c@erc.montana.edu
• Dr. John Peters
  Director, Thermal Biology Institute
  Department of Chemistry and Bio-
  chemistry
  Research Interests: Enzyme struc-
  ture-function
  john.peters@chemistry.montana.edu
• Dr. Brent Peyton
  Associate Director, Thermal Biology
  Institute Center for Biofilm Engineering
  Department of Chemical and Bio-
  logical Engineering
  Research Interests: Bioremediation,
  bioenergy
  bpeyton@erc.montana.edu
• Dr. John Priscu
  Cold Regions Research
  Department of Land Resources and
  Environmental Sciences
  Research Interests: Polar
  microbiology
• Dr. Mark Skidmore
  Cold Regions Research, Department
  of Earth Sciences
  Research Interests: Geomicrobiology,
  ice habitats
  skidmore@montana.edu
• Dr. Phil Stewart
  Director, Center for Biofilm
  Engineering
  Research Interests: Biofilms
  phil_s@erc.montana.edu
• Dr. Mark Young
  Director, NSF EPSCoR Program
  Research Interests: Virology,
  Nanomaterials
  myoung@montana.edu

Program Description
The mission of the Integrative
Graduate Education and Research
Training (IGERT) program in
Geobiological Systems Science is
focused on the geomicrobiology of
complex microbiological systems, and
brings together expertise in hydrody-
namics, geochemistry, microbial eco-
logy, biochemistry and genomics. The
primary goal of this Ph.D. program is
to train students to use consistent and
coherent interdisciplinary approaches
in the study of microbial communities,
and that lead to a more comprehen-
sive understanding of the important
interface between the biosphere and
gosphere. This novel Ph.D. train-
ing program encompasses research
scientists focused on the microbiology
of extreme thermal, psychrophic, or
industrial biofilm communities.

Research And Training
The IGERT program in
Geobiological Systems is both inter-
and multi-disciplinary and involves
faculty and Ph.D. students from the
Colleges of Agriculture, Engineering,
and Letters and Science. The primary
research areas supported by and inte-
grated within the IGERT program
include the geomicrobiology of ther-
mal, psychrophic or anthropogenic
systems. Graduates from this IGERT
program will be well-prepared to
address the complexity of microbial
processes in any system, while maintaining significant disciplinary depth. The broader impacts of this graduate training program are extensive, and include partnerships with existing centers of excellence in Thermal Biology, Cold Regions Research, and Biofilm Engineering. Outreach is an integral part of the educational experience and graduate students in this program will participate and assist with important outreach activities including a formal K-12 science teacher course, scientific workshops, industrial partner programs, training for Yellowstone National Park (YNP) interpretive staff, field trips for K-12 students, educational exhibits at the Museum of the Rockies and the Old Faithful Visitor Museum, mentoring Native American high school and undergraduate students, and development of digital libraries and web content in collaboration with the YNP Research Coordination Network. These broader impacts are synergistic in supporting the diverse educational goals of an IGERT program, and in further developing literacy in the geobiological sciences.

Admission Requirements

Interested students must be admitted to the College of Graduate Studies at Montana State University and one of several potential participating academic departments. Current participating departments include: Chemistry and Biochemistry, Chemical and Biological Engineering, Civil Engineering, Earth Sciences, Land Resources and Environmental Sciences, Mechanical Engineering, and Microbiology. Application to the IGERT program is a separate process (see below), but is contingent on successful admission to the College of Graduate Studies. For application to the IGERT program, students will be asked to write a one-page description of their scientific interests and long-term goals and how these relate to the goals of the IGERT program (interested applicants must refer to the full description of application processes, see below). The IGERT traineeship awards are limited to U.S. citizens; however, international students may also consider applying to the program as IGERT Student Associates.

Complete applications and supporting materials should be received by February 15 for applicants to be considered for admission to graduate study beginning the following summer. Applicants will be generally notified of a formal decision form the College of Graduate Studies by April 15.

It is strongly recommended that you contact (either by letter or email) faculty at MSU directly and indicate your interest in the IGERT program. Additional IGERT program descriptions (pdf file: IGERT Program Overview) are available on the Thermal Biology Institute and Center for Biofilm Engineering web sites (www.tbi.montana.edu and www.erc.montana.edu).

Application Procedures

Interested students must send (i) a curriculum vita, and (ii) a one page document (12 pt font, 1 inch margins) containing the following information: name, status at MSU (applied versus enrolled; if already enrolled, provide home department, current advisor), prior degrees and universities attended, and a detailed description of why the student would like to participate in this IGERT program. For example, this should include coverage of research and disciplinary interests, rationale for choosing to pursue to a Ph.D. program, short and long-term academic goals, and a discussion of opportunities available within the IGERT program that are consistent with student career goals. If not already submitted to the College of Graduate Studies at MSU as part of admission requirements, the IGERT program will need full copies of academic transcripts, GRE scores and three letters of reference. Send application materials (as pdf files) to Dr. Bill Inskeep, IGERT Director (binskeep@montana.edu). Receipt of application will be acknowledged, and decisions regarding fellowship applications made as soon as possible.

Traineeship Awards

Students applying to the IGERT program may receive a traineeship award for approximately 2.5 years, after which research support must be provided by a faculty member or other source. The traineeship awards are $30,000 per year including a cost of education allowance of $10,500 per year to offset any tuition, fees, and or other related educational expenses.

ECOLOGICAL AND ENVIRONMENTAL STATISTICS

The Ecological and Environmental Statistics Program will train students to understand and critically apply modern statistical principles to the solution of problems in ecological and environmental science. We feel that to do this successfully the student must develop an understanding of both statistics and the underlying science.

Mission

The purpose of the masters program in Ecological and Environmental Statistics is to foster interdisciplinary cross-training at MSU, by promoting the statistical training of ecological and environmental scientists and the scientific training of statisticians. Ecology and other biological and environmental science disciplines have become increasingly quantitative, and graduate students in these disciplines now require extensive training in sophisticated statistical methodology. The old criterion of one introductory statistics course followed by an additional course in linear modeling is no longer adequate. Such quantitative and interdisciplinary skills are needed so that ecological and environmental scientists are equipped to facilitate communication between science and society, between scientists and the general public and between scientists and those who make policy based on scientific knowledge. MSU’s location provides a unique opportunity to take advantage of and address these needs. The Greater Yellowstone Ecosystem is recognized by scientists around the world as an outstanding natural laboratory for ecology and environmental science.

MS Program - Ecological and Environmental Statistics

A student’s graduate committee would be composed of a minimum of two members from Mathematical Sciences, and one member representing the collaborating department.
Students would need to pass two comprehensive exams, one in statistics and one in the participating field.

Requirements
1. Minimum of 30 postbaccalaureate units as stated in the Graduate Catalog.
2. No more than 9 units duplicated in other MSU degrees (see Graduate Catalog).
3. Minimum of 21 units in statistics (400 level or higher) or other approved quantitative courses. Unless equivalent previously taken, these must include:
   a. STAT 410 - Data Analysis I
   b. STAT 412 - Data Analysis II
   c. STAT 420 - Probability
   d. STAT 424 - Mathematical Statistics
   e. STAT 446 - Sampling
   f. Two graduate courses in statistics
   g. Two graduate courses in ecology/environmental science
   h. Committee may require additional coursework depending on background
4. Minimum 20 graduate level credits (note that unless some of the required undergraduate statistics courses have been previously taken this implies more than 30 credits will be needed).
5. Comprehensive exam in Statistics:
   a. A four hour written exam covering the required courses listed above and two elective courses selected by the student and approved by the student's committee.
   b. The exam will be graded as pass or fail. Examinees will be informed of the results within three working days of taking the exam. The exam may be repeated once in which case, the student's committee will indicate which topics are to be repeated.
6. Demonstration of the following:
   a. Technical knowledge of participating substantive field.
      Requirements to be determined by collaborating department.
      Requirements may include:
      i. Comprehensive exam
      ii. Course work
      iii. Undergraduate degree.
   b. Competence in scientific writing, satisfied by:
      i. A graduate course in scientific writing and a professional paper.
      
Potential statsitics and approved quantitative courses:
- STAT 410 - Data Analysis I
- STAT 412 - Data Analysis II
- STAT 420 - Probability
- STAT 424C - Mathematical Statistics
- STAT 431 - Nonparametric And Resampling Methods
- STAT 436/536 - Time Series Analysis
- STAT 437 - Introduction To Applied Multivariate Analysis
- STAT 438 - Statistical Computing And Graphical Analysis
- STAT 499 - Introduction To Categorical Data Analysis
- STAT 446 - Sampling
- STAT 500 - Seminar
- STAT 505 - Linear Models
- STAT 506 - Advanced Regression Analysis
- STAT 510 - Statistical Consulting Seminar
- STAT 520 - Topics In Applied Statistics
- STAT 522 - Stochastic Processes
- STAT 524 - Biostatistics
- STAT 526 - Experimental Design
- STAT 554 - Spatial Data Analysis
- STAT 537 - Multivariate Analysis I
- STAT 539 - Generalized Linear Models
- BIOL 508 - Scientific Writing
- Or research thesis in statistical ecology
- Or a research paper suitable for publication (with approval).
- Or research thesis of collateral degree.
- Scientific presentation satisfied by:
  i. Presentation at a scientific meeting.
  ii. Or a seminar course requiring presentation.
- Research satisfied by:
  i. Research thesis in statistical ecology.
  ii. Or research thesis of collateral degree.
  iii. Or a research paper suitable for publication (with approval).
- Philosophy of science, one course such as:
  i. PHIL 378 - Philosophy Of Science
  ii. BIOL 525 - Research Methods And The Scientific Process
  iii. HIST 506 - Topics In History Of Science And Technology
- STAT 570 - Individual Problems
- STAT 575 - Research Or Professional Paper/Project
- STAT 580 - Special Topics
- BIOL 504 - Quantitative Biology
- BIOL 505 - Environmental Analysis
- BIOL 509 - Introduction To Practical Modeling
- BIOL 518 - Parameter Estimation For Ecological Models
- BIOL 540 - The Analysis Of Ecological Communities
- F&W 502 - Analysis Of Population & Habitat Data
- LRES 426 - Remote Sensing and Digital Imaging Processing
- LRES 535 - Techniques Of Spatial Analysis
- LRES 545 - Watershed Analysis
- GEOG 411 - Advanced GIS And Spatial Analysis
- GEOG 501 - GIS And Environmental Modeling

Competency in Ecology
Competency in ecology can be demonstrated either by the completion of a collateral graduate degree in ecology (M.S. or Ph.D.) or by completion of at least four graduate courses in ecology and a comprehensive exam. Ecology would require a course from each of four categories:
- philosophy and process of science
- population level ecology
- ecology at higher levels of organization such as community, ecosystem, or landscape scales
- evolutionary ecology

Competency in Environmental Science
Competency in environmental science can be demonstrated either by the completion of a collateral graduate degree in Land Resources and Environmental Sciences (M.S. or Ph.D.) or Land Rehabilitation (M.S.); or by completion of a comprehensive exam and at least four graduate courses (12 credits) in environmental sciences from the following list:
- LRES advisor approved, graded, graduate-level LRES courses, not including 500 or courses numbered ≥ 570 other than 580 (special topics)
- up to 6 credits of LRES advisor approved, graded, graduate-level MSU environmental science coursework may be substituted for LRES courses.
Collaborating Departments and Faculty

Mathematical Sciences
2-214 Wilson

Participating Faculty
- Robert Boik
- John Borkowski
- Steve Cherry
- Mark Greenwood
- Megan Higgins
- Kathryn Irvine
- Jim Robison-Cox

Ecology
310 Lewis

Participating Faculty
- Scott Greel
- Daniel Goodman
- Steven Kalinowski
- David Roberts
- Jay Rotella
- Mark Taper

Land Resources and Environmental Sciences
334 Leon Johnson

Participating Faculty
- Rick L. Lawrence
- Lucy Marshall
- Bruce Maxwell
- Lisa Rew
- Catherine Zabinski

ENVIRONMENTAL ENGINEERING

Contact Civil or Chemical and Biological Engineering Departments
http://www.chbe.montana.edu or http://www.coe.montana.edu/ce/
che_b@coe.montana.edu or cedept@coe.montana.edu

Participating Faculty

Civil Engineering
- J. E. Cahoon; hydraulics, river engineering, soil physics, porous media and overland flow.
- A. K. Camper; water treatment and distribution.
- A.B. Cunningham; groundwater contamination.
- W.L. Jones; biological treatment process, hazardous waste.

- Z. Lewandowski; water/wastewater treatment, instrumentation.
- O.R. Stein; water quality management, hydraulics, erosion and sedimentation.

Chemical and Biological Engineering
- R.P. Carlson; biochemical engr., systems biology, metabolic engr., biofilm physiology and control
- B.M. Peyton; extremophile bioprocessing, biofilms, bioremediation
- R. Gerlach; biofilm barriers, bioremediation, bacterial transport in porous media, extremophilic biofilms, biofuels
- D.L. Shaffer; hazardous waste.
- P.S. Stewart; biofilm process engineering.
- B. Tyler; biomaterials.
- J. Duffy; water chemistry, remediation of hazardous waste.
- J.T. Sears; biofilms, remediation.

Degree Offered
M.S. in Environmental Engineering

The Environmental Engineering program is an integrated effort of the Departments of Civil and Chemical and Biological Engineering. The vision of the program is to educate students who will develop solutions to environmental and industrial needs for physical/chemical/biological treatment, environmental restoration, and waste management using a cross-disciplinary approach.

The degree of Master of Science in Environmental Engineering is awarded through either the Civil or Chemical and Biological Engineering departments, depending on the student's background, academic program and research work. Areas of specialty within the program include water quality management, design of water and waste water facilities, and chemical/microbial process analysis and design. Environmental Engineering is also one of the options for the Doctor of Philosophy in Engineering.

Admission

Students entering the Environmental Engineering program must meet the admission requirements for either Civil or Chemical and Biological Engineering. Generally, students with undergraduate degrees in Civil or Chemical and Biological Engineering will apply to the department of their undergraduate discipline. Students with degrees in disciplines other than engineering may be admitted to the program through either department, but may be required to complete remedial coursework. Successful applicants are accepted into both the department and Division of Graduate Education. For further information, refer to the Admission Policies and Application Requirements sections.

Program Requirements

Candidates for the M.S. degree in Environmental Engineering must meet the degree requirements of either Civil or Chemical and Biological Engineering, depending on the focus of the student's program, as well as the requirements of the Division of Graduate Education.

The coursework carrying the Environmental Engineering rubric (ENVE) is listed in the Course Description section of this Bulletin. Additional courses in Civil Engineering, Chemical and Biological Engineering, Chemistry, Microbiology, Biology, and other disciplines may form part of the student's academic program.

Curriculum requirements for the M.S. degree in Environmental Engineering in the Civil Engineering Department are highly individualized and established in consultation with and approved by the student's graduate committee.

Master of Science in Environmental Engineering degree requirements through the Chemical and Biological Engineering Department are:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHBE 500</td>
<td>Graduate Seminar</td>
<td>1</td>
</tr>
<tr>
<td>CHBE 503</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 530</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 560</td>
<td>Environmental Engr Processes</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 561</td>
<td>Environmental Engr Reactor Theory</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 510</td>
<td>Reaction Engineering &amp; Reaction Modeling</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 562</td>
<td>Water Treatment Theory Processes &amp; Design</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 590</td>
<td>Masters Thesis credits</td>
<td>5*</td>
</tr>
</tbody>
</table>

Students may be required to complete remedial coursework.
Investigations

Additionul Recommended Courses:
CE 599 – Groundwater Contamination .......... 3
ENVE 534 – Environmental Engineering Investigations .......................................... 3

Research
Research is considered a vital part of the Environmental Engineering program. Many of the students do their research work through the Center for Biofilm Engineering, although avenues through Civil or Chemical and Biological Engineering are also available. Research is used as the basis for a thesis or professional paper, one of which is required for graduation.

Current research within the program focuses on both the fundamentals and application of chemical and biological processes relating to water quality management, water and wastewater treatment processes, the remediation of contaminated soils, and groundwater and biofilm processes of industrial relevance.

Financial Assistance
A number of teaching and research assistantships are available in both the Civil and Chemical and Biological Engineering Departments. Additionally, research assistantships are available in the Center for Biofilm Engineering. Students should apply directly to the appropriate department and/or to the Center for Biofilm Engineering for financial assistance. See the Graduate Assistantships sections for more information.

MASTER OF SCIENCE
IN SCIENCE EDUCATION

Montana State University
403 Linfield Hall
Bozeman, Montana 59717

Tel: (406) 994-5679
www.montana.edu/msse

Participating Faculty

Biology
• J. Bradshaw; ecology/biology
• J. Johnson; land use issues
• B. Kerans; freshwater ecosystems

• T. McMahon; aquatic ecology
• J. Rotella; ecology
• T. Weaver, III; ecology
• D. Willey; ecology

Chemistry & Biochemistry
• J. Amend; inorganic chemistry, chemistry education
• C. Bahn; inorganic chemistry
• S. Holmgren; chemistry education
• A. Sower; biochemistry

Earth Science
• S. Caster; geology, hydrology
• F. Jackson; dinosaur paleontology
• D. Lageson; structural geology and tectonics
• J. Schmitt; geology, relationships between tectonics & sedimentation

Education
• E. Brunssell, science education
• J. Graves, science education
• J. Reuter, science education
• E. Swanson; science education
• W. Woolbaugh, science education

Electrical Engineering
• T. Kaiser; micro electro mechanical systems

Health and Human Development
• M. Stein, nutrition
• P. Steinmuller, nutrition

Land Resources
and Environmental Sciences
• J. Bauder; soil science and water resources.
• B. Inskemp; soil and environmental science, Thermal Biology Institute
• S. Kelly; Thermal Biology Institute

Mathematics
• M. Burke; math education
• K. Jacobs; math education
• J. Luebeck; math education

Microbiology
• B. Pyle; environmental microbiology
• P. Glee; microbiology research
• E. Pulcini, biofilms research, microbial genetics

Physics
• Adams; physics education
• G. Francis; physics education

Plant Science
• R. Klein; medical botanist

Degree Offered
M.S. in Science Education

The Master of Science in Science Education (MSSE) program is an interdisciplinary, intercollege degree program designed by educators and scientists for middle and high school science teachers. MSSE is sponsored by the Colleges of Agriculture; Education; Health and Human Development; and Letters & Science and is coordinated by Intercollege Programs for Science Education.

Admission
Entrance requirements include:
a bachelor’s degree in an area of science or in science education; and an undergraduate GPA of 3.0 or higher.

Program Requirements
The program of study may begin with distance learning courses in any semester or summer classes at the MSU-Bozeman campus. Study continues with distance learning courses that students take from their homes or workplaces, and ends with a second campus visit for presentation of the results of a personalized science education capstone project. Over 80% of the courses and credits may be taken off-campus by asynchronous, computer-mediated communication. Thirty semester credits are required for the degree. Students typically will complete the degree in two or three years.

All students seeking the MSSE degree complete core courses (12 credits) in education. For the remaining credits (18), students select interdisciplinary combinations of science content courses emphasizing topics in biology, chemistry, earth science, land resources and environmental science, microbiology, physics, and plant science. Interdisciplinary efforts and incorporation of both science content and pedagogy have been encouraged during the development of courses.

Required Core Courses credits
EDCI 504 – Evaluation and Measurement...................... 3
EDCI 505 – Foundation of Action Research .................. 3
EDCI 509 – Implementing Action Research .................. 3
EDCI 575 – Capstone Project and Presentation............ 3

(*Substitution for this course requirement may be approved by the committee after carefully considering the professional goals of the student.)

Additional Recommended Courses:
CE 599 – Groundwater Contamination .......... 3
ENVE 534 – Environmental Engineering Investigations .......................................... 3

Research
Research is considered a vital part of the Environmental Engineering program. Many of the students do their research work through the Center for Biofilm Engineering, although avenues through Civil or Chemical and Biological Engineering are also available. Research is used as the basis for a thesis or professional paper, one of which is required for graduation.

Current research within the program focuses on both the fundamentals and application of chemical and biological processes relating to water quality management, water and wastewater treatment processes, the remediation of contaminated soils, and groundwater and biofilm processes of industrial relevance.

Financial Assistance
A number of teaching and research assistantships are available in both the Civil and Chemical and Biological Engineering Departments. Additionally, research assistantships are available in the Center for Biofilm Engineering. Students should apply directly to the appropriate department and/or to the Center for Biofilm Engineering for financial assistance. See the Graduate Assistantships sections for more information.
Further information

For additional information and application forms, contact: 406-994-5679 (voice), dianap@montana.edu (e-mail), www.montana.edu/msse (web site), or write to Intercollege Programs for Science Education, 403 Linfield Hall, Montana State University-Bozeman, Bozeman, MT 59717-2805.

MOLECULAR BIOSCIENCES PROGRAM

960 Technology Blvd
Montana State University
Division of Graduate Education
P.O. Box 172580
Bozeman, MT 59717-2580
mbprogram@montana.edu
406-994-6652

Program Chair
Allen Harmsen

Program Director
Stephanie Cunningham

Program Description

The Molecular Biosciences Program offers an interdisciplinary program towards a Doctorate in Philosophy. You are able to pursue your science in a research area across departmental boundaries. Our integrated curriculum provides you with broad academic training necessary to excel in life science research. You will be able to participate in a first-year rotation in three different laboratories in your chosen research area.

Research Areas:
- Biofilm Sciences & Engineering
- BioInspired Materials
- Bioinformatics/Genomics/Proteomics
- Biomedical Sciences
- Biophysics
- Cell, Developmental, & Molecular Biology
- Chemical Biology
- Environmental Microbiology
- Immunology & Infectious Disease
- Life in Extreme Environments
- Plant Sciences
- Virology

Our program offers students a common but rigorous educational experience for the first year, and continued challenge as you begin to specialize during your second year. MB Program students participate in seminar series, program retreats, teaching, and may attend scientific meetings. In the second year once you have chosen a research advisor based on your first-year rotation process, you will be formally admitted to one of the nine participating departments to conduct a research project leading to the awarding of a Doctorate of Philosophy.

Professors

This interdisciplinary program brings together over faculty from nine basic science departments: Cell Biology and Neuroscience; Chemical and Biological Engineering; Chemistry and Biochemistry; Earth Sciences, Ecology, Land Resources and Environmental Sciences, Microbiology, Plant Sciences and Plant Pathology, and Veterinary Molecular Biology and three research centers: Center for Biofilm Engineering, Center for Biologically-Inspired Materials and the Thermal Biology Institute to provide students with the didactic and laboratory instruction they require to become successful research scientists.

Admission

Ph.D. Degree Program

It is recommended that applicants for the Ph.D. program have a Bachelor's or Master's degree with a solid foundation of science courses. Admission to the doctoral program follows the requirements of the Division of Graduate Education. Factors that the department uses in its admissions process include GRE scores, TOEFL scores (for non-native English speakers), reference letters, GPA, research experience and previous coursework.

Details about applying can be found at http://mbprogram.montana.edu/application.asp. The Molecular Biosciences Program encourages applicants to use the online application procedure.

Program Requirements

Ph.D. Program First-Year

A Ph.D. student must complete a minimum of 9 credits of coursework each semester their first-year. Required courses include:

Fall Semester
- MBSP 500, Molecular Biosciences Program Seminar
- MBSP 561, Molecular Biosciences Lab Rotation I
- MBSP 562, Molecular Biosciences Lab Rotation II
- Two courses from any of the approved courses in the nine participating science departments

Spring Semester
- MBSP 500, Molecular Biosciences Program Seminar
- MBSP 563, Molecular Biosciences Lab Rotation III
- MBSP 564, Molecular Biosciences Lab Rotation IV (if needed) or MBSP 575 Molecular Biosciences Program Research Project (You have an option of taking a research credit within your chosen home department)
- Two courses from any of the approved courses in the nine participating science departments

Research Experience

Ph.D. students will gain research experience through their lab rotation, conference submissions, and attending conferences.

Research Facilities

Research Facilities vary on lab rotation selection

Financial Assistance

The Molecular Biosciences Program at Montana State University is offering outstanding students a fellowship of $22,000 plus tuition per year to fund their Ph.D. graduate education in the life sciences.
PH.D. DEGREE IN ECOLOGY
AND ENVIRONMENTAL SCIENCES

This cross-college doctoral degree represents a broad collaboration among departments and faculty from across MSU. It provides the opportunity for motivated students to integrate our world-class faculty research programs in diverse aspects of ecology and environmental sciences, within the unparalleled natural laboratory that is the Greater Yellowstone Ecosystem. Particular program strengths include terrestrial and aquatic ecology, environmental biogeochemistry, evolutionary biology, hydrology and watershed analysis, quantitative ecology, invasive plant ecology and management, conservation biology, land rehabilitation/restoration ecology, environmental microbiology, remote sensing and spatial sciences. Please see our website for a more comprehensive list of EES faculty programs and research opportunities: http://eesprogram.montana.edu/index.asp

Graduates will be well-trained professionals who will compete strongly in research, teaching, and related fields nationally and internationally. EES doctoral students will be affiliated with a home department that corresponds to that of their major faculty advisor. Some specific graduate program criteria, procedures, and processes vary among departments; students will follow those of their home department, which are also consistent with policies set forth by the Division of Graduate Education.

Admission
Prospective students should submit a pre-application or application to the graduate program online at http://eesprogram.montana.edu/index.asp. The application should specify the desired area(s) of study to facilitate its full evaluation by faculty members in the desired field(s). Applicants are expected to have appropriate preparation to undertake the doctoral degree in the area of study. Students may undertake the Ph.D. following completion of a Master’s degree, or exceptional students may apply directly following completion of a suitable bachelor degree. An appropriate faculty mentor must agree to serve as the student’s major advisor as a condition of admission. Stipend and operations funding are generally from research grants and contracts awarded to faculty members, but graduate teaching assistantships and other forms of support are also available on a limited basis.

Core Curriculum
Because of the substantial diversity in disciplinary and multidisciplinary foci within the EES doctoral program, there is no universal required core curriculum. The student’s individual coursework program will be developed in partnership with the major advisor and graduate committee, and must be consistent with the home department and DGE guidelines and requirements. A minimum of 30 credits of resident coursework must be taken from MSU.

Candidates for the Ph.D. degree in Ecology and Environmental Sciences are expected to be familiar with the degree requirements of both their home department and the Division of Graduate Education.

Program Participants
The program is jointly centered in the departments of Ecology (College of Letters and Sciences) and Land Resources and Environmental Sciences (College of Agriculture), but is also specifically open to students and faculty mentors in other MSU departments and colleges who undertake relevant doctoral study.

Interested students should consult the program website at http://eesprogram.montana.edu/index.asp for additional information and to submit a graduate pre-application or application.

WWAMI MEDICAL PROGRAM
Linda E. Hyman, Ph.D., Director and Vice Provost for Health Sciences
310 Leon Johnson Hall
994-4411
lhyman@montana.edu
www.montana.edu/dhs/

Director
Linda E. Hyman, Ph.D.

Associate Director
R. "Brownie" Schoene, M.D.

Professors
• R. Baricos (adjunct); pathology
• C. Cusick; cell biology
• R. Flaherty (adjunct); medical science
• A. Goodman (adjunct); microbiology
• J. Hensold (adjunct); medical science
• M. Herring (adjunct); medical science
• M. Jutila; immunology
• F. Lefcort; cell biology
• D. Phillips; cell biology
• R. B. Schoene; medical science

Associate Professors
• V. Copie; biochemistry/chemistry
• S. Eiger; cell biology
• M. Teintze; biochemistry/chemistry.

Assistant Professor
• J. Burritt; microbiology
• S. Gibson; cell biology
• S. Halonen; microbiology
• B. Komlos (adjunct); Spanish
• N. Meissner (adjunct); pathology
• S. Sindelar (adjunct); medical science
• J. Voyich-Kane; microbiology

Program Description
Sponsored by the University of Washington School of Medicine and leading to an M.D. degree from that school, the WWAMI program is designed to provide medical education for citizens of the participating states (Washington, Wyoming, Alaska, Montana and Idaho), to provide physicians for these states, to encourage physicians to practice in locations where physicians are most needed and to provide a nucleus of medical education in regions that do not have an independent school of medicine.

WWAMI is a medical school program, not a premedical program. The program is supported by the State of Montana and guarantees that 20 qualified Montana residents can be admitted to the Medical School at the University of Washington School of Medicine each year.

Students who enter the program receive their first year of their medical education at the participating university in their home state. First year programs exist at Washington State University-Pullman, the University of Wyoming-Laramie, the University of Alaska in Anchorage, Montana State University-Bozeman, and the University of Idaho-Moscow. The curriculum at each site is similar and compatible with
the University of Washington School of Medicine curriculum which integrates the basic and clinical sciences, stresses rural health care at an early time in medical education, and incorporates a department of family medicine.

Course subject matter at MSU includes human anatomy and tissue structure, human physiology, medical biochemistry, introduction to clinical medicine, infectious diseases, behavioral systems, nervous system, and head, neck and musculoskeletal anatomy. A clinical preceptorship program has been developed which involves the student with local physicians for several hours each week.

Following one year of study at MSU, students join their classmates from other WWAMI sites at the Seattle campus for the remaining years of their medical education.

At the conclusion of the first two years, students enter the clinical phase of their education. During this phase students have the opportunity to complete their third year and most of their fourth year of medical school at either Billings or Missoula. Students receive training from physicians in the communities where the physicians live and practice (community phase). These "Clerkships" are established for a given educational need (e.g., pediatrics, family medicine). Six Clerkship sites have been established in Montana: Billings (Internal Medicine, OB/GYN, Pediatrics, Family Medicine, Surgery and Psychiatry), Great Falls (Pediatrics), Missoula (Internal Medicine, OB/GYN, Surgery and Psychiatry, Pediatrics and Family Medicine will start in July 2006), Whitefish (Family Medicine), Havre (Family Medicine and OB/GYN), and Dillon (Internal Medicine).

To be eligible for the Montana State University WWAMI program, the prospective medical student must be certified by the Montana University System as a resident of Montana and must satisfy the admission requirements of the University of Washington School of Medicine. It is not necessary for a student to take premedical (undergraduate) education at MSU in order to be eligible for the WWAMI program. Students admitted to the program are selected by the Admissions Office at the University of Washington School of Medicine and are regarded as members of the freshman medical class there, although they register as resident students in their home states for the first year of the program.

**First Year Medical School Curriculum**

The first year basic medical school curriculum is required for all medical students accepted at the University of Washington School of Medicine.

<table>
<thead>
<tr>
<th>Required Courses: Fall Semester</th>
<th>credits</th>
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<tbody>
<tr>
<td>MedS 510 – Anatomy - Microscopic</td>
<td>3</td>
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<tr>
<td>MedS 511 – Anatomy - Gross</td>
<td>4</td>
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<tr>
<td>MedS 512 – Mechanisms in Cellular Physiology</td>
<td>4</td>
</tr>
<tr>
<td>MedS 513 – Introduction to Clinical Medicine I</td>
<td>2</td>
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<tr>
<td>MedS 514 – Molecular and Cellular Biology</td>
<td>5</td>
</tr>
<tr>
<td>MedS 516 – Clinical Preceptorship</td>
<td>1</td>
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<tr>
<td>MedS 533 – Systems of Human Behavior</td>
<td>3</td>
</tr>
<tr>
<td>MedS 591 – Medical Info &amp; Decision Making</td>
<td>1</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Required Courses: Spring Semester</th>
<th>credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MedS 521 – Infectious Diseases &amp; Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>MedS 522 – Introduction to Clinical Medicine II</td>
<td>2</td>
</tr>
<tr>
<td>MedS 528 – Immunology &amp; Hum Diseases</td>
<td>2</td>
</tr>
<tr>
<td>MedS 531 – Head and Neck Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>MedS 532 – The Nervous System</td>
<td>6</td>
</tr>
<tr>
<td>MedS 551 – Musculoskeletal Anatomy</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22</strong></td>
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</tbody>
</table>

**Further Information**

Contact the Montana WWAMI Director at MSU or the URL [http://www.montana.edu/wwami](http://www.montana.edu/wwami) for complete application, admission, and program requirements.
Division Of Graduate Education:
Policies And Procedures

http://www.montana.edu/wwwdg/

Application for Graduate Admission
Thank you for your interest in Montana State University!

Any individual who has received a bachelor's degree from a regionally accredited college or university may apply for admission to the Division of Graduate Education (DGE). The DGE provides two application options: an online application and a paper application. Paper applications may be downloaded or are available from the department to which you are applying as well as from the DGE. All paper application materials for graduate degree programs must be submitted directly to the department to which you are applying. All paper application materials for non-degree graduate status must be submitted to the DGE.

At the time of application, each student is assigned a MSU student identification number. We ask that you voluntarily provide a social security number to help distinguish between individuals with the same or similar names. You will not be penalized should you decline to provide this number. Federal law requires that students applying for financial aid, graduate assistantships, fellowships, traineeships, or tuition waivers must provide their Social Security number for purposes of identification.

The following applications are for both degree-seeking and non-degree students.

Graduate Online Application
The $50 online application fee may be paid using a credit/debit card or direct payment from a United States checking account at the time the application is submitted to MSU.

Graduate Paper Application
The $60 paper application fee may be paid by check or money order payable to Montana State University and should be submitted directly to the department if applying to a degree program or to the DGE if applying to non-degree graduate status.
Degree-Seeking Graduate Students

Please contact the department you are interested in applying to prior to completing the application. Departmental deadlines vary and some departments may require a preliminary application.

In order for your graduate degree application to be reviewed for admission, all of the required documents must be submitted to the department to which you are applying prior to their application deadline. For more information regarding deadlines and requirements, please contact the department.

We recommend that you follow up with the department to ensure that all supporting documents were received for review. Once the department reviews your completed application and all of the accompanying documents, they will send your file to the Division of Graduate Education (DGE) with their recommended admission decision. The DGE then reviews your application and issues a formal decision letter.

International students should refer to the international student section for more information.

Application Requirements

All applications must include the following:
• a completed Application for Graduate Admission;
• a completed Grade Point Average Calculation sheet;
• a nonrefundable application fee payment of $50 for online applications or $60 for paper applications;
• official transcripts reflecting all baccalaureate and post-baccalaureate work and reflecting the completion of the first bachelor’s degree;
• three letters of recommendation;
• official entrance exam scores (contact department for requirements);
• a letter of intent or essay, if required by the academic department.

Application Deadlines

Each department sets its own application deadlines. Contact the department to which you are applying for their specific deadlines.

Entrance Exam Requirements

Please contact the department to which you are applying for information regarding their entrance exam requirements.

If the department requires an entrance exam, the DGE must receive an official score report from the specific testing agency. Unofficial score reports may be used to initiate the application process. However, if accepted, registration for classes will be prohibited until an official score report is received.

If an official score report is not obtainable, a score report will be accepted directly from another accredited academic institution.

Non-Degree Graduate Students

Non-degree graduate students are those who have earned a bachelor’s degree and:
• do not wish to pursue a graduate program leading to an advanced degree at MSU but wish to take courses;
• have been denied regular or provisional admission;
• have non-degree standing through the recommendation of the department or the Division of Graduate Education (DGE);
• whose formal degree application is pending final action;
• who applied too late to be admitted for the intended term;
• who wish to apply for the teacher certification program, Northern Plains Transition to Teaching, Post-Baccalaureate Pre-Medical Certificate, or WWAMI.

International students should refer to the international student section for more information.

Non-Degree Application Requirements

Non-degree seeking applicants must submit the Application for Graduate Admission to the Division of Graduate Education. All applications must include:
• a completed Application for Graduate Admission;
• a non-refundable application fee payment of $50 for online applications or $60 for paper applications;
• an official transcript reflecting the completion of the first bachelor’s degree.

Non-Degree Application Deadlines

Domestic non-degree applications must be received by the DGE by the following dates:
Fall Semester: September 10
Spring Semester: January 31
Summer Semester: June 30

Non-Degree Registration

New non-degree students will be eligible to register for classes as soon as the completed application is processed. An acceptance letter with registration information will be mailed to the applicant within five business days following the receipt of the completed application.

Non-degree graduate students may register for both graduate and undergraduate level courses.

Ineligible for graduate assistantships

Non-degree graduate students are not eligible for graduate assistantships.

Use of non-degree credits on a future graduate program

For information regarding the use of non-degree credits on a future program on study, please refer to the section on Transferring Credits.

Continuing Education

• Enrollment in continuing education courses does not imply application to non-degree graduate status.
• If taking continuing education courses while in non-degree graduate status, the courses are considered non-degree credits unless the student has been formally admitted into a graduate degree program.

International Graduate Students

Please contact the department you are interested in applying to prior to completing the application. Departmental deadlines vary and some departments may require a preliminary application.

In order for your graduate degree application to be reviewed for admission, all of the required documents must be submitted to the department to which you are applying prior to their application deadline. For more information regarding deadlines and requirements, please contact the department.
We recommend that you follow up with the department to ensure that all supporting documents were received for review. Once the department reviews your completed application and all of the accompanying documents, they will send your file to the Division of Graduate Education (DGE) with their recommended admission decision. The DGE then reviews your application and issues a formal decision letter.

International students must submit the following application materials:

• a completed Application for Graduate Admission;
• a nonrefundable application fee payment of $90 for online applications or $60 for paper applications;
• official transcripts reflecting all baccalaureate and post-baccalaureate work;
• official degree certificate from each college or university from which a degree was received;
• three letters of recommendation;
• official entrance exam scores (contact department for requirements);
• official English proficiency exam score report;
• a completed and signed Financial Certificate including proof of available funds (items such as a certified bank statement, certificate of deposit or other verified document). In the case of a sponsor, the document should be accompanied with a letter indicating support;
• a letter of intent or essay, if required by the academic department.

Application Deadlines

Each department sets its own application deadlines. Contact the department to which you are applying for their specific deadlines.

Entrance Exam Requirements

Please contact the department to which you are applying for information regarding their entrance exam requirements.

If the department requires an entrance exam, the DGE must receive an official score report from the testing agency. Unofficial score reports may be used to initiate the application process. However, if accepted, registration will be prohibited until an official score report is received.

If an official score report is not obtainable, a score report will be accepted directly from another accredited academic institution.

Non-Degree International Student

Non-degree graduate students are those who have earned a bachelor's degree and:
• do not wish to pursue a graduate program leading to an advanced degree at MSU but wish to take courses;
• have been denied regular or provisional admission;
• have non-degree standing through the recommendation of the department or the DGE;
• whose formal degree application is pending final action;
• who applied too late to be admitted for the intended term;
• who wish to apply for the teacher certification program, Northern Plains Transition to Teaching, or Post-Baccalaureate Pre-Medical Certificate.

International students must submit the following application materials:

• a completed Application for Graduate Admission;
• a nonrefundable application fee payment of $90 for online applications or $60 for paper applications;
• official transcripts and bachelor's degree certificate;
• official English proficiency exam score report;
• a completed and signed Financial Certificate including proof of available funds (items such as a certified bank statement, certificate of deposit or other verified document). In the case of a sponsor, the document should be accompanied with a letter indicating support;
• a letter of intent or essay, if required by the academic department.

International Graduate Students And Non-Degree Status

International students will be accepted as non-degree graduate students for a maximum of one year.

Deadlines

International non-degree applications must be submitted approximately 75 days prior to the start of the term to ensure enough time for the issuance of an I-20. Specific deadlines for non-degree international applicants are as follows:

Fall Semester: May 15
Spring Semester: October 1
Summer Semester: February 1

English Proficiency Exam

International applicants to both degree and non-degree status must submit an official English proficiency exam score report. The accepted exams and minimum required scores are as follows:

• TOEFL (Test of English as a Foreign Language)
  - 80 (internet based test)
  - 213 (computer based test)
  - 550 (paper based test)
• IELTS (International English Language Testing System)
  - 7.0 (minimum band score)

Some departments may require higher scores. International student requirements for teaching assistantships are addressed in the section on Graduate Assistantships.

English proficiency exam scores are not required if:

• English is the first official language of the applicant's country of citizenship, or
• the applicant has received an undergraduate or graduate degree from an institution in the United States.

If sending official TOEFL or IELTS scores, please have them sent directly from ETS (Educational Testing Service) or the IELTS to Montana State University. Unofficial score reports may be used to initiate the application process. However, if accepted, registration will be prohibited until an official score report is received. Photocopies of the TOEFL may be accepted from the student and will be verified by ETS for accuracy.

For information regarding the TOEFL, please view the website www.toefl.org.

For information regarding the IELTS, please view the website www.ielts.org.
Admission Policies

General Guidelines
Admission decisions are made on an individual basis. Before admission is granted, each application is reviewed by the appropriate departmental faculty and the Division of Graduate Education (DGE) to determine if the applicant's academic history and preparation is satisfactory. Enrollment in a graduate program may be limited by the availability of faculty, staff, facilities, area of interest, or financial resources. In such cases, it may not be possible to admit all students who are otherwise qualified.

Students may be admitted into full or provisional status. A student's admission status may also include a condition specified in the letter of acceptance. An admission decision is based upon the department's recommendation and the final approval by the DGE. Applicants should consider themselves admitted only when official notification has been received from the DGE. Please note that admission is permitted for only one degree program at a time.

The DGE will designate a specific term for which the student is accepted. Applicants may request a change in that term for up to one year. When a student does not register for the term admitted or is denied admission, the application materials submitted will be retained for one year. If a student decides to reapply after this one year time frame, the student will be required to resubmit all the application materials as well as the application fee.

Full Admission
In order to receive full admission, the student must demonstrate potential for success in graduate study. The DGE requires a minimum GPA of 3.0 for both undergraduate and post-baccalaureate work. Some departments have higher admissions standards; please contact the department for their minimum GPA and entrance exam requirements.

Provisional Admission
Provisional admission is granted when the department or the DGE determines the student has not met the requirements for full admission. Students admitted provisionally may be suspended without a probationary period if the provisions placed on their admission have not been met.

Provisional admission may be granted to a student when some type of deficiency is noted in the student's academic work, such as:
• the student has less than 3.0 but greater than 2.75 cumulative GPA in undergraduate work;
• the student's last two years of undergraduate or post-baccalaureate work does not appear to be of sufficient rigor;
• the student has made a major change in his/her area of specialization but has demonstrated potential for graduate study;
• the student has low entrance exam scores;
• the department or the DGE identifies other academic weaknesses that may adversely impact the student's graduate career.

The DGE may grant provisional admission with up to fifteen (15) credits of deficiency coursework needed. The following stipulations apply:
• the deficiency coursework must be listed in writing on the official acceptance letter from the DGE. The acceptance letter will also state when the department requires additional prerequisites or deficiency work;
• the department must list additional deficiency courses in writing on either its acceptance letter or in a memo to the student on or before the first day of the term the student begins his/her graduate career;
• it is up to the department to monitor acceptable progress of deficient course work and to ensure completion of such coursework in a timely manner;
• provisions stated in the acceptance letter from the Vice Provost for Graduate Education must be satisfied as required prior to completion of degree.

Admission with Condition
A student admitted into either full or provisional status may also have a condition placed on his/her admission. A condition is typically placed on a student's admission when the DGE is missing an official document, such as transcripts or exam scores. When a condition is placed on a student's admission, a corresponding hold is placed on the student's record that will prevent registration until the hold is removed.

Admission Denial
Students may be denied admission based on academic qualifications as well as the availability of faculty, facilities, and/or financial resources. The department or the DGE may recommend enrollment as a non-degree graduate student or completion of additional undergraduate coursework to improve the student's GPA standing and provide evidence of the student's ability to do well in graduate school.

The falsification, omission, or willful suppression by the applicant of any information requested, whether on the application forms or in the application packet, is grounds for either denial of admission or dismissal from Montana State University.

Residency

University and Graduate Student Fees
Refer to the Estimated Expenses-Fee Schedules (in the Expenses section in the Undergraduate Catalog), which contains both graduate and undergraduate student fees. Current tuition and fee schedules also are available from the MSU Business Office. For summer fees, refer to the MSU Summer Session Bulletin. Late fees are assessed for registration after regular registration days. All fees are subject to change at any time by action of the Board of Regents of Higher Education.
Requirements for Fee Purposes
Residency for fee purposes is determined by the regulations of the Montana Board of Regents and is outlined by the Office of the Registrar's Residency Policy. The Division of Graduate Education assigns the residency status of each student at the time of admission. The residency status is established by the information provided in the residency portion of the application for graduate admission.

Training and Development

Information Fair and Welcome Dinner
Each fall semester, the Division of Graduate Education hosts a dinner to welcome all new graduate students. The DGE hopes that this event will offer each new student the opportunity to meet with faculty, staff, students in their degree program and other students pursuing graduate degrees at Montana State University. Each dinner is highlighted by a motivating guest speaker who is familiar with graduate education at MSU, and who can entertain while offering great tips and words of advice to graduate students across the disciplines.

Various campus administrators take part in an Information Fair that precedes the dinner. Students have the opportunity to learn about many offices on campus and to become involved in campus events. Representatives have included University Police, MSU Libraries, Community Involvement, MSU Daycare, MSU CAT Card, Information Technology Center, Athletics and Intramurals, and many more.

Graduate Seminars
The Division of Graduate Education offers professional development seminars designed to assist graduate students in pursuit of their degree. Seminar topics include grant writing, working in academics, and intellectual property. The presentations are delivered by a diverse and highly knowledgeable pool of MSU staff and faculty. Check our website for dates and locations.

Graduate Teaching Assistant Orientation
A separate orientation is held for new graduate teaching assistants (GTAs) each fall and spring, usually the day before classes begin. Attendance by new graduate teaching assistants is required.

Training and Development Fee
The first semester in which a degree-seeking graduate student registers for classes, a training and development fee of $50 will be assessed. If a student is a non-degree graduate student or is registering for extended University courses, the $50 fee will not be assessed.

Auditing Courses
Graduate students may audit courses for zero credit with the permission of the instructor. The following policies apply to audited courses:
1. Audited courses will be designated on a graduate transcript as "Au" in place of the grade.
2. Audited courses may not be used on the Program of Study and do not count towards degree requirements.
3. Audited courses may not be covered by GTA/GRA tuition waivers.
4. Full tuition and fees apply to all audited courses.
5. Audited courses will not count towards the total credit load when considered for residency.
6. Audited courses may be changed to credit courses up to the 10th class day. After the 10th class day the audit status cannot be changed.

Continuous Enrollment Policy
To maintain graduate status, a student must be enrolled in three (3) or more credits (including thesis or dissertation) each semester, including summer semester.
Continuous enrollment policy is applicable for:
Master's students
- after completion of required content coursework on the approved Graduate Program of Study (content coursework excludes thesis or dissertation credits)
OR
- after the student passes any portion of the comprehensive examination.

Doctoral students
- Doctoral students after passing any portion of the comprehensive examination.

Students to whom continuous enrollment applies may be absent from the university for a maximum of three semesters, including summer term, without penalty. This leave of absence may be taken as consecutive or individual semesters. No form or approval from the Division of Graduate Education is required to be absent. As a courtesy, we ask that you discuss the absence with your department.

Students taking a semester off who require access to MSU library resources may register for less than three (3) credits. Students taking a semester off are not entitled to use university facilities. A comprehensive exam or defense of thesis/dissertation may not be conducted during a leave of absence.

Failure to maintain continuous enrollment constitutes evidence that the student has resigned from the degree program and Montana State University.

Additional absences may be approved for documented medical reasons or military duty.

1. Registration Following a "Leave of Absence"
Students wishing to register for coursework following one or more semesters off must file the Intent to Register form with the Office of the Registrar 30 days prior to registration for an intended semester.

2. Readmission to Graduate Standing
Students absent for more than three semesters while in continuous enrollment must:
- Reapply to the degree program and to the Division of Graduate Education by completing the Application for Graduate Admission including the $50 application fee and official transcripts of any academic work completed during the absence. The application must be reviewed and approved by the student's department and the Division of Graduate Education prior to the beginning of the intended semester;
• Submit a revised Program of Study to the Division of Graduate Education. Outdated course work (any course work older than six years for master’s students or older than ten years for doctoral students) cannot be included in the revised Program of Study;
• Retake the comprehensive examination and be registered for a minimum of three (3) credits during the semester the examination is taken;
• Maintain continuous enrollment through completion of the degree.

Credit Requirements
It is the student's responsibility to enroll for the number of credits needed to satisfy all department, college, and university criteria. The following list is to be used only as a guide; other credit restrictions may apply.
• Graduate Teaching or Research Assistants (GTAs/GRAs) may not enroll in more than twelve (12) semester credits if appointed to work more than fifteen (15) hours per week. Graduate Assistants appointed to work fifteen (15) or fewer hours per week may carry up to fifteen (15) semester credits. GTA or GRA stipends require enrollment of at least six (6) credits each semester.
• Social Security exemption requires a minimum of six (6) credits for the semester of employment.
• Graduating students must be registered for a minimum of three (3) credits during the semester of graduation.
• Students taking qualifying/comprehensive exams must be registered for a minimum of three (3) credits during the semester of the exam.
• Office of International Programs require registration of nine (9) credits per semester. Contact the Office of International Programs for policies about registration for fewer than nine (9) credits.
• Family and Graduate Housing requires five (5) credits during the academic year; no credit minimum in the summer term as long as the student is pre-registered for the upcoming fall semester.
• Residence Halls requires nine (9) credits during the academic year; no credit minimum in the summer term as long as the student is pre-registered for the upcoming fall semester.
• Financial Aid usually requires a minimum of six (6) credits each semester during the academic year.
• Montana Residency: An individual who is enrolled for more than half-time status (At Montana State University, 6 credits is considered half-time enrollment status for both undergraduate and graduate students.) at a post-secondary school during any semester that falls within the 12-month period is presumed to be present in the state primarily for educational purposes, and such periods will not generally be considered as part of the 12-month period of the policy.

Grades, Course Loads
and Special Courses

Grades
Grade Point Average (GPA) standards: A student must maintain a minimum 3.0 semester GPA, a minimum 8.0 GPA in the entire Program of Study and a cumulative 3.0 GPA overall. Any student whose cumulative or semester GPA is less than 3.0 at the end of any semester may be placed on probation or suspended from their degree program. (Refer to the section on Academic Probation and Suspension.)

Courses in which the student receives a grade of "C-" or lower that are not offered for neither of the two subsequent semesters may be substituted by another course to fulfill the degree requirement. The original course will remain on the program of study but will be noted by the DGE as a substituted course.

The original course must be retaken if offered in either of the following two semesters, regardless of intended semester of graduation. A memo from the department head will be sufficient to clarify the intent of the additional course work.

Incomplete Grades: Unless a specified earlier time is given by the instructor, an "I" grade shall be made up no later than the end of the following semester (excluding summer session). The instructor may extend the time given to fulfill an "I" grade; however an "I" grade may not be extended beyond one calendar year. An "I" grade not made up in the prescribed length of time or within one calendar year lapses to a failure (F).

Course removal
A course listed on the Program of Study may not be removed once a grade has been posted.

Pass/Fail grades
In all pass/fail grading, passing work receives a "P" grade on a student's transcript but does not count in the grade point average. However, the course credit may count toward the number of credits required for degree completion.

Please Note: Failing work will receive an "F" grade and will count in the grade point average.

Course Loads
1. Nine (9) semester credits are considered a full-time graduate load.
2. International students are generally required to take a minimum of nine (9) credits per semester. International Students must contact the Office of International Programs for current policies.
3. To be considered a full-time student during the summer semester a student must be registered for at least nine (9) credits for any one or a combination of summer sessions.

Individual Problems Course (570)
Individual Problems (570) courses may be included in the Program of Study. The allowable number of 570 credit hours is limited as follows:
• Master's (thesis) four (4) credits total.
• Master's (non-thesis) six (6) credits total.
• Doctoral, no more than six (6) credits total.

Students who register for a 570 without an approved "Request for Individual Problems" form may be dropped from course.

Special Topics Course (580)
Special Topics (580) courses may be included in a master's or doctoral Program of Study. The total number of Special Topics courses that may be taken during a graduate student's tenure varies by degree program.

Professional Development (588)
Professional Development (588) courses are not applicable to degree programs and may not be used toward graduate degree requirements.
Graduate programs approved prior to September 1, 2000 may use a maximum of three credits of Professional Development.

Graduate Consultation Course (589)
This course is permitted only for master's degree students who have completed all of their coursework and the thesis or the professional paper, but who need additional faculty or staff time. This course may not be used for degree credit requirements.

Undergraduate Courses (4XX)
The following 4XX courses will NOT be approved for use on a graduate Program of Study:
- 400 (Undergraduate seminars)
- 470 (Undergraduate Independent Study)
- 476 (Undergraduate Internship)
- 480 (Undergraduate Special Topics)
- 489 (Undergraduate Research/ Creative Activity Instruction)
- 490 (Undergraduate Research/ Creative Activity)

Internships

Program Requirements
Internships provide an opportunity for graduate students to work closely with a professional gaining experience in a business or professional setting. Establishment of the intern's goals prior to participation in the internship will make the experience more meaningful and will help develop a stronger commitment from the supervisor and the student.

All departments offering graduate internship programs must address numbers 1-5 below. In addition, the university supervisor and agency supervisor must develop the specific internship criteria by considering and stating responses to the following, in writing:
1. Objectives
2. Eligibility and prerequisites for the internship
3. Application procedure
4. Procedure for selecting interns
5. Procedure for selection of cooperating offices, agency or institution
6. Due dates for final reports by agency and university supervisor.

The university supervisor, agency supervisor and intern must discuss and develop the following in writing:
1. Educational goals and objectives of the experience;
2. Specific expectations/duties of the intern during, amount of effort, credits, stipend, responsibilities, etc.;
3. Credit requirements of the intern (daily logs, final reports, seminars, etc.);
4. Evaluation criteria and grading responsibilities of the university supervisor and agency supervisor;
5. Date by when the student must have completed all requirements for the internship credits
6. Signatures of agency supervisor, student and university supervisor.

Permanent documentation includes agreement forms, logs, reports and all other items used in the evaluation process which become a part of the student's permanent file in the department. This documentation is to be available for review at the request of the Graduate Vice Provost.

Internship Credit Requirements and Other Criteria
1. Graduate students may register in graduate internships (Department rubric, 576 course number) after successfully completing nine (9) credits graduate coursework.
2. Internships will require a minimum of 45 hours of student effort for each semester credit.
3. Internship credit will not be granted for previous work experience or current job duties if employed.
4. A maximum of twelve (12) semester internship credits may be applicable toward a graduate degree.
5. Interns may receive a stipend for work performed.
6. Internship periods shall correspond inasmuch as possible with university semesters so that regular grades (not incompletes) can be properly assigned each semester. When internships will encompass more than one semester, proper credits and criteria for grading shall be arranged for each term.

Pass/Fail Courses

Pass/Fail Categories
"Pass/fail only" courses are those offered solely on a pass/fail basis. These include but are not limited to thesis research (590), dissertation research (690) and consultation (589).

Registration for Pass/Fail Courses
- Registration for pass/fail only courses is the same as for other courses.
- For courses, the student desires to take on a pass/fail basis must complete a form provided by the Registrar requesting that the final grade be recorded as pass/fail.
- A student may submit or withdraw a pass/fail request until the 10th day of university instruction of the semester.
- For pass/fail only courses, grades of "P" or "F" are given.

Grading for Pass/Fail Courses
- "P" grades on the student's transcript are not computed in the GPA.
- "F" grades will be computed in the GPA.

Pass/Fail Course Limitations
Pass/Fail credits, excluding thesis/dissertation (590/690) and professional paper (575), may be allowed up to a maximum of three (3) pass/fail credits in all graduate programs.

Transfer of Pass/Fail Credits
Pass/fail and other non-traditionally graded courses may not be transferred from another institution.

Registration
Graduate students must register each semester in which faculty time or University facilities are used for any purpose.
Late fees will be assessed after published deadlines for registration. Students must register on or before the 10th class day of instruction as set forth by the Office of the Registrar's Schedule of Classes.

The Division of Graduate Education reserves the right to deny class registration to any student after the 10th class day of instruction.
Immunization Requirements

Students are required to show proof of current immunization against measles, mumps and rubella, (MMR). A current skin test for tuberculosis may also be required. Students will not be permitted to register for classes until Student Health Service receives the immunization verifications. Contact MSU Student Health Service at (406) 994-2911.

Final Semester Registration:

All students are required to be registered for a minimum of 3 credits the semester of graduation. If a student is not able to meet the deadline within that semester, typically the student is required to apply to graduate the following semester and register for 3 credits. However, if the student does not need an entire semester to complete degree requirements, but rather a short extension on the original intended semester of graduation, a One Credit Extension may be applicable.

One Credit Extension

A One Credit Extension allows students additional time past the intended semester of graduation up to the first day of the following semester. Appropriate reasons to utilize the one credit extension are as follows:

- To satisfactorily complete all coursework (including "I" grade make-ups).
- Defense of thesis/dissertation past the published deadline for the intended semester.
- Satisfactory completion of all recommended corrections to the thesis or dissertation and submission of all required copies in final format to the DGE past the published deadline for the intended semester.
- Approval of the thesis/dissertation by the graduate Vice Provost.
- Successful completion of all other degree requirements as determined by the department and the Division of Graduate Education, including submission of all documentation required for graduation.

To use the One Credit Extension, the student must do the following:

- Withdraw their Application for Advanced Degree for the original semester of graduation on the DGE website @ http://www.montana.edu/gradstudies/withdraw_app.shtml.
- Submit a new Application for Advanced Degree for the following semester;
- Register for 1 credit the following semester.

The degree will not be conferred until the end of the following semester.

If all degree requirements are met by 5:00 p.m. on the first day of the following semester, the student will be required to register for an additional 2 credits (to meet the minimum of 3 credits) to complete graduation requirements.

Students who intend to take advantage of this option should contact the DGE.

Petitions, Appeals & Grievances

Graduate Student Academic Appeals

Appeals by graduate students seeking waivers from established University academic policies such as admission, retention, or graduation requirements must be made in writing by the student. Student appeals must include a letter from the student as well as approvals (signature and/or letter) from the advisor and department head prior to submission to the Division of Graduate Education. In instances where the advisor and/or department head choose not to endorse the request, this must be noted and the student may then forward the appeal directly to the Division of Graduate Education.

The Graduate Vice Provost will either act on the matter or refer it to the Graduate Student Academic Appeals Board (GSAAB) for action. Decisions by the Graduate Vice Provost may be appealed in writing to the GSAAB. Appeals from non-degree students seeking admission to the Division of Graduate Education may also be presented to the Board.

Academic Appeal Process

Students may appeal an academic policy or decision by following this process:

1. State in writing, the policy or decision that is being appealed;
2. Note the reasons you believe the decision should be changed or policy be waived;
3. Include your advisors and department head's approval statements or signatures with the appeal.

Graduate Student Academic Grievance Procedure

A copy of the current academic grievance procedures is available upon request from the Division of Graduate Education, 108 Montana Hall or the office of the Dean of Students, Room 120, Strand Union Building.

Academic Integrity and Student Conduct Guidelines

Copies of official guidelines and procedures concerning academic integrity and student conduct are available from the Division of Graduate Education, 108 Montana Hall or the Dean of Students Office, Room 120, Strand Union Building.

Academic Probation and Dismissal

Good Standing

The student has a cumulative and semester GPA of 3.0 or higher and has met the provisions of admission as stated in the Division of Graduate Education admission letter, the student is in good standing.

Scholastic Probation

A student will be placed on College Probation if the semester GPA falls below a 3.0, even though the cumulative GPA remains above a 3.0. Students are placed on College Probation to maintain satisfactory progress for degree completion.

University Probation

A student may be placed on University Probation for any of the following:

- The student's semester and cumulative GPA or graduate program GPA have fallen below a 3.0.
• The student fails to successfully complete ("B" or better) a majority of the courses each semester
• The student did not meet the Division of Graduate Education or academic department provisions of admission.

Dismissal (Suspension)

A student may be suspended from Degree Program and Division of Graduate Education for any of the following:
• The student’s cumulative or program GPA falls below a 3.0 after University Probation status
• The student did not meet the provisions of admission
• The student failed to make satisfactory progress toward their degree program
• The student failed to maintain a cumulative or program GPA for two (not necessarily consecutive) semesters.

University Withdrawals

All University withdrawals by graduate students must originate in the Division of Graduate Education.

Readmission to Graduate Degree Standing

Following suspension, consideration for readmission to degree seeking status within the Division of Graduate Education may be requested after the student has completed a minimum of nine (9) semester credits in non-degree status. The student must also achieve a 3.0 GPA in 4XX-level and higher courses taken during non-degree status. Courses taken during suspension may not be used toward meeting degree requirements.

Transfer Credits

Up to (9) semester credit hours may be transferred from an accredited institution towards degree requirements at MSU.

The number of semester hours transferred from other institutions (non-degree or degree status) combined with credit(s) taken as a non-degree graduate at MSU may not exceed nine (9) credit hours on a Program of Study. Individual departments may have stricter standards on the number of credits to be transferred.

All eligible credits to be transferred are subject to approval by the student’s graduate committee, graduate department, and the Division of Graduate Education.

Official transcripts of any proposed transfer credit to be used on a Program of Study must be sent to the Division of Graduate Education. If the Division of Graduate Education approves a Program of Study which includes transfer credits that have not been taken, this approval is based on the understanding that the transfer credits will meet all standards of transfer credit eligibility.

The following are credits that cannot be transferred to MSU:
• Credits awarded by postsecondary institutions in the United States that lack regional accreditation;
• Courses with a grade of pass, credit, or satisfactory (non-traditionally graded);
• Courses older than six (6) years for master’s students and ten (10) years for doctoral students;
• Courses with a grade below a “B”
• Credits awarded by postsecondary institutions for life experience;
• Credits awarded by postsecondary institutions for courses taken at non-collegiate institutions (e.g. government agencies, corporations, and industrial sponsored agencies);
• Credits awarded by postsecondary institutions for noncredit courses, workshops, and seminars offered by other postsecondary institutions as part of continuing education or professional development programs;
• Credits on an undergraduate transcript (undergraduate status);
• Credits used for completion of a degree at another institution.

Master’s Examinations

Master’s Qualifying Examination

To test the student’s preparedness, a qualifying examination may be administered by the major department. The student usually takes the examination during the first year of attendance.

Master’s Comprehensive Examination

Mandatory comprehensive examination requirement

Each candidate for a master’s degree, including professional and/or seamless degrees, must pass a written and/or oral comprehensive examination. The examination covers subject matter included in the graduate program and any other material the examining committee considers pertinent. Comprehensive examinations are structured according to the department’s individual requirements.

Comprehensive examination and thesis defense

On thesis plans, the defense-of-thesis examination is also required. The comprehensive examination and the defense of thesis may be combined and offered at the same time.

Professional licensure/certification examinations

Examinations for professional licensure or certification may not be used for or in place of the comprehensive examination.

Comprehensive examination deadline

Two-thirds (2/3) of the course work required for a degree must generally be completed prior to sitting for the comprehensive exam.

The last day to take the comprehensive examination or defend a thesis if you plan to graduate during the same semester is on or before the fourteenth (14th) business day prior to the end of the semester.

Minimum registration to take an examination

A student must be registered for a minimum of three (3) credits at MSU during the term in which an examination is taken.

If a student wishes to sit for the comprehensive exam during the intersession (i.e. the time between semesters), a student must be registered for a minimum of three (3) credits in the term prior to the intersession or the term immediately following the intersession.
Grading of the comprehensive examination

The comprehensive examination is graded with either a passing or failing grade determined by a majority committee vote. The student officially passes the examination when all concerns and deficiencies have been met and are deemed satisfactory by all Committee members.

Notice of results of the comprehensive examination

The Committee and department head are responsible for submitting written notice of the results of the comprehensive examination to the student and to the Division of Graduate Education no later than one (1) week after the examination is held or after each section is administered. If the written and oral sections are given at separate times, the results of each section must be reported in writing to the student and to the Division of Graduate Education no later than one (1) week after each section is completed by the student.

Failed Examination

A failure on any portion of the examination is considered to be a failed exam. A failed examination may be repeated one (1) time. At least two (2) months must elapse before the second examination may take place. Failure to pass a second examination results in termination of graduate study and dismissal from the academic program. Students who are dismissed from the program due to a failed comprehensive examination are ineligible to reapply to the same degree program at any time.

Invalid Examination

Examinations held in the absence of the chair or both individuals in case of co-chairs will be considered invalid and the exam will have to be rescheduled. The chair and/or co-chairs must be present throughout the entire examination.

All Committee members must be present at the comprehensive: Last minute Committee changes based on scheduling conflicts must be approved by the Division of Graduate Education.

It is the student’s responsibility to ensure that all Committee members are available when scheduling an exam. Examinations held with only two Committee members present will be invalidated.

Defense of Thesis

On thesis plans, the defense-of-thesis examination is required. The comprehensive examination and the defense of thesis may be combined and offered at the same time.

Minimum Credit Registration

To Defend The Thesis

A student must be registered for a minimum of three (3) credits at MSU during the term in which the thesis is defended.

If a student wishes to sit for the thesis defense during the intersession (i.e., between semesters), the student must be registered for a minimum of three (3) credits the term prior to the intersession or the term immediately following the intersession.

Scheduling The Thesis Defense

The last day to defend a thesis is on or before the published deadline (generally on or before the fourteenth 14 th working day prior to the end of the semester.)

Advertising The Defense

The following information may be published in the Division of Graduate Education "News and Announcements" Bulletin on the DGE website:

a) the name of the candidate;
b) title of the master’s thesis;
c) time and place of defense; and
d) the place where a copy of the thesis may be obtained for inspection.

Posting the above information is not mandatory for Master’s students.

Committee Representation

At The Thesis Defense

If a master’s student chooses to have more than the minimum of three members on his/her graduate Committee, all members must be present at the comprehensive and/or the defense of thesis. Last minute committee changes based on scheduling conflicts must be approved by the Division of Graduate Education.

Invalid Defense of Thesis

A defense of thesis held in the absence of the chair (or both individuals in case of co-chairs) will be considered invalid and the exam will have to be rescheduled. The chair and/or co-chairs must be present throughout the entire defense. Examinations held with only two Committee members present will be invalidated.

Grading Of The Thesis Defense

The defense of thesis is graded with either a passing or failing grade—determined by a majority committee vote. The student officially passes the defense when all concerns and deficiencies have been addressed and are deemed satisfactory by all Committee members.

One Week Notice Of Results Of The Thesis Defense

The graduate committee and department head are responsible for providing written notice of the results of the defense to the student and to the Division of Graduate Education no later than one (1) week after the defense is held.

Failed Defense

A failed defense may be repeated one (1) time. At least two (2) months must elapse before the second defense takes place. Failure to successfully pass the defense of thesis results in termination of graduate study and dismissal from the academic program. Students who are dismissed from the program due to failure to pass the defense are ineligible to reapply to the same degree program at any time.

Doctoral Examinations

Doctoral Qualifying Examination

To test the student’s preparedness, a qualifying examination may be administered by the major department. The student usually takes the examination during the first year of attendance.
Doctoral Comprehensive Examination

The comprehensive examination is the major academic examination during doctoral study that assures that the student has attained sufficient mastery of their Program of Study, including sufficient knowledge of pertinent literature, academic background, training and ability to conduct research.

Written And Oral Comprehensive Requirement

The comprehensive examination must be both written and oral. The comprehensive examination will be assessed by the committee formally approved as the student's Graduate Committee by the Division of Graduate Education.

Minimum Registration To Take The Comprehensive Examination

A student must be registered for a minimum of three (3) credits at Montana State University during the term in which an examination or defense is taken.

If a student wishes to sit for the comprehensive exam during the intersession (i.e., the time between semesters), the student must be registered for a minimum of three (3) credits term prior to the intersession or the term immediately following the intersession.

When To Take The Comprehensive Examination

Two-thirds (2/3) of the course work required for a degree must be completed prior to sitting for the comprehensive exam.

In certain instances, the graduate committee and department head may decide that the written and oral sections of the examination should be held on separate occasions.

The last day to take the comprehensive examination or defend a thesis if you plan to graduate during the same semester is on or before the fourteenth (14th) business day prior to the end of the semester.

Reporting The Results Of The Comprehensive Examination

The Committee and department head are responsible for submitting written notice of the results of the comprehensive examination to the student and to the Division of Graduate Education no later than one (1) week after the examination is held or after each section is administered. If the written and oral sections are given at separate times, the results of each section must be reported in writing to the student and to the Division of Graduate Education no later than one (1) week after each section is completed by the student.

Acceptable Age Of The Comprehensive Examination

The maximum time allowed between the comprehensive examination for the Ph.D. or Ed.D. and degree completion is five (5) years.

Failed Examination

If the student fails the examination, at least six (6) months must elapse before the examination may be repeated. Failure to pass a second examination will result in termination of doctoral work and dismissal from the academic program. Students who are dismissed from the program are ineligible to reapply to the same degree program at any time.

Invalid Examination

Written examinations not made available to the Graduate Representative or oral examinations held in the absence of the Graduate Representative and Chair(s) will be invalidated and must be rescheduled. The Graduate Representative must be included in the process as an impartial observer to ensure the examination is fair for the student, comprehensive in nature (e.g., includes both breadth and depth), and that it is conducted within the guidelines set by the university.

All committee members approved by the Division of Graduate Education must be present at the comprehensive examination. Last minute committee changes based on scheduling conflicts must be approved by the Division of Graduate Education. It is the student's responsibility to ensure that all committee members are available when scheduling an exam.

Defense of Dissertation

A defense covering the dissertation must be taken by all doctoral candidates. The defense usually consists of a public presentation and an oral examination of the candidate's research focus and background.

Notification Of The Defense Date

Each member of the examining committee must be given a minimum of one (1) week's notification before the student's final examination to read the draft of the dissertation. The dissertation defense will be arranged by the major professor and the graduate student, and is given before the final draft of the dissertation is completed. The defense is an oral examination only. Examinations in which any committee member has had insufficient time to prepare should not take place and may need to be rescheduled. The committee chair should discourage a student from defending if the chair (or the committee) feels the student is not adequately prepared.

Registration During The Semester Of The Defense

A student must be registered for a minimum of three (3) credits at MSU during the term in which the defense is held.

Defense Of Dissertation Deadlines

If a student wishes to hold their defense the semester of graduation, the defense must be held and passed at least fourteen (14) working days before the end of the term of graduation.

The "Open" And "Closed" Defense

A portion of the defense must be open to the public. This is usually a presentation of the student's research. Following the open portion of the defense, the committee chair will excuse all attendees other than committee members from the room. This begins the closed portion of the defense in which the student's knowledge of the subject matter will be assessed by the committee.
Advertising The Dissertation Defense
The student and the academic department are responsible for supplying the following information for publication in the Division of Graduate Education "News and Announcements" on the DGE website:
   a) the name of the candidate,
   b) title of the doctoral dissertation,
   c) time and place of defense, and
   d) the place where a copy of the dissertation may be obtained for inspection.

The defense date must be advertised at least one (1) week prior to the actual defense date.

Reporting The Defense Results
The Dissertation Defense report must be submitted to the Division of Graduate Education no later than one (1) week after the defense is held. Failure to submit the report of the defense may invalidate the examination.

Failed Defense Of Dissertation
If the student fails the defense, at least two (2) months must elapse before the examination is repeated. Failure to pass a second examination will result in termination of doctoral work and dismissal from the academic program. Students who are dismissed from the program are ineligible to reapply to the same degree program at any future time.

Invalid defense of dissertation
An examination held in the absence of the chair(s) and/or the graduate representative will be considered invalid and must be rescheduled. The graduate representative must be included in the process as an impartial observer to ensure the examination is fair for the student, comprehensive in nature (includes both breadth and depth), and that it is conducted within the guidelines set by the university.

It is the student's responsibility to ensure that all committee members are available when scheduling an exam. All committee members approved by the Division of Graduate Education must be present at the defense of dissertation. Last minute committee changes based on scheduling conflicts must be approved by the Division of Graduate Education.

For Master's Students
Master's Degree Plans
Masters programs in most fields may be taken under two plans: thesis plan (Plan A) or a professional paper, or project plan (Plan B).

Thesis (Plan A)
This is the research-oriented master's degree. It is particularly recommended for the student whose educational and professional goals make early research experience desirable. In some professions, a master's degree is the terminal degree. In other professions, the master's is a necessary step to the doctorate.

Conversion of thesis credits to professional paper credits: When a master's student changes from a thesis plan to Plan B (professional paper/project plan), a maximum of six credits of thesis (department rubric 590) may be converted to six credits of professional paper (department rubric 575). The student must be able to show support of the change from the entire committee: A memo/letter signed by all committee members would suffice.

Professional Paper or Project (Plan B)
This plan is designed to serve two types of graduate students.
1. In some study areas, a student needs coursework beyond the baccalaureate before being qualified to do acceptable research. Plan B allows the student to defer original research until enrolled in a doctoral program.
2. For students in professional or terminal degree programs, thesis research is not necessary. A professional paper or project is substituted for the thesis requirement.

Conversion of professional paper credits to thesis credits: If a student wishes to switch from a Plan B option to a Plan A option, professional paper credits may not be converted to thesis credits.

Second Master's Degrees
A candidate for a second or additional master's degree must fulfill all requirements for a master's degree.
A maximum of nine (9) semester credits completed during a master's degree program may be applied toward the requirements for a second or additional master's degree at MSU, with approval of the Division of Graduate Education and the student's graduate Committee.

General Credit Requirements for Master's Degrees
1. The minimum credit requirement for master's degrees is thirty (30) credits, individual degree programs may require more.
2. Only those courses listed on a graduate Program of Study are applicable toward graduate degree credit requirements.
3. Non-thesis credits: In all non-thesis programs, at least thirty (30) credits or more as determined by the department, must be for content coursework (not thesis credits).
4. 500-level courses: A minimum of 20 credits (including thesis) must be comprised of 500-level courses. Some degree programs may require a higher number.
5. Conversion of thesis credits to professional paper credits: When a master's student changes from a thesis plan to Plan B (professional paper/project plan), a maximum of six credits of thesis (department rubric 590) may be converted to six credits of professional paper (department rubric 575). The student must be able to show support of the change from the entire committee: A memo/letter signed by all committee members would suffice.
6. Conversion of professional paper credits to thesis credits: Professional paper credits may not be converted to thesis credits.
Registration Requirements for Master’s Degrees

Students must register for a minimum of (3) credits the semester a comprehensive exam is taken.

Students must register for a minimum of three (3) credits the semester of intended graduation.

Course Limitations for Master’s Degrees

General Guidelines
1. Undergraduate (MSU 4XX) courses: Up to 9 credits at the 400-level are allowed on a graduate Program of Study under two circumstances:
   a. They were taken as a graduate student, or
   b. They were reserved for graduate credit as a bachelor degree seeking student.
2. Repeating or challenging previously taken courses: Courses taken as an undergraduate or non-degree student may not be later repeated or challenged and then applied toward requirements for a graduate degree.
3. 3XX (or lower numbered) courses are not applicable to master’s degree requirements.
4. A maximum of three pass/fail credits, excluding thesis, may be used toward the minimum credit requirements for the degree.
5. Challenging courses: Master’s degree students may challenge no more than six (6) credits for application toward a degree program. (Refer to the section on Petitions, Appeals and Grievances.)
6. Limit on age of courses: The age of courses at the time of graduation may not exceed six (6) years.
7. Once a course is taken, it cannot be removed from a Program of Study.

Limits on Specific Courses
1. Seminar (500), Independent Study (570), Internship (576) and departmental practicum courses may not comprise more than one-third (1/3) of the minimum required credits for a graduate degree.
2. Undergraduate Independent Study (470), Professional Development (588) and Graduate Consultation (589) courses are not allowed on a Program of Study and will not count toward requirements for the degree.
3. Graduate Consultation (589): Registration in ‘Graduate Consultation’ (MSU 589) is permitted only for master’s degree students who have completed all of their coursework (and the thesis or the professional paper) but who need additional faculty or staff time to complete requirements for the degree. Registration in 589 (Consultation) does not count toward meeting degree credit requirements.
4. Special Topics (580): This course may be included in the graduate Program of Study. The total number of Special Topics courses for which a student may register is not limited.
5. Individual Problems (570): A total of four (4) credits of Individual Problems (570) courses may be included in the master’s Program of Study on thesis plans; six (6) credits of Individual Problems may be included in non-thesis plans. Individual Problems (570) courses may NOT be taken as pass/fail.

Foreign Language Requirement
Foreign Language requirements are specific to degree programs.

Master’s Graduate Committee
The master’s committee advises the student on academic matters and is the examining committee for the master’s comprehensive and/or defense-of-thesis examinations.

Committee Composition
A master’s committee is comprised of 3 to 5 faculty members. The chair must be a PhD, tenure track (or tenured) professor from the degree granting department. The majority of the committee should be made up of faculty from the degree granting department, but due to the interdisciplinary nature of many degrees, is not limited to the degree granting department.

The major professor and the department head recommend the committee which must be approved by the Division of Graduate Education on the “Program of Study” or “Change of Committee” forms found at www.montana.edu/wwdgd/pdf_files/GradProg.pdf

Faculty Affiliates and Non-MSU Committee Members
Faculty affiliates, faculty of other institutions and nonacademic experts may serve as additional committee members, but not as committee chair. Committee members not holding faculty status at MSU must submit documentation of their qualifications, including a vita. In some cases, faculty affiliates, faculty of other institutions or nonacademic experts may act as co-chairs of a student’s committee.

Changes to the Committee
The student has the right to make faculty changes in his/her committee. Changes to an existing committee must be made through the “Committee Change” form and approved by the Division of Graduate Education.

Committee Appointment Deadline
The committee must be appointed by the end of the second semester of graduate study. If the committee is not submitted by the end of the student’s second semester of attendance, the student is seen as not making satisfactory academic progress, becomes ineligible for financial aid (including graduate assistantships, student work-study and student labor) and will be placed on college probation.

Program of Study
The graduate committee and the student jointly develop a proposed Program of Study. The Program of Study defines the minimum requirements for the degree. Other requirements as determined by the student’s graduate committee may also be listed.

The Program of Study acts as a contract between the student and the University. It may be amended through the course of the student’s graduate education. Changes to a student’s program of study must be made through the “Change of Program of Study” form and approved by the DGE.
Program Approval
The Program of Study must be approved by the student's committee and department head. Final approval rests with the Division of Graduate Education.

Filing Deadlines
The Program of Study must be submitted on an official 'Program of Study' form to the Division of Graduate Education by the end of the second semester of graduate study. Students failing to submit a program by this date will be seen as failing to achieve satisfactory progress. Consequently, the student becomes ineligible for financial aid (including graduate assistantships, work-study and student labor) and will be placed on college probation. Exceptions to this policy will be granted only for extraordinary reasons.

When filed, attachments to the program must include transcripts of all non-MSU coursework. If the student obtained those required transcripts during the application process, they may be reused for program purposes. Changes in the program must be requested before or during the semester affected. Once a course is taken, it cannot be removed from the program.

Thesis Credit Requirements
1. At least ten (10) thesis credits must be successfully completed for thesis plan programs. An unlimited number of 590 credits may be taken to complete a thesis; however, only ten thesis credits may be applied toward degree requirements. As such, "Plan A" students must include ten thesis credits on the graduate program. The remaining twenty credits (or more as determined by the department) on the graduate Program of Study must be content coursework.
2. Registration in Master's Thesis (590) credits is required during those terms the student is working on the thesis, using faculty time, and in university facilities.
3. When registering for thesis credit, the minimum registration is one (1) credit for a semester.
4. Thesis credits are taken pass/fail only.

Master's Thesis
A thesis, written by the student seeking the degree and based on original research is a requirement for all thesis plan (Plan A) master's degree programs. The thesis is usually the result of research by the candidate and is an original contribution to knowledge.

Committee Composition for Thesis Plan Students
Three members of the student's graduate Committee will be designated to guide the thesis. The graduate advisor is chairperson of the thesis committee.

Submission of the Final Thesis
The thesis must be submitted in final form to the Division of Graduate Education by published deadlines (usually no later than fourteen (14) working days before the end of the term in which graduate work is completed.)

One-Credit Extension
If a thesis is submitted after the published deadline and the student is currently registered for three credits, the student may choose to make all corrections/changes before the first day of the following academic term and be eligible for a one-credit extension for the following term (instead of the mandatory three-credit registration the term of graduation). Students who choose and are eligible for this option, will be certified to graduate the following term. If more time is needed beyond the first day of the following term, the student will be required to register for at least three credits to be eligible for graduation that term.

<table>
<thead>
<tr>
<th>Step</th>
<th>What</th>
<th>Procedure</th>
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<tbody>
<tr>
<td>1.</td>
<td>Pre-application form. If required by the academic department, submit before obtaining application packet.</td>
<td>Send pre-application form to appropriate department.</td>
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<tr>
<td>2.</td>
<td>Graduate Record Examination or alternative</td>
<td>May be required for admission. Take exam at a testing center in your area and have results sent to MSU-Bozeman (code 4488).</td>
</tr>
<tr>
<td>3.</td>
<td>Admission to department and Division of Graduate Education. Per departmental and Division of Graduate Education deadlines.</td>
<td>Request application packet from appropriate department or apply on-line.</td>
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<td>4.</td>
<td>Selection of advisor and committee. By the end of the second semester of registration.</td>
<td>See department head; submit the committee form to the Division of Graduate Education.</td>
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<tr>
<td>5.</td>
<td>Graduate Program of Study. By the end of the second semester of registration.</td>
<td>Consult advisor; submit the program in official format to the Division of Graduate Education.</td>
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<td>6.</td>
<td>Qualifying Examination As required by the department.</td>
<td>Consult and schedule through the academic advisor.</td>
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<tr>
<td>7.</td>
<td>Thesis outline (if thesis option is chosen) As early as possible.</td>
<td>Submit outline to thesis committee for approval.</td>
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<tr>
<td>8.</td>
<td>Application for Advanced Degree Submit on or before the third Friday of the semester of completion of degree requirements.</td>
<td>Complete form obtained from major department.</td>
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<tr>
<td>9.</td>
<td>Final Changes to the Program of Study. Submit on or before the third Friday of the semester of completion of degree requirements.</td>
<td>Submit form to the Division of Graduate Education.</td>
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<tr>
<td>10.</td>
<td>Comprehensive examination. Must be passed at least 14 days before the end of semester in which graduate work is completed.</td>
<td>Make arrangements with advisor.</td>
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<tr>
<td>11.</td>
<td>Defense of thesis. At least 14 days before the end of the semester in which graduate work is completed. Make arrangements with advisor. This examination may be part of the comprehensive examination.</td>
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<tr>
<td>12.</td>
<td>Approval of thesis or professional paper. After the defense-of-thesis examination and at least 14 working days before the end of the semester in which graduate work is completed. Approval by the Graduate Vice Provost.</td>
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</table>
Thesis Approval Requirements

The thesis must meet all requirements set forth in the Division of Graduate Education ‘Guide for Preparation of Theses, Dissertations and Professional Papers’. Final authority for approval or rejection of a thesis or professional paper rests with the Graduate Vice Provost.

The Division of Graduate Education will require all students to submit the electronic version of their thesis or dissertation to the Division of Graduate Education instead of paper copies. These documents will be placed on the internet for worldwide access. Exceptions for reasons that have not been addressed within the Montana State University ETD initiative will be considered on an individual basis. Internet access allows the student’s work to be viewed freely by anyone on the World Wide Web, restricted to only the MSU campus or a mixed restriction (where parts of the student’s thesis or dissertation may not be seen by the World Wide Web or MSU campus because of patent or publishing issues). Students may view the choices for restricting access by reading the Certificate of Approval form at www.montana.edu/etd/submit/ETDApprovalForm.pdf. The ETD initiative also provides students with a unique opportunity to learn more about publishing. Please read about publisher issues at www.montana.edu/etd/PublisherIssues.shtml.

Copy quality, punctuation and spelling, as well as consideration of the subject researched and completeness of the research is the responsibility of the student’s department. The Graduate Vice Provost has authority to deny final approval of the thesis on grounds of unsatisfactory grammar, formatting, or overall quality of the thesis.

Submission of the Thesis to the MSU Library

MSU has the authority to require graduate students to submit the graduate thesis to the MSU Library. The Division of Graduate Education will transmit all theses and dissertations to the MSU Library following approval of the document by the Graduate Vice Provost. A thesis is considered complete when accepted by the Library.

Thesis Patent Policy

Patent requests should be submitted to the U.S. Patent Office well ahead of submission of the thesis to the Division of Graduate Education. If a patent request is submitted late and the contents of the thesis or any part thereof is still in the process of being patented, the student, major professor and department head may submit a written request to the Division of Graduate Education to request withholding of the thesis from the ETD website. This hold may be for a period of not more than six (6) months during which time the patent request may be submitted to the U.S. Patent office. Upon receipt of notice from the Patent Office that the patent request has been received, the department head shall inform the Division of Graduate Education the thesis is to be released for public access on the ETD website.

If the Division of Graduate Education is not notified to release the thesis prior to the expiration of six (6) months, the thesis will automatically be released to the library at that time. Under special circumstances a request for an extension of time may be granted at the discretion of the Graduate Vice Provost. The Division of Graduate Education will make every attempt to keep thesis information confidential.

Application for Advanced Degree

The semester of intended graduation, the student must file an ‘Application for Advanced Degree’ with the Division of Graduate Education. The deadline for filing the application is:

- September 20 for Fall Semester
- February 5 for Spring Semester
- June 10 for Summer Semester

The form is available at www.montana.edu/gradstudies/pdf_files/AppAdvDg.pdf

“One Credit Registration”

If an ‘Application for Advanced Degree’ is submitted after the published deadline and the student is currently registered for three credits, the student may submit the application for graduation for the next term and be eligible for a one credit registration the following term (instead of the mandatory three-credit registration the term of graduation). To be eligible for the one-credit registration, the student must complete all degree requirements before the first day of the subsequent term. The student will be certified to graduate the following term. If more time is needed beyond the first day of the following term, the student will be required to register for at least three credits to be eligible for graduation that term.

For Doctoral Students

Doctor of Philosophy and Doctor of Education

The Doctor of Philosophy degree (Ph.D.) and Doctor of Education (Ed.D) are awarded on evidence of a particular field of knowledge, evidence of ability to carry out independent research, and the ability to present the results of such research in a scholarly manner.

Course and residency requirements are secondary to these objectives, and the degree is not awarded solely for faithfully completing a number of courses over a prescribed period.

The Doctoral Degree Application Process

Application for all doctoral degrees at Montana State University is made using the Division of Graduate Education application. A student who is completing a master’s degree at Montana State University and who wishes to begin a doctoral program in the same department the immediate following term may submit a letter, co-signed by the department head, to the Graduate Vice Provost, requesting permission to continue graduate studies.

The Department of Education requires an entirely new application process for all Ed.D. applicants following completion of the master’s degree. Other departments may exercise this option as well. Please contact the academic department to which you are applying for current procedures.
General Credit Requirements for Doctoral Degrees

All Ph.D. candidates are expected to be familiar with both the Division of Graduate Education and their specific academic college and department degree requirements. All Ed.D. candidates are expected to be familiar with both the Division of Graduate Education and the Department of Education degree requirements.

Minimum Credit Requirement

All students earning a doctoral degree from Montana State University must complete a minimum of 60 credit hours post-baccalaureate, of which 18 – 28 of must be dissertation credits. A maximum of 30 credits from a previously earned master’s degree (from MSU or another accredited University) may be applied toward the 60 credit minimum required for the doctoral degree.

In some departments, a greater number of credits are required. In others, in addition to dissertation/research credits, the satisfactory completion of certain courses is stipulated. The student must check specific departmental requirements.

Course Limitations For Doctoral Degrees

1. Special Topics (580): Credits allowed toward degree requirements for Special Topics (580) courses may not exceed the number defined by each department program.

2. Individual Problems (570): Not more than six credits of Individual Problems (570) courses may be included on a doctoral Program of Study. Individual Problems (570) courses may not be taken pass/fail.

3. Pass/Fail credits: A maximum of three credits (excluding dissertation) may be included on a doctoral Program of Study.

4. Limit on Age of Courses: The age of courses at the time of graduation for a doctoral degree may not exceed 10 years.

5. Courses from a Master’s program: The Graduate 'Program of Study' lists those courses the student’s committee feels are required to earn the doctoral degree.

Courses taken while in a master’s degree program at M.S.U. beyond those listed on the graduate Program of Study, may be used on an additional master’s program or a doctoral program at a later time.

Dissertation Credit Requirements

All Ph.D. candidates are required to register for and complete a minimum of eighteen dissertation (690) credits. Fourteen credits of dissertation (690) are required for Ed.D. candidates. An unlimited number of 690 credits may be taken to finish a dissertation; however, only the eighteen or fourteen (Ed.D.) 690 credits are applicable toward degree requirements.

Foreign Language Requirement

Individual departments determine the language requirement for their graduate programs.

Residence Credit Requirements For Doctoral Degrees

1. A minimum of thirty (30) credits applicable to the degree must be taken from MSU.

2. A student must be registered for a minimum of three (3) credits during the semester of a comprehensive examination, a defense of dissertation, and the semester of graduation.

Doctoral Graduate Committee

The graduate committee advises the student on academic matters and is the examining committee for the comprehensive examination and dissertation defense.

Committee Composition

A graduate committee must include a minimum of four members excluding the Division of Graduate Education-assigned Graduate Representative. Due to the interdisciplinary nature of many degrees the committee does not have to be composed entirely of faculty from the same department. The major professor and the department head recommend the committee which must be approved by the DGE through the Program of Study.

The final member is the Graduate Representative, who is appointed by the Graduate Vice Provost. See "Graduate Representative" below.

The committee must have a majority of tenured or tenure track faculty members from MSU. Exceptions and justification for a waiver from the majority may be requested in writing by the chair of the committee to the DGE. These will be reviewed on a case by case basis.

Committee members not holding faculty status at MSU must submit documentation of their qualifications, including a vita. Non-MSU individuals may not hold positions as committee chairs.

Changes to the Committee

The student has the right to make faculty changes to their committee, using the Change of Committee form. Changes in committee composition may not be made due to examination scheduling problems.

Faculty Affiliates, Faculty of Other Institutions, and Nonacademic Experts

Faculty affiliates, faculty of other institutions, and nonacademic experts may serve as additional committee members, but may not serve as the committee chair.

Committee Size

A maximum committee size is not stipulated. However, students are advised to keep the committee size to a reasonable number.

Deadline to Appoint the Committee

The committee must be selected and appointed no later than the end of the student’s third semester of attendance. If committee appointments are not submitted by the end of the student’s third semester, the student is not seen as making satisfactory progress; s/he becomes ineligible for financial aid (including graduate assistantships, student work-study and student labor) and will be placed on college probation due to lack of identifiable satisfactory progress toward the degree.

Major Professor (Committee Chair)

As early as possible after admission, a student should secure a tenured or tenure-track faculty member to serve as the major professor. This professor is the student’s graduate advisor, chairperson of the student’s gradu-
Vice Provost no later than the third final examination (defense of dissertation). The representative's responsibility

The Graduate Representative

The Division of Graduate Education appoints the Graduate Representative at the time the student submits their Program of Study. The Division of Graduate Education will notify, via e-mail, each committee member of the appointment within three weeks of receiving the proposed committee from the department.

The Graduate Representative's Responsibility

The primary responsibility of the Graduate Representative is to monitor and insure compliance with the policies and procedures of the Division of Graduate Education as well as ensure that committee meetings are conducted in a fair and satisfactory manner. The Graduate Representative is to be advised of all committee meetings and is encouraged to attend these meetings.

The Graduate Representative must attend the oral comprehensive and final examination (defense of dissertation). Written examinations are also to be made available to the Graduate Representative who must attend any committee meeting(s) held to discuss an examination or the results of an examination(s). At examinations that are open to faculty, the Graduate Representative has the same privileges to question and comment that are accorded to any other faculty member.

Graduate Representative's Responsibility to File Exam Report

Within five days after the examination, the Graduate Representative must file a brief written report with the DGE regarding the examination, stating whether it was conducted in a fair and satisfactory manner. Comments may also be made regarding the candidate's performance. DGE will carefully consider any written suggestions submitted by the Graduate Representative.

Identifying a Replacement Graduate Representative

The student and the student's advisor are responsible for arranging meeting times that allow the Graduate Representative to attend. If illness or some other emergency will prevent the Graduate Representative from attending an examination, that individual is responsible for identifying a suitable replacement. If the Graduate Representative is unable to find his/her own substitute, then the chair of the committee may find a replacement. However, the Division of Graduate Education must be notified of any substitutions before the examination is held in order to approve the replacement Graduate Representative. In cases where a substitute Graduate Representative is not approved by the Division of Graduate Education, the exam must be postponed and rescheduled.

Examinations held in the absence of the graduate representative or a previously approved substitute will be considered invalid and will have to be repeated.

Doctoral Graduate Program of Study

The student's graduate committee and the student complete a Program of Study that lists those courses that are required to earn the doctoral degree. It is not unusual for students to take classes beyond those listed on their Program of Study; however, courses used on a Program of Study to meet the degree requirements for a particular degree may not be used on a new Program of Study to be applied towards an additional graduate degree (master's or doctoral). Transcripts of all transfer course work must be submitted with the Program of Study or when the student completes the course. If the student submitted those transcripts during the application process, the Division of Graduate Education will reuse the transcript for program auditing purposes.

Program Approval

The Program of Study must be approved by each committee member, who will indicate approval by signature on the Program of Study form. Final approval for the Program of Study rests with the DGE.

Filing Deadlines

A Program of Study must be submitted on official forms to the DGE by the end of the third semester of attendance. If a student's Program of Study has not been submitted by the end of the student's third semester of attendance at MSU, they become ineligible for financial aid (including graduate assistantships, student work-study and student labor), and will be placed on college probation for failing to make satisfactory progress toward the degree. Exceptions to this policy will be granted only for extraordinary reasons.

Filing Final Program Changes

The deadline for filing final changes in a graduate Program of Study is the submission date for filing an Application for Advanced Degree.

Doctoral Dissertation

A dissertation is required for doctoral degrees. The dissertation must embody the results of extended research by the doctoral student, be an original contribution to knowledge, and include new material worthy of publication.

An outline or proposal for the doctoral dissertation should be submitted to and approved by the student's graduate committee as early as possible. The final dissertation must be presented in an acceptable form and defended to the student's graduate committee not later than five years after successful completion of the Comprehensive Examination.
When to Register for Dissertation (690) Credits
Registration in appropriate 690 (Doctoral Dissertation) courses is required during those terms when the student is working on the dissertation, using faculty time or university facilities.

Submission of the Final Dissertation
The dissertation must be submitted as an electronic dissertation, in final form to the Division of Graduate Education not later than 14 working days before the end of the term in which graduate work is completed. The dissertation must meet all the requirements set forth in the most current Division of Graduate Education 'Guide for Preparation of Theses, Dissertations and Professional Papers.' Final authority for approval or rejection of the dissertation rests with the DGE.

Dissertation Quality
Printable quality, proper use of the English language, punctuation and spelling, as well as consideration of the subject researched, completeness of the research and overall, scholarly quality of the final product will be the responsibility of the student's department.

Final Dissertation Approval
Approval of the dissertation will be defined by the signature of the Graduate Vice Provost only after the dissertation has been judged to meet all expectations. A dissertation is considered completed when accepted by the MSU Library in an electronic format. MSU has the authority to require graduate students to submit the graduate dissertation to the MSU Library and to UMI for microfilming. Therefore, graduate students should submit a final electronic copy of the dissertation to the Division of Graduate Education following ETD (Electronic Theses and Dissertations) guidelines.

Qualifying Examination
A qualifying exam is sometimes required for doctoral students to test the student's preparedness. The student usually takes the examination during the first year of residence. If it is failed, the student must meet specific requirements made by the committee to continue in the doctoral program. See Examinations at ./cat_doctoral_exams.shtml.

Doctoral Comprehensive Examination
The Comprehensive Examination is the major academic examination during doctoral study that assures that the graduate student has attained suf-

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<td>Take exam at the designated testing center in your area and have results sent to MSU-Bozeman (code 4488).</td>
</tr>
<tr>
<td>3. Admission to degree program and the Division of Graduate Education</td>
<td>Per departmental deadlines.</td>
<td>Request application packet from appropriate department or apply online.</td>
</tr>
<tr>
<td>4. Qualifying examination.</td>
<td>If required, during the first year.</td>
<td>If required, will be arranged by the major department.</td>
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<td>5. Selection of major professor and advisory committee.</td>
<td>As early as possible, but not later than the end of the third semester of registration.</td>
<td>See department head; submit the committee form to the Division of Graduate Education.</td>
</tr>
<tr>
<td>6. Program of Study.</td>
<td>By the end of the third semester of registration.</td>
<td>Consult major professor; submit the program in official format to the Division of Graduate Education.</td>
</tr>
<tr>
<td>7. Foreign Language.</td>
<td>If required, as early as possible.</td>
<td>See department head.</td>
</tr>
<tr>
<td>9. Comprehensive examination.</td>
<td>After at least two-thirds of the content coursework has been completed. Doctoral students usually sit for the comprehensive exam near the end of their 'content' coursework.</td>
<td>Make arrangements with major professor.</td>
</tr>
<tr>
<td>10. Application for Advanced Degree.</td>
<td>Submit on or before the third Friday of the semester of completion of degree requirements.</td>
<td>Complete form obtained from major department.</td>
</tr>
<tr>
<td>11. Final changes in program.</td>
<td>Submit on or before the third Friday of the semester of completion of degree requirements.</td>
<td>Submit form to the Division of Graduate Education.</td>
</tr>
<tr>
<td>12. Defense of dissertation.</td>
<td>When the dissertation is complete, but not more than five years after passing the comprehensive examination. Must be passed at least 14 days before the end of the semester in which graduate work is completed.</td>
<td>Make arrangements with major professor. Be sure examination is announced in the What's New Bulletin in the Division of Graduate Education web pages.</td>
</tr>
<tr>
<td>13. Approval of dissertation.</td>
<td>After the defense and at least 14 working days before the end of semester in which graduate work is completed.</td>
<td>Approval by the Graduate Vice Provost.</td>
</tr>
</tbody>
</table>
efficient mastery of the degree discipline. Students are expected to have sufficient knowledge of pertinent literature, and the capability to conduct research sufficiently for a doctoral dissertation. See Doctoral Comprehensive Examinations at /cat_doctoral_exams.shtml#comp.

Defense of Dissertation
All doctoral students must complete a defense of the dissertation to graduate with a doctoral degree. This is the culminating examination of the student's doctoral career and is an assessment of the student's knowledge and their doctoral research.

Application for Advanced Degree
Students expecting to receive a doctoral degree must file an 'Application for Advanced Degree' with the Division of Graduate Education for the intended semester of completion. The deadline for filing the application is on or before September 20 for Fall Semester, February 5 for Spring Semester, and June 10 for Summer Semester. If a student fails to meet semester deadlines, they must file an Application for Advanced Degree the next semester in which they expect to graduate.

'One Credit Registration'

If the dissertation is submitted after the published deadline and the student is currently registered for three credits, the student may choose to make all corrections/changes before the first day of the following academic term and be eligible for a one-credit registration the following term (instead of the mandatory three credit registration the term of graduation). Students who choose and are eligible for this option will be certified to graduate the following term. If more time is needed beyond the first day of the following term, the student will be required to register for at least three credits to be eligible for graduation that term.

Eligibility to Participate in Commencement
Montana State University allows only those graduate students who have completed all requirements for the degree (including all coursework, examinations, and final papers including approval of the thesis or dissertation by the Graduate Vice Provost) and who have applied to graduate by the deadline to participate in commencement exercises. Graduate students who will finish the degree the following August may walk through the May ceremonies only if they are utilizing the one credit extension and have documentation from their major advisor of the student's assured completion of degree requirements by the one credit extension deadline.

Students who are unable to attend commencement must make special arrangements with the Registrar to have their diplomas mailed to them. Students who participate in commencement must purchase academic robes and hoods. These may be purchased from the MSU Bookstore, usually in February.

Satisfaction of Financial Obligations
All candidates for degrees must fully satisfy their financial obligations to the University (or make arrangements with MSU for doing so) as a condition for completing their degree programs. Candidates failing to comply with this requirement shall not be eligible for graduation, diplomas, degrees or any transcripts of their records.

Commencement Book
Students listed in Montana State University's commencement book are those candidates who have identified themselves as eligible to graduate. The degree will not be awarded until all requirements for the advanced degree are met and the candidate has been certified to graduate by the Division of Graduate Education. Being listed in the commencement book does not imply completion of the degree.

Research at Montana State University
Research is one of the fundamental building blocks of the majority of the graduate work conducted at Montana State University. Most of the graduate degrees awarded require students to conduct original research which is then presented in theses, dissertations, or published articles. The Division of Graduate Education is fortunate to be associated with a number of outstanding research centers and programs on the Bozeman campus and beyond. The availability of faculty and facilities through the various centers and programs allows graduate students the opportunity to conduct the high level, in depth investigation of their subject of interest. The Research, Creativity & Technology Transfer website can be found at http://www.montana.edu/wwwvt.

Brief descriptions of MSU's Research Centers & Programs are available through the Research Creativity and Technology Transfer web site at www.montana.edu/wwwvt/centers_programs.html.

Electronic Theses and Dissertations (ETDs):
- Students have had the option to post their theses and dissertations on the world wide web http://etd.lib.montana.edu/etd/view/ since Fall 2003. The Division of Graduate Education highly recommends that students submit their work in the electronic format for possible posting on the world wide web. The ETD initiative web site is at www.montana.edu/etd/.
- Complete copies of all MSU dissertations produced since 1996 are available in electronic format from http://wwwlib.umi.com/cr/montana/main/. This service is only available from computers with an appropriate MSU IP address.

Graduate Assistantships & Employment
Teaching and research assistantships are available in many academic departments. Prospective graduate students should contact their department of choice for information regarding assistantship availability. Non-degree gradu-
ate students are not eligible for graduate assistantships or tuition waivers. Graduate Assistantship Appointment Forms do not constitute a contract of employment. Final appointment and continuation authority resides with the Division of Graduate Education.

Academic Year Guidelines:
- Graduate assistants must be registered for 3 credits by the 20th of the month that they are appointed as a GRA or GTA in order to receive a paycheck the following 11th payday.
- Graduate Assistants may work a maximum of 20 hours per week during Fall and Spring semester.
- All GTAs and GRAs must carry a minimum of three (3) credits during each semester they receive an assistantship.
- Graduate assistants may enroll in no more than twelve (12) semester credits if appointed to work more than fifteen (15) hours per week.
- Graduate assistants may enroll in up to fifteen (15) semester credits if appointed to work fifteen (15) or fewer hours per week.

Summer Guidelines:
- GRAs and GTAs must enroll in a minimum of one (1) credit during the summer.
- Summer Graduate Assistants appointed as GRAs and GTAs may work up to 40 hours per week provided that they take a minimum of one (1) credit and no more than three (3) credits.
- Summer Graduate Assistants appointed as GRAs and GTAs may work up to 20 hours per week if enrolled in four (4) to twelve (12) credits.

Graduate Teaching Assistants (GTA)
Graduate Teaching Assistants are those graduate students who are involved in instruction, usually of undergraduates. Qualified GTAs perform instructional duties in an area of their expertise, most often within their home departments, although qualified GTAs may perform teaching duties outside their departments.

General Duties Include:
- Actual instruction in a classroom setting.
- Instruction in recitation sections.
- Conducting help sessions and holding office hours to advise students on class assignments.
- Assisting with laboratory setup.
- Grading papers, exams, laboratory reports, and homework, and
- Other duties pertaining to the instructional mission of MSU.

MSU faculty members oversee all GTA teaching duties. GTAs are usually assigned to work from 15 to 20 hours per week.

GTA Requirements for International Graduate Students
- The student must earn the minimum scores outlined below.
- The department also must certify that it has evaluated each student's ability to successfully carry out teaching assignments.

Minimum Scores
1. International students must also meet the minimum score requirements for the TOEFL as listed below:
   a. Classroom teaching in charge of a class or section:
      - 580 paper-based test or
      - 237 computer-based test or
      - 93 internet based test or
      - 7.0 IELTS total band score.
   b. Lab assistant or discussion leader with another qualified GTA, or with a regular faculty member present in the classroom:
      - 555 paper-based test or
      - 225 computer-based test or
      - 86 internet based test or
      - 7.0 IELTS total band score.
   c. Test/paper grader, assisting with lab set up, or other non-student contact duties:
      - 550 paper-based test or
      - 213 computer-based test or
      - 80 internet based test or
      - 7.0 IELTS total band score

2. International students must meet minimum TSE/SPEAK scores:
   a. Classroom teacher in charge of a class or section; lab assistant or discussion leader with another qualified GTA, or regular faculty member present in the classroom:
      - 50 TSE/SPEAK score or
      - 26 internet based test or
      - 7.0 IELTS total band score.
   b. Test/paper grader or performance of other non-student contact duties:
      - 45 TSE/SPEAK score or
      - 26 internet based test or
      - 7.0 IELTS total band score.

GTA Tuition Waivers
- Tuition Waivers do not waive the various fees attached to a student's tuition and fee statement.
- GTA tuition waivers are available on a limited basis, and eligibility does not guarantee a tuition waiver.
- The Division of Graduate Education is in no way obligated to award tuition waivers based on promises made by departments.

Requirements & Deadlines for Submission of Tuition Waiver Requests
- By the 10th class day of each semester students:
  - Must be registered for a minimum of 3 credits.
  - Must confirm attendance with student accounts, http://www.montana.edu/wwbu/studentaccts.html
  - Must be appointed as a GTA.

Late Awarding and Retroactive Waivers
- Tuition waivers awarded after the tenth class day are not guaranteed, and students may have to pay full tuition.
- Retroactive tuition waivers are neither permitted nor granted.
- MSU reserves the right to bill the student for the amount of the waiver when GTA assistantship appointments are cancelled after the 10th day of instruction.
Graduate Research Assistants (GRAs)

Research conducted by Graduate Research Assistants (GRAs) is a significant portion of the total sponsored research at MSU. GRAs often conduct research in a relevant area of their major course of study under the direction of a faculty member. GRAs are expected to work 15 to 20 hours per week.

The research is usually a component of the faculty advisors research that is directly supported by external funding. GRAs are generally expected to carry out a specific research project which often forms the basis for a thesis or dissertation.

General Duties Include:
- Performing experiments, calculations, and analyzing the results and disseminating new knowledge orally or in written publications
- Reflecting on the state of the field and proposing new research problems
- Attending conferences to present results and collaborate with other researchers
- Training and supervising less experienced research personnel.

Other Graduate Employment Options

Employment Authorization Form Required

Graduate students may also hold employment in other capacities (i.e., student employment such as custodial, cafeteria help, tutoring, as well as classified, professional or adjunct positions). Any non-assistantship position must be approved by the Division of Graduate Education (DGE) prior to accepting employment.

An individual who comes to MSU as a student may be employed primarily through a graduate teaching or research assistantship. However, students may also work as a student employee (through any combination of payroll types) at Residence Life, University Food Services, ASMSU Tutoring, or apply for classified, professional and adjunct positions. For this type of employment, a DGE Employment Authorization Form must be submitted with approval from the student's advisor and the Division of Graduate Education. Graduate students may not be employed for more than 20 hours per week cumulatively for all forms of employment on campus.

All student employment for graduate students must be approved through the Division of Graduate Education.

Ethical and Professional Standards: Consensual Relationships

Faculty, administrators, supervisors, and others in positions of authority shall take care to maintain the highest ethical and professional standards in their interactions with students and employees.

For more information, contact the Affirmative Action office.