### ACADEMIC CALENDAR

See semester schedule of classes for more specific information on the academic calendar.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Summer Session</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-2011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orientation and Registration</td>
<td>May 17</td>
<td>Aug. 25-29</td>
<td>Jan. 10-11</td>
</tr>
<tr>
<td>Classes Begin</td>
<td>May 17</td>
<td>Aug. 30</td>
<td>Jan. 12</td>
</tr>
<tr>
<td>Memorial Day</td>
<td>May 31</td>
<td></td>
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</tr>
<tr>
<td>Independence Day Observed</td>
<td>July 5</td>
<td></td>
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</tr>
<tr>
<td>Labor Day</td>
<td></td>
<td>Sept. 6</td>
<td></td>
</tr>
<tr>
<td>Election Day Holiday</td>
<td></td>
<td>Nov. 2</td>
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<tr>
<td>Veterans Day Holiday</td>
<td></td>
<td>Nov. 11</td>
<td></td>
</tr>
<tr>
<td>Thanksgiving Holiday</td>
<td></td>
<td>Nov. 24-26</td>
<td></td>
</tr>
<tr>
<td>Martin Luther King Holiday</td>
<td></td>
<td>Jan. 17</td>
<td></td>
</tr>
<tr>
<td>Presidents' Day Holiday</td>
<td></td>
<td>Feb. 21</td>
<td></td>
</tr>
<tr>
<td>Spring Break</td>
<td></td>
<td>March 14-18</td>
<td></td>
</tr>
<tr>
<td>University Day Holiday</td>
<td></td>
<td>April 22</td>
<td></td>
</tr>
<tr>
<td>Finals Week</td>
<td></td>
<td>Dec. 13-17</td>
<td>May 2-6</td>
</tr>
<tr>
<td>Semester Ends</td>
<td>Aug. 6</td>
<td>Dec. 17</td>
<td>May 6</td>
</tr>
<tr>
<td>Commencement</td>
<td></td>
<td></td>
<td>May 7</td>
</tr>
</tbody>
</table>

| 2011-2012     |                |               |                 |
| Orientation and Registration | May 16 | Aug. 24-26 | Jan. 9-10 |
| Classes Begin | May 16 | Aug. 29 | Jan. 11 |
| Memorial Day Holiday | May 30 | | |
| Labor Day Holiday | | Sept. 5 | |
| Independence Day Observed | July 4 | | |
| Veterans Day Holiday | | Nov. 11 | |
| Thanksgiving Holiday | | Nov. 23-25 | |
| Martin Luther King Holiday | | Jan. 16 | |
| Presidents' Day Holiday | | Feb. 13 | |
| Spring Break | | March 12-16 | |
| University Day Holiday | | April 6 | |
| Finals Week | | Dec. 12-16 | April 30-May 4 |
| Semester Ends | Aug. 5 | Dec. 16 | May 4 |
| Commencement | | | May 5 |

### IMPORTANT NOTICE TO ALL STUDENTS

The following information pertains to student and institutional rights and responsibilities under this catalog:

This general catalog is published biannually by Montana State University as a guide for students, faculty and others interested in the institution. Students are expected to be familiar with all University regulations and information set forth in this publication or any amendment to or modifications thereof.

Montana State University places full responsibility upon the student for registering for the proper courses and for fulfilling all requirements for a degree as set forth in this catalog, as amended from time to time. No agent or employee of the University has the authority to warrant graduation, the attainment of any type of license, or attainment of any other career goal. The institution does not accept any responsibility for delays in graduation or attainment of career goals resulting from errors in registration, cancelled courses, time schedule changes, changes in degree requirements, or similar related changes; or for errors resulting from consultation with and reliance upon any information acquired from and University employee, Advisor’s signatures on preregistration, drop-add or similar cards or forms do not necessarily indicate agreement with or approval of the student’s choice of courses nor may they be construed in any way as a warranty that the student’s choice of courses is sufficient for graduation or attainment of any career goals.
The most current and therefore most accurate version of this catalog is available on the Montana State University Web site at: http://www.montana.edu/wwwcat/

Montana State University is accredited by the Northwest Commission on Colleges and Universities, an institutional accrediting body recognized by the Council for Higher Education Accreditation and the U.S. Department of Education.

www.nwccu.org

Effective Fall Semester 2010
ON JANUARY 21, 1994, the Montana Board of Regents voted unanimously to restructure the Montana University System. Under the plan, the (now) Montana State University campuses in Billings, Great Falls and Havre were administratively joined with the Bozeman campus.

Since the consolidation, the MSU campuses have emphasized course transferability, sharing resources, telecommunications, and providing more and better services to students everywhere. In recent years, the MSU-Great Falls College of Technology has begun to offer developmental coursework and two-year programs in Bozeman.

This catalog is specific to Montana State University–Bozeman. For additional information, please contact:
IMPORTANT UNIVERSITY POLICIES

Equal Opportunity/
Affirmative Action Policy

University Policy

Montana State University does not discriminate on the basis of race, color, national origin, sex, sexual preference, marital status, age, religion, creed or political belief, mental or physical handicap or disability, or status as a Vietnam era or disabled veteran in admission, access to, or conduct of its educational programs and activities nor in its employment policies and practices.

Montana State University is committed to providing a working environment for all employees and an educational environment for all students that supports and rewards career and academic goals on the basis of ability and work or academic performance. Harassment based on race, color, national origin, religion, sex, gender, sexual orientation, age or disability is a form of discrimination and is prohibited.

The University is committed to a program of affirmative action in the recruitment, hiring, training, and promotion of persons in all classes of employment to help overcome the present effects of past discrimination and prevent underutilization of qualified women and minorities, persons with disabilities, Vietnam era and disabled veterans. In addition, Montana State University assumes particular responsibility for providing opportunities for education and training for the state’s Native American peoples in the various disciplines and professions that are characteristic of this land-grant university. The University’s Affirmative Action Plan is available in the Human Resources/Affirmative Action Office.

Employees or students who commit or supervises who knowingly condone or fail to report incidents of discrimination are subject to disciplinary actions when instances of discrimination are identified and confirmed. Knowingly filing false complaints of discrimination or knowingly providing false testimony will likewise result in disciplinary or corrective action when instances of such conduct are identified and confirmed.

Retaliation against persons who file complaints or serve as witnesses is also a violation of laws prohibiting discrimination and will lead to appropriate disciplinary action against offenders.

Montana State University affords any student, employee, applicant for employment or admissions, or person who believes he or she was discriminated against by the University, the right to file a grievance on grounds of discrimination. As a condition of their employment and enrollment, employees and students are expected to cooperate in formal investigations of complaints of discrimination. Failure to cooperate will result in disciplinary action.

Continued on page iv.
Complaints of discrimination, including harassment on the basis of race, color, national origin, sex, gender, sexual orientation, religion, age or disability should be reported to the Human Resources/Affirmative Action Office.

Sexual Harassment and Sexual Intimidation

Sexual harassment includes unwelcome sexual advances, requests for sexual favors, or other verbal or physical conduct of a sexual nature when:
- Submission to such conduct is made implicitly or explicitly as a term or condition of an individual’s employment or education,
- Submission to or rejection of such conduct is used as a basis for employment or educational decisions, or
- Such conduct has the purpose or effect of unreasonably interfering with an individual’s work or academic performance or of creating an intimidating, hostile, or offensive environment.

Sexual intimidation includes any unreasonable behavior, verbal or nonverbal, which has the effect of subjecting members of either sex to humiliation, embarrassment, or discomfort because of their gender.

Sexual harassment is a form of sex discrimination and is prohibited by state and federal non-discrimination laws. Sexual intimidation in education is prohibited by state rules.

Sexually Explicit Materials in the Workplace

In keeping with the University’s policy on sexual harassment, Montana State University desires to create a working environment for employees and a learning environment for students which is free of sexual harassment and intimidation. Materials such as calendars, posters, post cards, photography and cartoons that contain sexually explicit images or language can create an intimidating, hostile or offensive environment and may subject persons of either sex to humiliation, embarrassment or discomfort because of their gender. Such materials are inappropriate and should be removed from the workplace.

This policy applies to space provided by the University such as offices, shops, classrooms, hallways, lounges and study carrels.

This policy does not apply to: (1) libraries, resource rooms, research collections; (2) materials related to course content or assignments used in the educational setting; (3) displays and exhibits in galleries and museums or (4) private rooms or family housing units rented from the University.

Consensual Relationships

A consensual romantic relationship in which one party is in a position to evaluate the work of the other is a potential conflict of interest. When such a potential conflict of interest results between employees or an employee and a student, the employee(s) shall disclose the potential conflict of interest to his or her supervisor. The supervisor and the employee shall take steps to ensure that there is no conflict of interest.

The employee’s failure to disclose such a potential conflict of interest may require appropriate resolution.

Accommodation for Persons with Disabilities

The University is committed to the elimination of disability-based discrimination against qualified persons with disabilities and will make appropriate reasonable accommodation for any known disability that interferes with an applicant’s ability to compete in a selection process, an employee’s ability to perform the essential functions of a job, a student’s ability to meet the essential requirements of an academic program, or a person’s ability to benefit from a University service or participate in a University sponsored or hosted event.

All applicants, employees, students or participants, including those with disabilities, are expected to be able to perform the essential functions of the position or program, with or without reasonable accommodation.

It is the responsibility of the applicant, employee, student or participant with a disability to inform the appropriate person, as indicated below, that an accommodation is needed.

1. To request accommodation in a job application or interview process, contact:

   The hiring authority or chair of the search committee of the search, as indicated on the vacancy announcement; Employee Relations and Services (406) 994-3583; if the position is for classified employment, or Human Resources/Affirmative Action (406) 994-2042; if the position is for faculty or contract professional employment.

2. To request accommodation in employment, including concerns about job duties, contact the direct supervisor.

3. To request accommodation when applying for admission to the University, contact:

   The Director of New Student Services, (406) 994-2452, if applying for undergraduate admission; the Dean of Graduate Studies, (406) 994-4145, if applying for graduate admission.

4. To request accommodation when applying for housing or to request housing accommodation, contact:

   Residence Life and University Food Service (406) 994-2661, TDD (406) 994-5808, if applying for housing in the residence halls; Family Housing (406) 994-3730, TDD (406) 994-5808, if applying for family or graduate housing.

5. To request accommodation related to an academic program or requirement, class, or other educational opportunity or activity, contact:

   The Office of Disabled Student Services, Room #155, Strand Union Building, (406) 994-2824. A student who desires accommodation for a disability must submit appropriate documentation of the disability and request for accommodations to this address.

6. To request public accommodation or accommodation to participate in a university sponsored or hosted event, contact:

   Event sponsor or the University Compliance Officer (406) 994-2042.

University Compliance Officer

The person responsible for the University’s compliance efforts is:

Marjorie Brown
Human Resources/
Affirmative Action Director
Suite 7, Hamilton Hall
Montana State University
Bozeman, MT 59717-2430

Phone: (406) 994-2042
Fax: (406) 994-7999
### TELEPHONE NUMBERS

**Area Code 406**

If dialing from an on-campus phone, “994” should be excluded.

Numbers for academic departments are listed with their course descriptions.

**MSU-Billings**

<table>
<thead>
<tr>
<th>Department</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissions and Records</td>
<td>657-2158</td>
</tr>
<tr>
<td>Chancellor</td>
<td>657-2300</td>
</tr>
<tr>
<td>Academic Vice Chancellor</td>
<td>657-2155</td>
</tr>
<tr>
<td>Facilities Services</td>
<td>657-2306</td>
</tr>
<tr>
<td>Financial Aid</td>
<td>657-2188</td>
</tr>
<tr>
<td>Graduate Studies and Research</td>
<td>657-2238</td>
</tr>
<tr>
<td>Library</td>
<td>657-2262</td>
</tr>
<tr>
<td>Life-Long Learning</td>
<td>896-5890</td>
</tr>
<tr>
<td>Students Affairs/Vice Chancellor</td>
<td>657-2307</td>
</tr>
<tr>
<td>University Relations</td>
<td>657-2266</td>
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</tbody>
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**MSU-College of Technology-Great Falls**

<table>
<thead>
<tr>
<th>Department</th>
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</thead>
<tbody>
<tr>
<td>Administration</td>
<td>771-4305</td>
</tr>
<tr>
<td>Admissions and Registrar</td>
<td>771-4420</td>
</tr>
<tr>
<td>Business and Finance</td>
<td>771-4321</td>
</tr>
<tr>
<td>Community and Continuing Education</td>
<td>771-4300</td>
</tr>
<tr>
<td>Distance Education Coordinator</td>
<td>771-4444</td>
</tr>
<tr>
<td>Financial Aid</td>
<td>771-4334</td>
</tr>
<tr>
<td>Public Relations</td>
<td>771-4314</td>
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</tbody>
</table>

**MSU-Northern (Havre)**

<table>
<thead>
<tr>
<th>Department</th>
<th>Phone Number</th>
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<tbody>
<tr>
<td>Chancellor</td>
<td>265-3720</td>
</tr>
<tr>
<td>Academic Affairs, Vice Chancellor</td>
<td>265-3726</td>
</tr>
<tr>
<td>Academic and Student Affairs</td>
<td>265-3509</td>
</tr>
<tr>
<td>Administration, Vice Chancellor</td>
<td>265-3509</td>
</tr>
<tr>
<td>Extended University</td>
<td>265-3730</td>
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<tr>
<td>Graduate Studies</td>
<td>265-3738</td>
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<tr>
<td>Library</td>
<td>265-3706</td>
</tr>
<tr>
<td>Registrar</td>
<td>265-3703</td>
</tr>
<tr>
<td>University Relations</td>
<td>265-3727</td>
</tr>
</tbody>
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**Academic Affairs**

- 212 Montana Hall
- Administration and Finance . 994-4361
- 201 Montana Hall
- Admissions . 994-2452
- 201 Strand Union Building
- Affirmative Action/Human Resources . 994-2042
- Suite 7, Hamilton Hall
- Agricultural Experiment Station . 994-3681
- 202 Linfield Hall
- Agriculture, College of . 994-3681
- 202 Linfield Hall
- Alumni Relations . 994-2401
- Foundation/Alumni Center, 11th Ave. and Lincoln St.
- Arts and Architecture, College of . 994-4405
- 217 Cheever Hall
- ASK US Information Center . 994-4636
- 280A Strand Union Building
- ASMSU . 994-2933
- 281 Strand Union Building
- ASMSU Day Care Center . 994-4370
- 1295 W. Garfield St.
- Athletics . 994-4221
- 206 Fieldhouse
- Bookstore . 994-2811
- 185 Strand Union Building
- Business, College of . 994-4423
- 412 Reid Hall
- Career Services . 994-4353
- 125A Strand Union Building
- Communications and Public Affairs . 994-4571
- 106 Montana Hall
- Conference Services . 994-3081
- 280F Strand Union Building
- Counseling and Psychological Services . 994-4531
- 211 Swingle Health Center
- Disability, Re-entry, and Veteran’s Services . 994-2824
- 155 Strand Union
- Development, College of ... . 994-4133
- 250 Reid Hall
- Engineering, College of . 994-2727
- 212 Roberts Hall
- Extended University . 994-6550
- 128 EPS Building
- Extension Service . 994-1750
- 203 Culbertson Hall
- Facilities Services . 994-2001
- Physical Plant, 5. 6th Ave. and Grant St.
- Family Housing . 994-3730
- Financial Aid Services . 994-2845
- 135 Strand Union Building
- Foundation, MSU . 994-2053
- Foundation/Alumni Center, 11th Ave. and Lincoln St.
- Graduate Education, Division of . 994-4145
- 108 Montana Hall
- Health Service . 994-2311
- 121 Swingle Health Center
- Honors Program . 994-4110
- 106D Quad D
- HR – Personnel and Payroll Services . 994-3651
- 19 Montana Hall
- Information Technology Center . 994-3042
- 49 Renne Library
- International Programs . 994-7150
- 400 Culbertson Hall
- KGLT Radio . 994-3001
- 325 Strand Union Building
- KUSM Television . 994-3437
- 183 Visual Communications Building
- Letters and Science, College of . 994-4288
- 201 Montana Hall
- Library . 994-3199
- Museum of the Rockies . 994-2251
- 600 W. Kagy Blvd.
- Native American Studies . 994-3881
- 2-179 Wilson Hall
- Nursing, College of . 994-3783
- 115 Sherrick Hall
- Orientation Office . 994-2827
- 201 Strand Union Building
- Outdoor Recreation Center . 994-3621
- SOB Barn
- Parent/Family Association . 994-2502
- 106 Montana Hall
- Police, Campus . 994-2121
- Huffman Building
- Post Office, Campus . 994-2672
- Culbertson Hall
- President’s Office . 994-2341
- 211 Montana Hall
- Provost . 994-4371
- 212 Montana Hall
- Recreational Sports and Fitness . 994-5000
- 104 Romney Gym
- Registrar . 994-2601
- 101 Montana Hall
- Research, Creativity and Technology Transfer . 994-2891
- 207 Montana Hall
- Residence Life and Food Services . 994-2661
- 31 Hedges Complex
- Strand Union Bldg. Information . 994-3082
- Student Activities Office . 994-3591
- 282 Strand Union Building
- Student Affairs . 994-2828
- 120 Strand Union Building
- Student Employment Office . 994-5859
- 125A Strand Union Building
- Summer Session . 994-7136
- 318 Montana Hall
- University Business Services . 994-1991
- 102 Montana Hall
- University Police . 994-2121
- Huffman Building
- University Studies . 994-3532
- 418 Reid Hall
- Women’s Center . 994-3836
- 15 Hamilton Hall
- WWAMI/Division of Health Services . 994-4411
- 308 Leon Johnson Hall
### Board of Regents of Higher Education

Governor Brian Schweitzer, ex officio member  
Denise Juneau, Superintendent of Public Instruction, ex officio member  
Sheila Steinruck, Commissioner of Higher Education, ex officio member  
Lynn Morrison-Hamilton, Havre  
Stephen Barrett, Bozeman  
Todd Buchanan, Billings  
Clayton Christian, Missoula  
Angela McLean, Anaconda  
Janine Pease, Billings  
Student Regent

### Local Executive Board

Jay Bentley, Bozeman  
Bill Bryan, Bozeman

### Central Administration

**President's Office**  
Waded Cruzado, Ph.D., President of Montana State University  
Rolf Groseth, Ph.D., Vice President for Inter-Campus Affairs  
James Rimpau, Ph.D., Vice President for Planning and Analysis and Chief Information Officer  
Henrietta Mann, Ph.D., Special Assistant to the President

**Academic Affairs**  
Joseph Fedock, Ph.D., Interim Provost and Vice President for Academic Affairs  
Douglas Steele, Ph.D., Vice Provost and Director of Extension  
Gregory Young, D.M.A., Vice Provost for Undergraduate Education  
Jeff Adams, Ph.D., Assistant Vice Provost for Undergraduate Education  
Norman Peterson, Ph.D., Vice Provost for International Education  
Jane Shelby, Ph.D., Executive Director of Health Services

**Student Success**  
Allen Yarnell, Ph.D., Vice President for Student Affairs  
Glenn Puffer, Ed.D., Associate Dean of Students  
Erika Swanson, B.S., Assistant Dean of Students  
Erin McDonald-Peck, M.Ed., Assistant Dean of Greek Life

**Research and Creative Activities**  
Thomas McCoy, Ph.D., Vice President for Research, Creativity and Technology Transfer  
Leslie Schmidt, B.S., Assistant Vice President for Research, Creativity and Technology Transfer

**Administration and Finance**  
Craig Roloff, M.Ed., Vice President for Administration and Finance  
Robert Lashaway, B.A., Associate Vice President for University Services  
Laura Humberger, B.S., C.P.A., Assistant Vice President for Financial Services

### Colleges

**Agriculture**  
Jeffrey Jacobsen, Ph.D., Dean and Director  
Robert Gough, Ph.D., Associate Dean for Academic Programs

**Arts and Architecture**  
Susan Agee-Kippenhan, M.F.A., Dean  
Heather Bentz, B.A., Assistant Dean

**Business**  
Dan Moshari, Ph.D., Dean  
Bruce Raymond, Ph.D., Associate Dean of Administration and Finance  
Christine Lamb, Ed.D., Assistant Dean  
Susan Dana, J.D., Associate Dean of Academic Affairs, Director of Bracken Center

**Education, Health and Human Development**  
Larry Baker, Ed.D., Dean  
Jill Thornogren, Ph.D., Associate Dean

**Engineering**  
Robert Marley, Ph.D., Dean  
Anne Camper, Ph.D., Associate Dean for Research and Graduate Studies  
Heidi Sherick, M.S., Assistant Dean

**Letters and Science**  
Paula Lutz, Ph.D., Dean  
Adele Pittendrigh, M.A., Associate Dean  
Melody Zajdel, Ph.D., Associate Dean

**Nursing**  
Helen Melland, Ph.D., Dean  
Gretchen McNeely, D.N.SC., Associate Dean  
Donna Williams, Ph.D., Associate Dean, Research and Graduate Education

**University College**  
Greg Young, D.M.A., Vice Provost for Undergraduate Education  
Jeff Adams, Ph.D., Assistant Provost for Undergraduate Education

**Division of Graduate Education**  
Carl Fox, Ph.D., Vice Provost for Graduate Education

### Administrative Offices

**Admissions**  
Ronda Russell, M.Ed., Director

**Affirmative Action/Human Resources**  
Diane LeTendre, B.A., Interim Director

**Alumni Relations**  
Jaynee Groseth, M.A., Director

**Athletics**  
Peter Fields, M.S., Director

**Career Services**  
Carina Beck, M.A., Director

**Communications and Public Affairs**  
Cathy Conover, M.S., Vice President

**Counseling and Psychological Services**  
Patrick Donahoe, Ed.D., Director

**Extended University**  
Kimberly Obbink, Ed.D., Executive Director

### Facilities Services

Jeff Butler, CET, Director, Facilities Services  
Walt Banzinger, M.Arch., Director, Planning, Design and Construction

### Foundation

Connie Talbott, B.S., President and Chief Executive Officer

### University Studies

Diane Donnelly, M.Ed., Interim Director

### Honors Program

Ise-Marie Lee, D.M.A., Director

### Human Resources/Personnel and Payroll

Susan Alt, M.P.A., Director

### Information Technology Center

Jim Rimpau, Ph.D., Chief Information Officer

### International Programs

Norman Peterson, Ph.D., Vice Provost for International Education

### Legal Counsel

Leslie Taylor, J.D.

### Library

Tamara Miller, M.L.S., Dean  
Brian Rossmann, M.L.S., Associate Dean

### Mail Services

Wanda DeMay, Manager

### Museum of the Rockies

Sheldon McKamey, B.S., Dean and Director

### Native American Studies

Walter Fleming, Ph.D., Director

### Registrar

Charles Nelson, M.Ed., Registrar and Director  
Bonnie Ashley, M.Ed., Associate Registrar

### Residence Life and Food Services

Thomas Stump, B.S., Dean of Residence Life and Family and Student Services  
Todd Jutila, Director of University Food Service

### Safety and Risk Management

Jeff Shada, M.Ed., Director

### Strand Union

Frank Damberger, B.S., Director

### Student Accounts

Bonnie Holden, B.S., Director

### Student Health Service

James Mitchell, M.B.A., Director  
Ita Killeen, M.D., Associate Director

### University Police

Robert Putzke, B.S., Director

### WWAMI/Division of Health Sciences

Martin Teintze, Ph.D., Director

### Women's Center

Betsy Danforth, B.S., Director
Montana State University at a Glance

The integration of learning and discovery is a hallmark of the undergraduate experience at Montana State University. MSU students have ample opportunities to pursue exciting research or creative projects throughout their college careers, both on campus and in unique outdoor laboratories such as nearby Yellowstone National Park. Not limited to the sciences, these projects include artistic endeavors such as original musical compositions, paintings, and architectural designs.

Our students work with world-class faculty in a community that values diversity and is invested in every student’s success. Our preeminent research involves students in developing creative solutions to today’s and tomorrow’s challenges.

Founded in 1893 as the state’s land grant institution, Montana State University is the university of choice for those seeking a student-centered learning environment distinguished by innovation and discovery in a Rocky Mountain setting.

The MSU Promise

Each of our undergraduate students participates in hands-on research or creative experience during their education. This experience prepares them for successful futures beyond MSU.

MSU is designated as one of 96 research universities with “very high research activity” by the Carnegie Foundation for the Advancement of Teaching, and offers significant opportunity for research, scholarship and creative work. This highest tier Carnegie classification—out of 4,400 institutions—distinguishes MSU as the only institution in the five-state region of Montana, Wyoming, Idaho and North and South Dakota to achieve this level of research prominence.

MSU Snapshot

- Location: Bozeman, Montana
- Accreditation: Regionally accredited by Northwest Commission on Colleges and Universities (NWCCU). Professional schools and departments are approved by specialized accrediting organizations.
- Degrees offered: Bachelor’s, master’s, and doctoral degrees
- Degree options: Over 120 degree options are available in the eight colleges which include: Agriculture; Arts & Architecture; Business; Education, Health & Human Development; Letters and Science; Nursing; and University College
- Faculty/student ratio: 16:1
- Average class size: 36
- Average High School GPA: 3.28
- Average ACT: 24
- Average SAT: 1115
- Academic year: Fall and spring semesters, summer sessions
- Campus: 1,170 acres located in the Gallatin Valley

Building Upgrades

MSU recently completed several renovation and construction enhancements on campus:
- Renovations to Gaines Hall and Hamilton Hall include classrooms with high-tech equipment and updated labs and support spaces as well as energy efficiency improvements.
- The newly constructed Animal Bioscience Building allows for growth and expansion of Animal and Range Science education, research and outreach programs.

Varsity sports

- Men (Bobcats): football, basketball, track, cross-country, skiing, and tennis
- Women (Lady Bobcats): volleyball, basketball, track, cross-country, tennis, golf, and skiing

Campus organizations

Approximately 140 student organizations on campus

Major employers of MSU


Nearby attractions

- Bridger Bowl Ski Area, 16 miles; Big Sky Ski Resort, 45 miles; Lee Metcalf Wilderness Area, 10 miles; Absaroka-Beartooth Wilderness, 25 miles; Yellowstone National Park, 80 miles; Glacier National Park, 350 miles

Brief MSU History

- February 16, 1893: Montana State University was established as the Agricultural College of the State of Montana at Bozeman by an act of the State Legislature. The first term of instruction began on April 17 of that year.
- 1913: the name of the institution was changed to the State College of Agriculture and Mechanic Arts.
- 1920: the name was changed to Montana State College
- July 1, 1965: name became Montana State University
- January 21, 1994: the Montana Board of Regents of Higher Education restructured the Montana University System. Five campuses were consolidated to comprise Montana State University and include MSU Billings, MSU-Northern, MSU-Billings College
of Technology, and MSU-Great Falls College of Technology and the home campus of Montana State University in Bozeman.

**Instruction**

As the land-grant institution for the State of Montana, the University has created an atmosphere of outstanding research effort and adult education services to complement its regular instructional programs. MSU is represented in each of Montana’s 56 counties and seven reservations through Extension offices that work to disseminate information to improve the lives of Montanans. As a land-grant institution authorized by the Morrill Act of 1862, Montana State University derives its support from biennial state legislature appropriations, student tuition and fees, federal land-grant income, and private and public grants.

**MSU’s Sustainability Commitment**

As an institution, Montana State University is committed to reducing its carbon footprint by promoting a forward thinking, conscientious culture across campus and in the greater Bozeman community.

From policies to student organizations, significant effort is invested in reducing energy and resource consumption and improving efficiency at all levels. MSU’s President signed the American College and University Presidents Climate Commitment, and established a Campus Sustainability Advisory Council. The ongoing refinement of a comprehensive Campus Sustainability/Energy Policy in MSU’s five-year vision document is a central consideration for all activities.

MSU is addressing the challenge in many ways.

**Academics**

- Recent addition of a degree program in Sustainable Food and Bioenergy Systems
- Leading research related to energy alternatives and food systems

**Awareness**

- Monthly awareness campaigns bring attention to a variety of topics: Turn Out the Lights, Local Foods, Weatherization, Conscious-Consumerism, Water Conservation, Recycle, Gallatin Earth Celebration and Re-use

**Initiatives**

- Creation of a Campus Sustainability Advisory Council to guide campus efforts
- Various departments provide bikes for campus commutes
- University Food Service has adopted a number of sustainable practices such as the use of Montana made products, promotion of refillable containers, purchase of energy efficient equipment and use of biodegradable to-go containers

**Programs**

- ASMSU Sustainability Center operates the campus recycling program, builds “green” campus culture through film screenings, lectures and educational outreach, and serves as a resource for students to learn about and get involved in sustainability efforts
- Streamline Bus System provides efficient, free public transportation for students, faculty and staff

**Facilities**

- MSU developed a long range campus plan to ensure smart growth and responsible practices from protection of open spaces to LEED certifications
- A complete list of MSU’s sustainability efforts, initiatives, programs, resources and research can be found at www.montana.edu/sustainability.

**Indian Education for All**

Montana State University is committed to the goal of Indian Education for All because we believe that many social problems cannot be addressed until all citizens have an understanding of the history, culture, and contemporary contributions of Montana’s Indian people. To reach this goal, we continue to develop, implement, and promote programs for all students, staff, and faculty at our institution.

**Research at MSU**

MSU is recognized by the Carnegie Foundation for the Advancement of Teaching as one of 96 research universities with “very high research activity.” The ranking signifies that the opportunities for research, scholarship and creative work at MSU are comparable to those found at other highly prestigious universities. This nationally and internationally recognized research and creative work at MSU provides opportunities for undergraduate and graduate students to link their learning with the discovery of knowledge.

Read about our many research centers, programs, facilities and institutes here or learn more online, http://www.montana.edu/wwwr/

**Agricultural Marketing Policy Center**

http://www.ampc.montana.edu

The Agricultural Marketing Policy Center sponsors research on agriculture and natural resource trade policies and their economic effects. It communicates this information to the public through various media.

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**Enrollment by College (2008)**

<table>
<thead>
<tr>
<th>College</th>
<th>2008 Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>739</td>
</tr>
<tr>
<td>Arts &amp; Architecture</td>
<td>1542</td>
</tr>
<tr>
<td>Business</td>
<td>1189</td>
</tr>
<tr>
<td>Education &amp; HHD</td>
<td>1439</td>
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<tr>
<td>Engineering</td>
<td>2065</td>
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<tr>
<td>Letters &amp; Science</td>
<td>2570</td>
</tr>
<tr>
<td>Nursing</td>
<td>827</td>
</tr>
<tr>
<td>University College</td>
<td>1505</td>
</tr>
<tr>
<td>Other</td>
<td>493</td>
</tr>
</tbody>
</table>
American Indian Research Opportunities (AIRO)
http://www.montana.edu/airo

AIRO provides educational and research opportunities for American Indian students in career fields where they are significantly under-represented. AIRO cooperates with Montana’s seven tribal colleges (Blackfeet Community College, Chief Dull Knife College, Fort Belknap College, Fort Peck Community College, Little Big Horn College, Salish Kootenai College, and Stone Child College) and MSU, Bozeman.

Animal Resources Center
http://www.montana.edu/aware

The center is a modern, centralized, laboratory animal facility for the care, use and production of laboratory animals used in teaching, research and testing at MSU.

Burns Technology Center
http://eu.montana.edu/btc/

The Burns Technology Center, a division of MSU Extended University, strives to create a more accessible and effective university for the 21st Century through public access to lifelong learning, especially for isolated individuals and communities. BTC studies how innovative technologies can enhance teaching and learning, build partnerships between MSU and public/private organizations, and better share MSU’s resources through public outreach.

Burton K. Wheeler Center
http://www.montana.edu/wheeler

The Burton K. Wheeler Center at Montana State University in Bozeman promotes the public discussion, analysis, and eventual resolution of critical issues facing Montanans. The Center holds an annual conference and business roundtable, sponsors lectures, and publishes conference reports.

Center for Biofilm Engineering
http://www.erc.montana.edu/

The Center for Biofilm Engineering (CBE) fosters a new approach to university engineering/science education. Multidisciplinary research teams find solutions to and applications for bacterial communities called biofilms.

Center for Bio-Inspired Nanomaterials
http://cbin.montana.edu/

The Center for Bio-Inspired Nanomaterials (CBIN) at Montana State University is a multidisciplinary research and education center focused on utilizing our fundamental understanding of the formation and hierarchical construction of biological materials such as viruses, cells, and biominerals (bones, teeth, seashells, etc).

Center for Bison and Wildlife Health
http://www.montana.edu/wwwbe/

This is a regional center for information exchange and research on all aspects of the biology and management of the American bison.

Center for Computational Biology
http://cns.montana.edu/

This interdisciplinary unit develops and applies complex computer methods to research on biological systems such as neurosystems. A major feature of the Center is its use of advanced, high-speed computer communication channels to the worldwide network.

Center for Entrepreneurship for the New West
http://www.montana.edu/cob/centernewwest/

The College of Business established the Center for Entrepreneurship for the New West to connect students with actual entrepreneurship in the early stages of businesses development. Through partnerships with TechRanch, a business incubator, and TechLink, a NASA funded technology transfer organization, students gain research experience and skills in assessing technology applications in the market place. The entrepreneurship course work is offered to students from any major in the University through a thirty credit hour entrepreneurship minor.

Center for Learning and Teaching in the West
http://www.cltw.org/

The Center for Learning and Teaching in the West (CLT West) is one of seven Centers for Learning and Teaching established by the National Science Foundation. CLT West helps to address a regional and national shortage of qualified science and Mathematics educators at all levels, from middle and high schools to community colleges and universities. The Center administrative headquarters is located at MSU in Bozeman, and science, Mathematics, engineering, and education faculty at MSU in Bozeman and The University of Montana participate in all aspects of the Center Program.

Center for Native Health Partnerships
http://cnhp.montana.edu/

The mission of the Center for Native Health Partnerships is to create an environment to improve Native American health through community-based participatory research. CNHP is committed to developing true partnerships between tribal communities and academic partners to conduct health disparities research. We focus on building research capacity within tribal and academic communities.

Energy Research Institute (ERI)

The Energy Research Institute conducts research and pilot projects in wind energy, biofuels, fuel cells, carbon sequestration, and algal biofuels, and pursues broader basic energy research. Projects typically involve multi-disciplinary teams, student research opportunities, and partnership with private industry. The ERI also conducts outreach to the general public and provides technical input to decision makers on topical energy issues.

Image and Chemical Analysis Laboratory (ICAL)
http://www.physics.montana.edu/ICAL/ICAL.html

ICAL provides analytical facilities for the physical, biological and engineering sciences. These facilities are open to both academic researchers and the general public.
Local Technical Assistance Program (LTAP)  
http://www.coe.montana.edu/ltap/  
The Local Technical Assistance Program fosters a safe, efficient, environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance and technology transfer.

Montana Area Health Education Center  
http://healthinfo.montana.edu/ahec.html  
Montana AHEC is one of six regional AHEC Centers of the University of Washington School of Medicine (UWSM). AHECs provide educational programs for health care students and professionals and assistance in improving health care access.

Montana Cooperative  
Fishery Research Unit  
http://www.montana.edu/mtfaru/  
Research at the Montana Cooperative Fishery Research Unit is problem oriented and provides our cooperators (Montana State University, Montana Fish, Wildlife, and Parks, U.S. Geological Survey) and other agencies with useful and practical information needed to understand and manage fishery resources in the Rocky Mountains and northern Great Plains.

Montana INBRE (IDEA Network of Biomedical Research Excellence)  
www.inbre.montana.edu  
The Montana INBRE Program focuses on increasing the biomedical research capacity of Montana by building research infrastructure, supporting faculty and student research, and fostering a statewide collaborative network. MT INBRE supports research in environmental health, infectious disease, and health disparities and is funded by the National Center for Research Resources (NCRR) of the National Institutes of Health (NIH). The statewide INBRE network includes Montana State University (the lead institution), University of Montana, Montana State University-Billings, Montana State University-Northern, University of Montana-Western, Carroll College, MT Tech of the University of Montana, Rocky Mountain Community College, Blackfeet Community College, Fort Belknap College, Fort Peck Community College, Little Big Horn College, Salish Kootenai College, and Stone Child College.

Montana Office of Rural Health - MORH  
http://healthinfo.montana.edu/orh.html  
MORH works to improve the quality of life for all rural Montanans by ensuring affordable, accessible, high quality health care; facilitating enhanced self-care and supportive care in the rural home setting; and promoting healthy lifestyles that prevent disease, disability and premature death. The MORH seeks to improve the health care of all rural Montanans through advocacy, networking, partnerships, education, outreach, research, and service.

Montana Space Grant Consortium  
http://spacegrant.montana.edu/index.html  
The consortium enhances aerospace research and education in Montana through research initiation grants, education enhancement grants, undergraduate research grants and a scholarship-fellowship program. The central consortium office acts as a statewide clearinghouse for information on NASA and other aerospace-related programs and takes an active role in alerting consortium faculty about opportunities in research and education with NASA and other space agencies.

Montana Water Center  
http://watercenter.montana.edu/  
The Center oversees water research, educates future water professionals and develops training materials for working water professionals. The Center is one of 54 located at land-grant universities in each state, authorized by Congress through the Water Resources Research Act of 1964.

MSU TechLink Center  
http://www.techlinkcenter.org/cgi-bin/techlink/index.html  
TechLink helps the private sector commercialize NASA, federal laboratory, and university technologies, to solve industry problems, to create or exploit business opportunities, and to stimulate economic development in the five-state region of Montana, Idaho, North and South Dakota, and Wyoming.

Northern Rocky Mountain Science Center  
http://nrmsc.usgs.gov/index.html  
The Northern Rocky Mountain Science Center (NRMSC), formed by the U.S. Geological Survey, conducts integrated, interdisciplinary research in support of natural resource management in the Northern Rocky Mountains.

NSF Experimental Program to Stimulate Competitive Research (EPSCoR)  
http://www.mtnsfepsco.org/mtnsfepsco.html  
EPSCoR, the Experimental Program to Stimulate Competitive Research, identifies, develops and utilizes the state’s academic science and technology resources. The program is designed to stimulate local action that will result in lasting improvements to the state’s academic research infrastructure and increased national R&D competitiveness.

Optical Technology Center (OpTeC)  
http://Chemistry.montana.edu/optec/  
OpTeC conducts research in the rapidly growing field of electro-optics. Multidisciplinary research teams work with industry and other research centers to find solutions to industry problems and discover new application potentials in optical fields.

Plant Growth Center  
http://agg.montana.edu/plantgrowth/  
The Plant Growth Center includes 29 greenhouses environmentally controlled by microcomputers, an insect quarantine unit, an indoor arboretum, labs and classrooms.

TechRanch  
http://www.techranch.org/  
TechRanch is a hi-tech business incubator specializing in software and internet related businesses. An incubator is an engine of economic development that gives a jump-start to fledging businesses so that they can go from inception to self sufficiency in 18 months or less. This includes building a business model that will enable start-ups to attract capital and compete in the highly competitive environment of the new economy.
The Big Sky Institute
http://bsi.montana.edu/

The Big Sky Institute for Science and Natural History (BSI) promotes the distribution of science-based knowledge related to natural ecosystems and the human communities that depend on them.

The Spectrum Lab
http://www.spectrum.montana.edu/

The Spectrum Lab was established in 1999 to do state of the art research and development in optical electronics, to transition that new technology to Montana corporations, and to provide enhanced educational opportunities for undergraduate and graduate students.

Thermal Biology Institute
http://tbi.montana.edu/

The Montana State University Thermal Biology Institute (TBI) is a multidisciplinary program for studying thermal biology. The TBI conducts and promotes research and education focused on the biology and interrelated physical and chemical processes of geothermal environments in the Greater Yellowstone Ecosystem. The long-term goal is to understand how organisms respond and adapt to unique physical and chemical features of the thermal environment.

Tradeoff Analysis Project
http://www.tradeoffs.montana.edu/

The Tradeoff Analysis (TOA) project, part of the USAID Soil Management Collaborative Research Support Program (SM-CRSP), has developed a decision-support system for assessing tradeoffs between agricultural production and the environmental and human health impacts of agriculture for different agricultural, environmental, and health technologies and policies.

Western Transportation Institute
http://www.coe.montana.edu/wti/

The Western Transportation Institute (WTI) forms cooperative alliances of public and private partners interested in implementing ITS technology on rural highway systems. WTI provides a location for research, development, testing, demonstration and deployment of rural ITS technologies and systems.

Women in Research and Teaching
http://www.montana.edu/wrt/

This site highlights the research and instructional accomplishments of women at MSU, Bozeman. It includes updates on grant opportunities for women as well as events, workshops and diversity links.

Statewide

Service and Outreach

As a land-grant institution, MSU is committed to sharing its research discoveries with Montanans through outreach and education. Applying these new discoveries in the field and marketplace helps to enhance the lives of Montanans. Learn about several of our programs.

Agricultural Experiment Station Research Centers
http://ag.montana.edu/departments/researchcenters.htm

These centers conduct research on agriculture, natural resources, and rural life and disseminate that information to Montanans.

Montana Manufacturing Extension Center
http://www.mtmanufacturingcenter.com/

The center increases the competitiveness of Montana manufacturers through direct, unbiased engineering and managerial assistance in partnership with other public and private resources.

Engineering Experiment Station
http://www.coe.montana.edu/eng_exp_station.html

The Engineering Experiment Station at Montana State University was created by the State Board of Education in 1924 to improve the economy, efficiency, and safety of engineering activity in Montana; to promote the conservation and utilization of Montana resources; and to encourage appropriate new industrial activities.

Extended University
http://eu.montana.edu/

Extended University administers and coordinates on-and off-campus instruction in the form of distance-delivered and face-to-face courses, programs, institutes, and conferences that supplement the formal academic curriculum at MSU. Extended University services are organized into three main categories: Montana State Online, Office of Continuing Education, and Burns Technology Center.

Extension
http://msuextension.org

Montana State University Extension provides research-based knowledge to strengthen the economic, social, and environmental well-being of Montana families, communities, and agricultural enterprises. Educational programs of MSU Extension are conducted on an informal, non-credit basis.

The Extension Service was created by the federal Smith-Lever legislation enacted in 1914. Its programs are funded cooperatively through a legal partnership among federal, state and county governments. The focal point for MSU Extension programs is the local Extension office. In Montana, these offices serve 56 counties and seven tribal reservations. Local county and reservation agents are backed by a staff of campus-based faculty who provide direct linkage with current research and a close working relationship with the Montana Agricultural Experiment Station. One of the functions of Extension is to provide input to the University on current Montana problems that are in need of research for their resolution.

Programs of MSU Extension address societal needs in the general areas of agriculture, family living, community and economic development, and youth development. One of Extension’s best-known programs is the 4-H youth development program. Another unit of MSU Extension is the Montana Fire Services Training School, which provides training for paid and volunteer fire fighters throughout the state.

MSU Extension is a unit of the Montana University System and is administered by the MSU campus.
Global Connections

With over 100 international partners, an MSU education goes far beyond Montana. Many faculty members collaborate globally to conduct research on various academic projects and topics. These collaborative projects as well as faculty participation on numerous committees and advisory boards worldwide open a host of opportunities for students. To further prepare students for the global marketplace MSU offers opportunities to study at partner campuses around the nation and internationally.

The Office of International Programs
http://www.montana.edu/international/

The OIP seeks to bring international education to the core of the academic and cultural life of MSU. In today’s world, every student, regardless of his or her major, needs to graduate with knowledge of other cultures and languages in order to succeed.

National Student Exchange
http://www.montana.edu/wwwgs/nse.htm

The National Student Exchange, a consortium of 180 state-supported colleges and universities, offers students the opportunity to attend another participating institution for a semester or full academic year. By bringing together students from different parts of the country, the exchange encourages participants to broaden themselves academically, socially, and culturally.

Library and Information Resources

Known for its nationally and internationally recognized scholars, MSU supports academic success through providing the equipment and resources necessary.

MSU Libraries
http://www.lib.montana.edu/

The MSU Libraries offer research and information resources to the institution’s students and faculty, as well as serving Montana citizens and the State’s business community.

Conveniently located in the center of campus, Renne Library has a full range of library collections and services for students and faculty, including over 120 public computer workstations, printers, scanners, technology-rich group study rooms, and quiet study areas. Knowledgeable and friendly professional librarians and staff provide assistance using the collections, access to online information resources, and instruction for individuals and groups. The MSU Libraries’ collections support teaching, learning and research at MSU, with particular emphasis in the fields of agriculture, science, health, and technology. The Libraries holds special collections in the areas of Montana agriculture and ranching, Yellowstone National Park and its ecosystem, Montana history, and trout and salmonid fish.

A wealth of information is available around the clock both on and off campus via the Libraries’ Web page, including the online catalog, electronic indexes, and many full-text E-journals and E-books. Personalized one-on-one research assistance is available to students on a drop-in basis at the reference desk, or online via E-mail or chat. Moreover, the Libraries offer the Research Assistance Program, or RAP: students may make an appointment for a consultation with a reference librarian who will thoroughly explore research options relating to a specific assignment or class.

Located on the second floor of Cheever Hall, the Creative Arts Library houses materials in the fields of art and architecture.

Computer Facilities

MSU places high priority on the integration of information technology into the educational experience. To help meet this goal, the campus provides a wide variety of computer resources to students and faculty. Within departmental and campus-wide computing facilities, students have easy access to nearly 800 microcomputers (mostly Windows), over 200 servers and workstations running the Unix and Windows operating systems, and a number of enterprise servers that meet campus demand for email, World Wide Web services, and other uses. A state-of-the-art, campus-wide, fiber optic network links seventy buildings to the campus network, to networks on other Montana University System campuses, to state government agencies, and to the Internet. Residence Life and Family & Graduate Housing have connected more than 3,200 residence hall rooms and married housing units to the ResNet network (http://www.montana.edu/resnet/). This service enables around-the-clock educational opportunities. Because email is a vital element of campus communication, all MSU students receive email accounts free of charge. An email account will remain active for as long as the student is registered at MSU, so projects can be carried along from year to year.

The Information Technology Center (ITC) operates several computer laboratories that offer over 300 Windows and Macintosh computers for general student use in Reid, Roberts, and Cheever Halls and in two mini-labs in the Renne Library. In each of these locations, students can access any of a wide variety of software packages. Students commonly make use of word processing, spreadsheets, and graphics in preparing their homework. MSU currently provides the latest releases of the Microsoft Office Suite, AutoCAD, SAS, SPSS, and MCAD, as well as other software for student microcomputer work. Instructors often incorporate these technologies into assignments. For more information see: greywulff, msu.montana.edu/usapage/index.php

Residence Life, the Renne Library, and many academic departments provide similar facilities in other buildings on campus.

ITC also provides over 30 Smart Podiums located in campus classrooms. The Smart Podium incorporates a variety of technologies such as an Internet-ready computer equipped with Microsoft PowerPoint, an overhead video projector, VCR, and DVD players, audio functions, and much more.

MontanaPBS - KUSM

KUSM, Montana PBS, is the public television provider for the state of Montana. Montana PBS is committed to enriching the lives of all Montanans through over-the-air broadcast and cable distribution of quality programming, instruction, and outreach activities.

KUSM is located in the Visual Communications Building, and shares facilities with the School of Film and Photography. Faculty, staff, and stu-
Museum of the Rockies
The Museum of the Rockies is a division of Montana State University. Students, faculty, and visiting scholars use its collections and exhibits for classes, research, and other programs. Some museum curators teach on campus and some MSU professors hold appointments at the museum. The Museum houses one of the world’s largest and most important collections of dinosaur fossils. Visitors learn about startling new discoveries in dinosaur research, experience pioneer life at the living history farm, explore the greater Yellowstone region’s Native American heritage, and journey to the stars in the planetarium.

The Museum is most well known for its paleontology program. In the Siebel Dinosaur Complex there are over 10,000 square feet of displays and thousands of fossils. The Complex houses the exhibit Dinosaurs under the Big Sky, based on the work of world-renowned paleontologist and advisor to the Jurassic Park films, Jack Horner. Visitors to the Museum can see the world’s largest T-rex skull, the largest dinosaur skull ever found, and some of the rarest fossils in the world. The Dinosaur Complex features fossils and new research that have made headlines worldwide such as the discovery of 68-million-year-old soft tissue, blood cells and protein in a T-rex femur; and the discovery of one of the first identified female dinosaurs in the world — an ovulating T-rex.

The world-class Taylor Planetarium hosts a variety of presentations including feature shows for children and adults, the majority of which are original productions, as well as school programs, live narrated night sky programs, and laser shows. A restored 100-year-old homestead is the centerpiece for a living history farm. The museum offers a variety of educational programs for people of all ages including tours, classes, lectures, field trips, field schools, and special events. Admission and membership discounts are offered to MSU students.

Students may now pursue an undergraduate minor in Museum Studies through a cooperative effort between the Museum of the Rockies and the Department of History and Philosophy. The 24-credit minor helps prepare students for careers in the museum world or a graduate degree program.

During the summer, the Museum of the Rockies is open daily from 8 am to 8 pm. After Labor Day, the Museum’s fall and winter hours are from 9 a.m. to 5 p.m., Monday through Saturday, and 12:30 p.m. to 5 p.m. on Sundays. For more information visit museumoftherockies.org or call 994-DINO. The Museum of the Rockies is located at 600 W. Kagy Blvd., on the south side of the Montana State University campus in Bozeman. Visit www.museumoftherockies.org for more information.

Stay Connected
MSU offers many ways for alumni, friends and families of current students to stay connected.

MSU Alumni Association
http://alumni.montana.edu/

The Alumni Association is committed to building positive relationships among Montana State University, its alumni, students and friends. This mission is carried out by keeping alumni informed through the Collegian, an alumni magazine and tabloid and Montana Statements, a monthly electronic newsletter. Tailgates, class reunions, Homecoming, social gatherings, lectures and receptions are held around Montana and throughout the country bringing alumni together to celebrate Montana State.

MSU Foundation, Inc.
www.montana.edu/foundation

The MSU Foundation is an independent, not-for-profit corporation entrusted with raising and administering private, donated funds according to the donor’s wishes and the university’s special needs. The Foundation receives contributions from a variety of sources, including individuals, corporations, and foundations. These gifts from alumni and friends help by supporting special programs such as scholarships, new equipment and facilities, improvements in laboratories and classrooms, professorships, and awards for scholarly achievements.

MSU Parent/Family Association
www.montana.edu/pfa

All parents and family members of MSU students are given automatic membership in the MSU Parent/Family Association. No dues are charged. The PFA offers several notable programs and events designed to encourage a strong relationship between families and the university. They include Parent/Family Fall Weekend, Parent Handbook (www.montana.edu/pfa_handbook.html), Parents Fundraiser and an Advisory Board.

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Photo: Kelly Gorham

Art student
Admission as an Undergraduate Student
Undergraduate students are first-time college students, or have attempted college level credits during high school and/or after graduating high school, or have not been awarded a bachelor’s degree.

Applications for admission to undergraduate programs are processed by the Office of Admissions. The requirements for admission are described in the following sections. There are several options for obtaining application forms to MSU.

Applications are accepted from resident, non-resident, and international students. Eligible undergraduate students may attend full-time or part-time. Montana State University retains the right to establish requirements which will ensure successful scholastic performance.

General Admission Information
Applicants are responsible for submitting applications for admission, financial aid, and housing, must provide verification of immunizations, and must register for the New Student Orientation/Registration program. Applicants should be aware of the following:

1. Applicants are requested to voluntarily provide their social security number, which permits the school to distinguish between individuals with the same or similar names.
2. Students intending to apply for financial aid may obtain appropriate forms from their high school guidance office, online at http://www.fafsa.ed.gov or by contacting Financial Aid Services, 406-994-2845.

3. Students with less than 30 credits of college level coursework are required to live in the residence halls. Additional information about residence life and family housing should be referred to the Residence Life Office, (406) 994-2661.
4. Students must submit required immunization records by logging onto the Student Health Service website, www.montana.edu/health and clicking on the “On-line Student Health” link. Students must submit proof of required immunizations prior to registration of classes. Questions should be referred to the MSU Student Health Service, 406-994-2311.
5. Students with a health condition or a disability which should be brought to MSU’s attention may submit a confidential letter of need to Disability/Re-Entry & Veterans Services. Questions about services for disabled students should be referred to the Office of Disability, Re-Entry & Veterans Services, 406-994-2824.
6. All admitted students must attend a New Student Orientation and Registration session prior to the beginning of the semester. Information about Orientation dates will be sent from the Orientation Office after admission has been determined. Questions should be referred to the Orientation Office, 406-994-2827.

When to Apply
Applicants are encouraged to apply at least six to eight months prior to the first semester of attendance. This will allow adequate time for the student to request any academic credentials needed to complete the application file, make housing arrangements, process financial aid materials, and participate in New Student Orientation and Registration.

Applications should be on file in the Office of Admissions according to the following priority dates:
- Fall semester - July 1
- Spring semester - December 1
- Summer session - May 1

Applicants will be notified of their admission status as soon as possible after all necessary credentials to determine a student’s admissions status have been received by the Office of Admissions.

Obtaining Undergraduate Application Forms
Several application alternatives are available to students interested in applying for undergraduate admission to MSU in Bozeman. Choose the one that best fits your situation. For more detailed information, please see our Undergraduate Admission Requirements page.

- On-Line Application Form: https://apply.embark.com/ugrad/montanastate/27/
- Adobe Acrobat Application Forms: You can interactively fill out the application form for undergraduate admission and submit it directly to MSU in Bozeman.
- Adobe Acrobat Application Forms: Viewing and printing these forms requires the free Adobe Acrobat reader, which you can download from the Adobe site if you don’t have it.

- Undergraduate Application Form: www.montana.edu/wwwcata/ugpp.pdf
  This is a large pdf file (702 KB) which you can download and print on a laser printer. A pdf file of instructions for completing the form is also available.
- International Undergraduate Application Form: This undergraduate application should be completed by applicants who are not U.S. citizens or Permanent Residents of the U.S.

- Form to Request Information: http://www.montana.edu/wwwsas/need_info.shtml
  Using this on-line request form, you can ask us to mail you a catalog, an application form, and/or information about financial aid, housing, and student services.
- E-mail: If your browser doesn’t support any of these forms, please send an e-mail request for more information to admissions@montana.edu. Be sure to include your full name, address, and phone number.
Campus Visitation Opportunities

Admissions

The Office of Admissions provides all types of information about Montana State University to prospective students and their families. Through high school visits, campus tours, and special on-campus events, prospective freshmen and transfer students learn first-hand about an MSU education. Applications for admission are also provided through the Office of Admissions. For more information about Admission to MSU, visit the admission Web site at http://www.montana.edu/admissions.

Individual Campus Visits

Prospective students and their families are encouraged to visit the MSU campus. The Office of Admissions offers individualized campus visits Monday through Friday. Campus visits enable prospective students to become acquainted with on-campus living options, academic, extracurricular activities, campus organizations, faculty, staff, and students. Guided campus tours, individualized appointments, and visits to classes are available on a daily basis.

Prior to visiting campus, students should review the catalog and other informative materials as preparation for meeting with university personnel. Visits should be scheduled two weeks in advance by calling the Office of Admissions (406-994-2452 or toll free: 888-MSU-CATS); this enables Admissions to schedule meetings to accommodate students’ individual interests. For further information on campus visits go to: http://www.montana.edu/admissions/visit_op.shtml

MSU Fridays

MSU Friday, held three times a year, gives prospective students and their families a chance to meet with faculty and students, explore academic facilities, tour the campus, and investigate possibilities and scholarships. It’s a great time to explore MSU! For details see: http://www.montana.edu/admissions/msufriday.shtml

New Student Orientation

All new students are required to attend an Orientation/Registration Session. Summer Orientation Programs are offered to new freshmen and transfer students who enter in the fall semester. Additional programs for freshmen, transfers, internationals, and graduates are offered prior to each semester.

Orientation assists students in course selection and registration, and the location and use of campus facilities and services. It also highlights University academic assistance and special services as well as recreational and social programs.

Montana State University believes that Orientation assists all new students in their transition to MSU and increases their chances for academic success.

Upon acceptance to MSU, all students receive information about Orientation/Registration. All new freshman and transfer students pay a one-time New Student Fee. This fee is included on the fee statement of the first semester in which a student attends MSU. Contact the Orientation Office at 406-994-2827 or visit http://www.montana.edu/admissions/orientation for more information.

International students should contact the Office of International Programs at 406-994-4031.

Freshmen (First-time Undergraduates)

Freshmen students are those who have completed high school or its equivalent, and have never attended a college or university. Students that have attempted less than 12 quarter or semester college-level credits at another regionally accredited college or university after high school graduation are considered incoming freshmen. Students who have earned college-level course credit, Advanced Placement or International Baccalaureate credits while still attending high school are also considered incoming freshmen.

Academic Eligibility

Students who do not meet all freshman admission requirements listed below are still encouraged to apply for admissions and submit the necessary credentials. Montana State is allowed a number of exemptions to the stated requirements and will examine each student’s credentials on a case-by-case basis for admisibility. Some students who do not meet the requirements below may be admitted regularly and can enroll full time. Others may be admitted as a Pre-University Studies student. In Pre-University Studies, students may take up to 7 credits at Montana State University in Bozeman and up to an additional 7 credits through a partnership with the College of Technology-Great Falls while on the Bozeman campus. Students who take a combination of at least 12 credits will qualify for federal financial aid as a full-time student. Once the student has earned 7 credits with a minimum cumulative GPA of 2.0, he/she will be admitted as a full-time MSU student.

Admission requirements

(Resident and Non-Resident):

1. Graduation from a regionally accredited high school or one accredited by the State Department of Education or passed a General Educational Development (GED) exam or obtained qualifying scores on the ACT Compass Exam.
2. MSU Academic Requirements:

One of the following:

- A 2.5 cumulative grade-point average (on a 4.0 scale), OR
- ACT Enhanced Composite score of 22, OR
- SAT combined critical reading/mathematics/writing score of 1540, OR
- Rank in the upper half of the graduating class.

AND

- Minimum Math score of 22 on ACT or 520 SAT, OR
- Minimum Math score between 18-21 ACT or 440-510 SAT (students must enroll in and pass a math course within the first 3 semesters at MSU), OR
- Score of 3 or above on Advanced Placement (AP) Calculus AB or BC exam, OR

- Score of 3 or above on Advanced Placement (AP) Calculus AB or BC exam, OR

- Score of 3 or above on Advanced Placement (AP) Calculus AB or BC exam, OR
3. Successful completion of a College Preparatory Curriculum. Non-resident applicants who have not completed the college preparatory requirements stated below may satisfy the requirements by providing evidence that they have: (a) completed a similar college preparatory program required in their home state and certified by the high school; or (b) met two of the three academic admission requirements stated above:

- Four years of **English**: Courses should emphasize the development of written and oral communication skills and literature.
- Three years of **Mathematics**: Courses should include algebra I, geometry, and algebra II (or the sequential content equivalent of these courses). Students are encouraged to take a math course in their senior year.
- Three years of **Social Studies**: Courses should include global studies (such as world history or world geography); American history, government, economics, Indian history, psychology, sociology, or other third-year courses.
- Two years of **Laboratory Science**: One year should be earth science, biology, chemistry, or physics, and the other year can be one of the above sciences or another approved college preparatory science.
- Two years of **Elective courses**: foreign language (preferably two years); computer science; visual and performing arts; or approved vocational education units.

4. The following categories of students are exempt from the admissions requirements above:

- Non-Traditional age students (out of high school more than 3 years)
- Non-Degree undergraduate students
- Two years of high school Math courses (which include Algebra I, Algebra II, Geometry and courses beyond Algebra II) and three years of science courses with grades of C or better in all courses.
- Score of 3 or above on the AP English Language or English Literature Exam, OR
- Minimum Writing score of a 440 SAT or a 7 on the Essay, OR
- Score of 3 or above on the AP English Language or English Literature Exam, OR
- Score of 4 or above on the IB English A1 Higher Level Exam, OR
- Score of a 3.5 or above on the Montana University System Writing Assessment.

Application Procedure

1. Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the high school, the registrar’s office at the college/university, or agency. Credentials must be sent directly from the school to the Office of Admissions. Credentials received from the state in which the student is residing will be used to determine admission status, awarding certain scholarships and in assisting with academic planning. Applicants who graduated three or more years prior to the semester in which they intend to enroll are not required to submit ACT/SAT test results. Arrangements to take the ACT test on campus may be made by contacting the MSU Testing Service, 406-994-6984.

f. **ACT/SAT scores**: All first-time incoming freshmen are required to take either the American College Test (ACT) or the Scholastic Aptitude Test (SAT). MSU does not accept the SAT Subject Tests (formally SAT II Subject Test) for admissions purposes. The test results are used in determining admission status, awarding certain scholarships and in assisting with academic planning. Applicants who graduated three or more years prior to the semester in which they intend to enroll are not required to submit ACT/SAT test results. Arrangements to take the ACT test on campus may be made by contacting the MSU Testing Service, 406-994-6984.

g. **College/university transcripts**: Applicants who have attended another college or university, whether credit was earned or not, must have an official transcript sent directly from each institution.

a. **Admission Application**: An application may be submitted on-line or printed out at http://www.montana.edu/wwcat/appoin.html. The application may also be obtained from a high school counselor or from the Office of Admissions.

b. **Application fee** (nonrefundable): $36 online application fee or $30 paper application. Checks should be made payable to Montana State University. The application fee will not be waived, deferred, or refunded. The fee must be paid before the application for admission will be processed.

c. **Student Self-Report form** (included in the Admissions Application): This form, required of all first-time applicants who have been out of high school less than three years, will be used to determine admission status prior to the receipt of the final high school transcript sent after graduation.

d. **High school transcript**: A complete and official transcript must be sent directly from the high school to the Office of Admissions after graduation. Courses completed, GPA (on a 4.0 scale), rank in class, and date of graduation must be posted.

e. **GED transcript**: A complete official General Educational Development (GED) score report/transcript must be sent directly from the Department of Education from the state in which the exam was given to the Office of Admissions.

1. **Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the high school, the registrar’s office at the college/university, or agency. Credentials must be sent directly from the school to the Office of Admissions. Credentials received from the state in which the student is residing will be used to determine admission status, awarding certain scholarships and in assisting with academic planning. Applicants who graduated three or more years prior to the semester in which they intend to enroll are not required to submit ACT/SAT test results. Arrangements to take the ACT test on campus may be made by contacting the MSU Testing Service, 406-994-6984.

f. **ACT/SAT scores**: All first-time incoming freshmen are required to take either the American College Test (ACT) or the Scholastic Aptitude Test (SAT). MSU does not accept the SAT Subject Tests (formally SAT II Subject Test) for admissions purposes. The test results are used in determining admission status, awarding certain scholarships and in assisting with academic planning. Applicants who graduated three or more years prior to the semester in which they intend to enroll are not required to submit ACT/SAT test results. Arrangements to take the ACT test on campus may be made by contacting the MSU Testing Service, 406-994-6984.

g. **College/university transcripts**: Applicants who have attended another college or university, whether credit was earned or not, must have an official transcript sent directly from each institution.
to the Office of Admissions after all final grades have been posted. For more information on how college/university courses will transfer to MSU, refer to the Evaluation of Transfer Credit section.

h. Advanced Placement (AP): Applicants who have completed an Advanced Placement Examination should request that the official scores be sent directly to the Office of Admissions. Scores of 3 or higher on an AP Exam will be granted college credit with a Pass grade for the equivalent courses. For more information on how AP courses will transfer to MSU, refer to the AP Course Equivalencies website.

i. International Baccalaureate (IB): Applicants who have completed an International Baccalaureate Examination should request that the official scores be sent directly to the Office of Admissions. IB Exams with scores of 4 or higher (Higher Level only) will be granted college credit with a Pass grade for equivalent courses. For more information on how IB courses will transfer to MSU, refer to the IB Course Equivalencies website.

Freshman Students Denied Admission

Students interested in appealing the admission decision should refer to the section titled Appeal of Admission Decisions.

Transfer Students

A transfer student has graduated high school or its equivalent and completed 12 or more quarter or semester credits in college-level courses at a regionally accredited institution. Students who have previously been awarded a baccalaureate degree who wish to apply as a Second Bachelor’s Degree student (Post-Baccalaureate) are also considered a transfer student. College-level work means those courses that are applicable towards at least an associate degree and does not include remedial or developmental courses. Students who previously attended Montana State University and who are returning after attending another institution should refer to the Former MSU Students section.

Academic Eligibility

Applicants will be considered for admission based on transferable credits from all regionally accredited colleges or universities previously attended. As determined by the Office of Admissions, a 2.0 (or C) cumulative transferable GPA (on a 4.0 scale) is required in order to be accepted for admission in good academic standing. Transfer students start with a new GPA upon enrolling at MSU.

Students who do not meet the 2.0 cumulative transferable GPA are still encouraged to apply for admissions and submit the necessary credentials. Montana State University will examine each student’s credentials on a case-by-case basis for admissibility. Some students who do not meet the requirements may be admitted on University Probation and will need to earn a 2.0 or higher GPA during the first term attended at MSU to be placed in good academic standing.

Application Procedure

Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the registrar’s office at the college/university, or agency previously attended. Credentials must be sent directly from each institution to the Office of Admissions. Credentials received from the student are considered unofficial working copies and will not be accepted as official documents.

Application materials and fees will be retained for one year from the original application term. To apply for a semester other than the one originally intended, notify the Office of Admissions as soon as possible.

Be sure to submit the following items (if applicable):

1. Admissions Application: An application may be submitted on-line or printed out at: http://www.montana.edu/wwwcat.appopts.html. The application may also be obtained from the Office of Admissions.

2. Application Fee (nonrefundable): $36 online application or $30 paper application. Checks should be made payable to Montana State University. The application fee will not be waived, deferred or refunded. The fee must be paid before the application for admission will be processed.

3. Official college/university transcripts: An official transcript must be sent directly to the Office of Admissions from each regionally accredited college or university attended. This academic information will be used to determine admission status as well as transfer credit. Applicants who are enrolled at a transfer school while applying to MSU will be considered for admission based on an incomplete official transcript showing all academic work completed and posted to date. A final official transcript must be received in the Office of Admissions by the 15th class day of the first term of attendance. Academic eligibility will be reviewed again upon receipt of that final transcript. For more information on how college/university courses will transfer to MSU, refer to the Evaluation of Transfer Credit section.

4. Transfer students follow the Undergraduate Catalog in effect at the time of initial enrollment at MSU. Transfer students from feeder institutions such as the community colleges in Montana and Wyoming as well as the four-year colleges in Montana may elect to follow the MSU catalog that was in effect when they began their freshman year at the feeder institution.

5. Advanced Placement (AP): Applicants who have completed an Advanced Placement Examination should request that the official scores be sent directly to the Office of Admissions. Scores of 3 or higher on an AP Exam will be granted college credit with a Pass grade for the equivalent courses. For more information on how AP courses will transfer to MSU, refer to the AP Course Equivalencies website.

6. International Baccalaureate (IB): Applicants who have completed an International Baccalaureate Examination should request that the official scores be sent directly to the Office of Admissions. IB Exams with scores of 4 or higher (Higher Level only) will be granted college credit.
with a Pass grade for equivalent courses.
For more information on how IB courses will transfer to MSU, refer to the IB Course Equivalencies IB Course Equivalencies website.

Evaluation of Transfer Credit
(freshman and transfer students)
Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the registrar’s office at the college, university or agency previously attended. Credentials must be sent directly from each institution to the Office of Admissions. Credentials received from the student are considered unofficial working copies and will not be accepted as official documents.

To see how courses may transfer, please visit our Transfer Course Equivalencies website at https://atlas.montana.edu:9000/pls/bzagent/hwzkxfer.p_selstate. If a course or institution is not listed it does not necessarily mean the course will not transfer; rather the information is not yet in our database.

1. An official evaluation of transfer credits will be completed after final transcripts from each institution have been received. Upon completion, a copy of the credit evaluation will be sent to the student and to the student’s academic department.
2. All college-level courses from colleges or universities in candidacy status or accredited by any of the six regional accrediting agencies at the time the courses were taken will be accepted for transfer. Courses from non-accredited schools will not be accepted for transfer.
3. The Office of Admissions determines whether or not the transfer work is college-level, the appropriate grading and credit conversions on transfer work and the applicability of transfer credit toward the MSU Core 2.0 requirements. The academic department has the authorization to substitute transfer courses for curriculum requirements. Transfer credit will be given for courses in which passing grades were received.
4. College level courses which do not have an equivalent at MSU will be accepted as an elective or as an elective with Core credit. The academic department will determine if the transfer electives satisfy specific curriculum requirements.
5. Freshman/sophomore level courses taken at another college or university will generally not be evaluated as equivalent to junior/senior level courses at MSU. Also, junior/senior level courses will generally not be evaluated as equivalent to freshman/sophomore courses at MSU. Elective credit will be granted in these cases. If a lower-level elective is substituted for an upper-level course by an academic department, that credit may not be used to fulfill the University upper-level credit requirement.
6. Transfer credit is accepted from vocational technical institutions if the institution is regionally accredited and the courses taken apply toward an associate degree at the institution. MSU does not accept courses that apply solely to a certificate degree.
7. Tech Prep courses taken through an approved program will be granted college credit for equivalent coursework. The Tech Prep courses must be listed on an official Big Sky Pathways transcript and sent directly to the Office of Admissions.
8. Credit is granted for college-level continuing education, correspondence, and extension courses successfully completed at institutions accredited by one of the six regional accrediting agencies. Official transcripts posting these courses must be sent directly from the institution to the Office of Admissions.
9. Applicants who have taken Advanced Placement (AP) Exams and/or International Baccalaureate (IB) Exams should request that the official scores be sent directly to the Office of Admissions. AP scores of 3 or higher and IB Exams with scores of 4 or higher (Higher Level only) will be granted college credit with a Pass grade for the equivalent courses. For more information on how AP and IB courses will transfer, refer to the AP Course Equivalencies http://www.montana.edu/admissions/ap.ap.html or the IB Course Equivalencies http://www.montana.edu/admissions/ib.ib.html websites.
10. College Level Examination Program (CLEP) credit may be awarded by the academic department for successful performance in certain subject exams. Credit awarded for the CLEP Exams will not count toward University Core requirements. Official results must be sent directly from the CLEP testing center to the MSU Testing Service http://www.montana.edu/ehhd/centers/testing/index.html.
11. Military experience will be considered for credit upon receipt of official military transcripts and will be evaluated as elective credit only. Contact the Office of Admissions for information on documentation requirements.
12. International coursework (except from Canadian institutions where English is the language of instruction) must be evaluated by a foreign credential evaluation company. Contact the Office of International Programs http://www.montana.edu/international for further information.
13. Applicants are encouraged to bring personal copies of their transcripts for advising purposes during orientation/registration. Catalogs and course syllabi describing previous coursework may be of assistance to the academic advisor when determining appropriate course placement.

Students who wish to appeal a decision regarding acceptance of transfer credit should address the concern to the Graduation and Admissions Requirements Committee (GARC). Students who wish to appeal the assignment of transfer credit to the University Core requirements should address the concern to the Core Equivalency Review Committee (CERC). Students should contact the Office of Admissions to receive information on the appeal process.
International Undergraduate Students

Students from countries other than the United States and Canada are encouraged to apply to Montana State University as first-time freshmen or transfer students. Those who have completed secondary school are considered freshmen; those who have completed university-level coursework equivalent to 12 credits or more beyond secondary school are considered transfer students.

Academic Eligibility

Freshmen

Freshmen will be considered for admission on the basis of their secondary school record and their English proficiency. Applicants who meet a TOEFL score of 525 (CBT 195, iBT 71), IELTS 6, or A.C.E. Language Institute Level 6 (available at MSU) and have a minimum cumulative grade-point average of 2.5 on a four-point scale will qualify for admission.

Transfer Students

Transfer students will be considered on the basis of their post-secondary education record and their English proficiency. Applicants who meet a TOEFL score of 525 (CBT 195, iBT 71), IELTS 6, or A.C.E. Language Institute Level 6 (available at MSU) and have a minimum cumulative transferable grade-point average of a 2.0 or C on a four-point scale will qualify for admission.

Application Procedures

1. All application materials must bear the official school seal and signature, and be sent directly from the institution or agency to the Office of International Programs. Transcripts and test scores received from students are unofficial and not acceptable. To provide time for evaluation and for notice of acceptance to reach the applicant in a timely manner, the application and required credentials must be received by the Office of Admissions according to the following dates:
   - Fall Semester - May 15
   - Spring Semester - October 15
   - Summer Session - March 1

2. Receipt of the following credentials in the Office of International Programs constitutes a complete application for admission:
   a. International Application for Admission (undergraduate): The application form may be obtained by contacting the Office of International Programs, Montana State University, P.O. Box 172260, Bozeman, MT 59717-2260 (Ph: +1-406-994-4031, Fax: +1-406-994-1619). Return the completed and signed application form to the Office of International Programs.
   b. $36 application fee (online application); $30 application fee (paper application): The fee must be in U.S. currency. Checks should be made payable to Montana State University and must indicate the U.S. banking codes. The application fee will not be waived, deferred, or refunded. The fee must be paid before the application will be processed.
   d. Evidence of financial support: Montana State University requires certification of financial support from students with non-immigrant visas. Financial documentation forms are included on the international application information. Admission will not be considered until an International Student Financial Certificate, complete with a signed statement of support is submitted and on file in the Office of Admissions. The Certificate guarantees that the required minimum amount of money, in U.S. dollars, will be available to the student during the academic year. A bank statement is also required.
   e. Secondary school academic records: A complete and official secondary school record listing all courses and grades/marks earned is required of all students applying as first-time freshmen or those who have earned fewer than 12 college/university credits. The record must be sent directly from the secondary school to the Office of International Programs. Additional official certificates may be required to show completion of secondary school.
   f. College/university transcripts: Official transcripts from each international and U.S. college/university attended are required. The transcript must be sent directly from each institution to the Office of International Programs and must list all courses taken and grades/marks earned.
   g. Translation of academic records: An English translation must be received for all non-English academic credentials.
   h. Evaluation of foreign credentials: MSU reserves the right to require a professional evaluation of non-U.S. academic credentials from applicants who have attended colleges/universities outside the United States and Canada (where English is not the language of instruction) unless MSU has a formal agreement with the post-secondary institution.
   i. Medical records/insurance: All applicants are required to submit a completed immunization record to the Student Health Service. Proof of medical insurance is required prior to registration for classes. Records may be submitted by logging into the Student Health Service website http://www.montana.edu/health and clicking on the “On-line Student Health” link. Questions may be directed to the Student Health Service, Montana State University, P.O. Box 173260, Bozeman, MT 59717-3260 (+1-406-994-2311).
   j. Foreign Student Eligibility to Transfer form: This form must be submitted by all international students transferring from a U.S. college or university. This form should be sent to the Office of International Programs, Montana State University, P.O. Box 172260, Bozeman, MT 59717-2260 (+1-406-994-4031).
3. The Office of International Programs will issue the Form I-20 (necessary for obtaining an F-1 student visa) to international applicants who are accepted for admission and whose admission files are complete.

4. The request to have credentials sent to Montana State University must be initiated by the applicant. Requests should be made in writing directly to the registrar at the former secondary school, college, university, or agency. Credentials must be sent directly to the Office of International Programs.

5. Application materials and application fee will be retained for one year from the original applied term. To defer admission to a later semester, the Office of International Programs must be notified well in advance of the intended semester of entry.

Requirements for International Undergraduate

Non-Degree-Seeking Students

Students interested in taking a limited number of courses at MSU without pursuing a degree may apply for non-degree-seeking status by submitting the following:

1. International Student Application form and $36 (US Dollars) application fee for online applications or $30 (US Dollars) application fee for paper applications.

2. Official proof of English language proficiency—525 (CBT 195, iBT 71) TOEFL, IELTS 6, or A.C.E. Language Institute Level 6 (available at MSU) or, if a student is coming for a limited period of time on another institution’s I-20, MSU will accept written permission from the instructor(s) of the MSU course(s) the student intends to take.

3. A letter of intent from the student outlining educational objectives, purpose of study, and specific terms and dates of attendance at MSU.

4. Financial Certificate guaranteeing the required minimum funds annually from students to whom MSU will issue an I-20.

Canadian Undergraduates

Students from Canada who have completed grade twelve or thirteen in secondary school are considered freshmen; those who have completed an equivalent of 12 credits or more of post-secondary university-level course work after secondary graduation are considered transfer students.

Academic Eligibility

1. Freshman Students:

Freshmen students will be considered for admission on the basis of their secondary school record and scores taken from the ACT or SAT tests. Applicants who have a minimum cumulative grade-point average (GPA) of 2.5 on a 4.0 scale or have an ACT score of 22 or an SAT score of 1540 will qualify for admission. If the applicant’s native language is not English, a minimum TOEFL score of 525 (CBT 195, iBT 71), IELTS 6, or A.C.E. Language Institute Level 6 will be required.

2. Transfer Students:

Transfer students will be considered on the basis of their post-secondary education record. A minimum cumulative transferable grade-point average (GPA) of 2.0 or C on a 4.0 scale is required of all Canadian transfer students. If the applicant’s native language is not English, a minimum TOEFL score of 525 (CBT 195, iBT 71), IELTS 6, or A.C.E. Language Institute Level 6 will be required.

Application Procedures

All application materials must bear the official school seal and signature and be sent directly from the institution or agency to the Office of International Programs. Transcripts and test scores received from students are unofficial and not acceptable. To provide time for evaluation and for notice of acceptance to reach the applicant in a timely manner, the application and required credentials must be received by the Office of International Programs according to the following dates:

- Fall Semester - May 15
- Spring Semester - October 15
- Summer Session - March 1

Receipt of the following credentials in the Office of International Programs constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. To apply for a semester other than the one originally intended, notify the Office of International Programs as soon as possible.

- Office of International Programs: PO Box 172260, 400 Culbertson Hall, Bozeman, MT 59717 USA, Phone: +1-406-994-4031, Fax: +1-406-994-1619, Email: international@montana.edu

Be sure to submit the following items:

1. International Undergraduate Application for Admissions: A paper application can be downloaded and printed at: www.montana.edu/international/admissions/docs/InternationalApplications.pdf. An on-line application may be submitted at apply.embark.com/ugrad/montanastate/26/.

2. Application fee (nonrefundable): US $36 on-line application fee or US $30 paper application. The fee must be in U.S. currency. Checks should be made payable to Montana State University and must indicate the U.S. banking codes. The application fee will not be waived, deferred, or refunded. The fee must be paid before the application will be processed.

3. Evidence of Financial Support:

MSU requires the International Student Financial Certificate from students with non-immigrant visas. The Financial Certificate guarantees that the required minimum amount of money, in U.S. dollars, will be available to the student during the academic year. A bank statement is also required. Admission will not be considered until the Financial Certificate is completed, with a signed statement of support, and is on file in the Office of International Programs. The Financial Certificate is included with the paper application or it can be downloaded with the online application and submitted separately.
4. **Secondary school academic records:** Complete and official secondary school transcripts listing all courses and grades/marks earned are required of all students applying as first-time freshmen or those who have earned fewer than 12 college/university credits. The record must be sent directly from the secondary school to the Office of International Programs. Additional official certificates may be required to show completion of secondary school.

5. **ACT/SAT scores:** All first-time freshmen are required to take either the American College Test (ACT) http://www.actstudent.org/scores/send/index.html or the Scholastic Aptitude Test (SAT) Reasoning Test http://www.collegeboard.com/student/testing/sat/scores/sending.html. MSU does not accept the SAT Subject Tests (formerly SAT II Subject Test) for admission purposes. The test results are used in determining admission status, awarding certain scholarships and in assisting with academic planning. Applicants who have graduated three or more years prior to the semester in which they intend to enroll are not required to submit ACT/SAT test results.

6. **College/university transcripts:** Official transcripts from each international and U.S. college/university attended are required and must list all courses taken and grades/marks earned. The transcript must be sent from each institution to the Office of International Programs.

7. **Translation of academic records:** An English translation must be received for all non-English academic credentials.

8. **Evaluation of foreign credentials:** MSU reserves the right to require a professional evaluation of non-U.S. academic credentials from applicants who have attended colleges/universities outside the United States and Canada (where English is not the official language of instruction) unless MSU has a formal agreement with the postsecondary institution.

9. **English Language Proficiency:** A TOEFL score of 525 (CBT 195, iBT 71), IELTS 6 or ACE Language Institute Level 6 or above is required of non-native speakers of English. If a student is coming for a limited period of time on another institution’s I-20, MSU will accept written permission from the instructor(s) of the MSU course(s) the student intends to take.

10. **Medical records/insurance:** Submit required immunization records by logging onto the Student Health Service website at www.montana.edu/health and clicking on the “On-line Student Health” link. Students must submit proof of required immunizations prior to registration for classes. Questions should be referred to the MSU Student Health Service, +1-406-994-2311.

11. **Foreign Student Eligibility to Transfer form:** This form must be submitted to the Office of International Programs by all international students transferring from a U.S. college or university.

**Notification of Admission**

Applicants are reviewed for admission when all required final and official credentials have been received at the Office of International Programs. Successful candidates will promptly be issued a letter of acceptance and an I-20 form necessary for obtaining an F-1 student visa. A packet of information regarding orientation, the registration process and other important information will follow directly in a separate mailing.

**Early Admission**

Early Admission (concurrent high school/university attendance) allows a high ability student who has not completed high school to take courses for university credit.

**Academic Eligibility**

1. Demonstrate ability to do university-level work in at least one academic area.
2. Demonstrate a strong likelihood of success at university-level work in that area.

3. Meet the course requirements for Early Admission set by the departments offering the courses to be attended.

4. Normally such students will have completed the sophomore year in high school and will have a grade-point average of at least 3.25, documented on an official high school transcript.

**Application Procedure**

Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the high school, the registrar’s office at the college/university or testing agency.

1. **Admissions Application:** An application may be submitted on-line or printed out at: http://www.montana.edu/wwwcat/appopis.html. The application may also be obtained from a high school counselor or from the Office of Admissions.

2. **Application Fee (nonrefundable):** $36 online application or $30 paper application fee. Checks should be made payable to Montana State University. The application fee will not be waived, deferred, or refunded. This fee must be paid before the application for admission will be processed.

3. **High School transcript:** An official transcript must be sent directly from the high school to the Office of Admissions. The transcript must post all courses completed and a minimum grade point average (GPA) of 3.25 and/or test scores listed below.

4. **ACT/SAT scores:** An ACT score of a 27 or an SAT score of an 1820. Official ACT/SAT scores should be sent directly to the Office of Admissions from the ACT/SAT testing agency.

5. **Coursework:** Must have completed the majority of the College Preparatory coursework outlined under Freshmen Admission Requirements.

6. **Letters of Recommendation:** A letter must be submitted from the high school principal and/or guidance counselor recommending the student for Early Admission.
7. **University Professor Recommendation:** A letter from a faculty member in the university department in which the course is to be taken must state that the student is apparently prepared to take the course in question and is granted permission to do so.

8. **Interview:** The MSU Early Admissions Committee must recommend acceptance in the Early Admission program. Applicants and their parents may be interviewed by the committee. Contact the Assistant Director of Admissions to schedule an interview.

**Special University Attendance**

Special university attendance allows a student of high school age who will not have graduated from high school to be considered for regular admission where a demonstrated extraordinary ability and general maturity warrant such acceptance. Admission will be very selective.

**Academic Eligibility**

To be eligible for special university admission, the applicant:

1. Demonstrate exceptional ability to do university level work.
2. Demonstrate a strong likelihood of success at university level work.

**Application Procedure**

1. Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission:
   a. **Admissions Application:** An application may be submitted online or printed out at http://www.montana.edu/wwwcat/appoptis.html. The application form may also be obtained from Montana high school counselors or from the Office of Admissions, Montana State University, P.O. Box 172190, Bozeman, MT 59717-2190 (406-994-2452). Return the completed and signed form to the Office of Admissions.
   b. **Application fee (nonrefundable):** $36 application fee (online application); $30 application fee (paper application). Checks should be made payable to Montana State University. The application fee will not be waived, deferred, or refunded. The fee must be paid before the application for admission will be processed.
   c. **High school transcript:** An official transcript must be sent directly from the high school to the Office of Admissions. Courses completed and grade point-average must be posted.
   d. **ACT/SAT scores:** Scores from either the ACT or the SAT (if available) or appropriate documentation confirming student’s academic ability must be sent directly to the Office of Admissions.
   e. **Letters of recommendation:** Letters recommending admission must be submitted by the student’s school principal, guidance counselor and/or teachers. Letters from teachers who work with gifted and talented students are particularly valued.
   f. **Interview:** An appointment must be made with the Registrar and Director of Admissions to discuss Special University Attendance.
   g. **Evaluation of ability and social maturity:** An evaluation of academic ability and social maturity may be requested through the MSU Counseling and Psychological Services.

2. The request to have credentials sent to Montana State University must be initiated by the applicant. Requests should be made to the registrar at the high school or agency. Credentials must be sent directly to the Office of Admissions.

**Non-degree Undergraduate Level**

Non-degree undergraduate students are those who have not earned a baccalaureate degree and are wishing to take college courses, but who are not interested in pursuing a baccalaureate degree at Montana State University.

**Academic Eligibility**

1. Students must have at least a high school diploma or equivalent and have not earned a baccalaureate degree.

2. Students must be in good academic standing at previous or current institution (including current students at MSU).

3. Non-degree students are not eligible for financial aid, family housing, or intercollegiate athletic competition.

4. Credit earned in non-degree status may apply to a future undergraduate degree program. Academic departments determine how or if the credit will meet graduation requirements.

**Application Procedure**

Receipt of the following constitutes a complete application for admission:

1. **Application form:** The application form may be submitted online or printed out at: http://www.montana.edu/wwwcat/appoptis.html or obtained from the Office of Admissions, Montana State University, P.O. Box 172190, Bozeman, MT 59717-2190 (406-994-2452). Return the completed and signed form to the Office of Admissions.

2. **Application fee, $36 fee (online application) or $30 fee (paper application):** Checks should be made payable to Montana State University. The application fee will not be waived, deferred, or refunded. The fee must be paid before the application will be processed.

**Former MSU Students**

Students are considered former/returning students when they have attended MSU in the past, but not the immediately preceding term. The Intent to Register Form should be completed and returned to the Registrar’s Office a minimum of 30 days prior to the registration period for the term desired. This form is also available at the Registrar’s Office or can be mailed/faxed upon request.

Students who have earned a bachelor’s degree at MSU, but are interested in taking additional work not applicable toward an advanced degree, should complete and file a Non-Degree Graduate Application with the Division of Graduate Education.

The following items are required of each former/returning student:
Appeal of Admission Decisions

Applicants who wish to appeal the decision(s) made in the Office of Admissions relating to admission status, acceptance of transfer credit, granting of University Core designation, or Montana residency status are encouraged to contact the appropriate campus resource. Initial questions regarding admission decisions and transfer credit evaluations should be directed to the Office of Admissions. If an appeal is appropriate, information about the appeal process can be obtained from the Office of Admissions.

Graduation and Admissions Requirements Committee (GARC)

The Graduation and Admissions Requirements Committee (GARC) considers appeals and/or petitions from students seeking re-evaluation of the assignment of transfer credit to meet University Core requirements. The Committee is composed of MSU faculty and administrators.

Residency Appeals Committee

The Residency Appeals Committee considers appeals from students seeking reconsideration of Montana residency status for fee purposes based upon the Montana Board of Regents Policy.

All incoming students should contact the Office of Admission regarding the appeal process and submission of required documentation. Continuing or returning students who wish to appeal the initial residency classification should contact the Registrar’s Office and request a Student Guide to Montana’s Residency Policy brochure. The Residency Appeals Committee will review all submitted documentation and determine Montana residency status for fee purposes.
SPECIAL ACADEMIC OPPORTUNITIES

For the most up-to-date catalog information:

www.montana.edu/wwwcat

A.C.E. Language Institute

The Language Institute is sponsored by the American Cultural Exchange (A.C.E.) of Seattle, Washington. This on-campus program provides an English language academic preparation program for students whose native language is not English. Seven-and-a-half-week sessions are offered throughout the year and are taught by highly trained instructors. The program offers seven levels of English instruction designed to meet students' needs at their particular language level. Students who complete the appropriate level and receive a full recommendation from the Language Institute can apply to Montana State University without taking the TOEFL exam.

Language Institute student services include: airport pick-up, homestay placement, academic advising, and help with college and university applications and visa information. The university setting offers Language Institute students the opportunity to meet Americans and to participate in campus activities.

The Institute also offers courses in English as a Second Language (ESL), the Language Institute for specific SPEAK exams. Students should contact the Language Institute for specific course listings.

For more information, contact:

A.C.E. Language Institute
Montana State University
1106 S. 6th Ave.
Bozeman, MT 59717 USA
Phone: 406-585-9832
Fax: 406-585-9838
e-mail to: msuace@cultural.org

American Indian Research Opportunities (AIRO)

AIRO, a consortium of Montana’s seven Tribal Colleges and MSU-Bozeman established in 1983, is dedicated to increasing the numbers of American Indians entering higher education and career fields where they are significantly underrepresented. AIRO is the umbrella organization for several specialized programs including the Initiative for Minority Student Development (IMSD), the Bridges to the Baccalaureate Program (BRIDGES), and the Montana (High School) Apprenticeship Program (MAP). All programs are funded wholly or in part by the federal government and foundations through such agencies as the National Institutes of Health (NIH), the National Science Foundation (NSF), and the Howard Hughes Medical Institute. The major goal of AIRO is to provide opportunities for American Indian students in science, Mathematics, engineering, and technology (SMET) career fields. Through AIRO, American Indian students have the opportunity to excel and to serve as role models for other minority students. Descriptions of the programs administered under the consortium of AIRO are as follows:

The IMSD Program focuses on undergraduate students. The program’s major goals are 1) to increase American Indian students’ academic competency in the biomedical fields, 2) to provide laboratory experiences in biomedical research for American Indian college-level students interested in biomedical/allied health careers, 3) to expose American Indian students to a broad spectrum of career opportunities in biomedical/allied health fields, 4) to strengthen facilities and research resources at the Tribal Colleges, and 5) to increase the number of American Indians in biomedical/allied health fields.

The BRIDGES program collaborates with Little Big Horn College, Fort Belknap College, and Fort Peck Community College to increase the number of students successfully transferring from the two-year tribal colleges to MSU and pursuing academic studies in the biomedical and other health-related sciences. BRIDGES activities include 1) conducting research seminars at the tribal colleges by MSU faculty and others in biomedical and behavioral sciences; 2) hosting spring workshops and campus visits to introduce tribal college students to the four-year campuses; 3) providing funds to cover the cost of tuition and fees for MSU course work to tribal college students during the summer months to improve students’ academic competitiveness and confidence; 4) providing students with research experiences in biomedical and related laboratories at MSU; 5) developing mentoring relationships between the student participant and an MSU faculty member in a related discipline; 6) providing tribal college faculty with opportunities for professional development, including support for travel to biomedical and related professional conferences, research supplies, and/or opportunities for collaborative research with MSU faculty; and 7) providing on-campus support after students bridge from one campus to the other, continuing to motivate and guide these students through their completion of a B.S. degree.

MAP is a summer enrichment program on the MSU-Bozeman campus for Native American high school students who are interested in science and math and want to work in a research lab and live on a college campus. Over eighty-five percent of the students who have attended MAP in the past twenty-three years have gone on to college, many in science, math, or engineering. The program also provides opportunities for middle and high school math and science teachers who work with Native American students.
American students. The teachers spend eight-to ten weeks on campus working in research labs and interacting with the MAP students.

For more information contact AIRO, 312 Roberts Hall, 406/994-5567, or send e-mail to slyoung@montana.edu.

Extended University

Extended University administers and coordinates on-and off-campus instruction in the form of distance-delivered and face-to-face courses, programs, institutes, and conferences that supplement the formal academic curriculum at MSU. Extended University services are organized into three main categories:

Montana State Online: Looking for an online or distance learning course at MSU? Currently MSU offers several graduate degrees and select undergraduate courses online and via video conferencing. Non-traditional programs are offered in partnership with Extended University and MSU academic departments.

Office of Continuing Education: Continuing education courses extend the educational resources of the University to the citizens of Montana and beyond. Credit and non-credit courses are offered at various locations across the state. Increasingly, instruction is provided through the use of distance learning technologies, such as video conferencing and web-based online courses. Fees for continuing education courses vary and are established on a cost-recovery basis.

Burns Technology Center: The BTC supports a variety of instructional technology classrooms and tools at Montana State University. The BTC provides training and support services for faculty, students, and private organizations on a contract basis. In addition, the BTC participates in pilot and demonstration programs that explore and enhance information and communication technologies to benefit education and society.

Organizations, professional groups, and interested individuals are invited to contact Extended University for additional information concerning credit and non-credit courses and instructional technology programs.

Directed Interdisciplinary Studies

For undergraduates interested in pursuing an area of scholarly/creative inquiry that falls outside the established departmental structure of Montana State University, a bachelor’s degree in Directed Interdisciplinary Studies is available. Directed Interdisciplinary Studies (DIS) is neither a “double-degree” nor a “major-minor” degree program. Interdisciplinary study is defined as the integration of more than one intellectual or methodological perspective within a field of study (or related fields) identified by the student and approved by the Faculty Advisory Committee (FAC). The FAC consists of three faculty members representing at least three different categories within two academic disciplines.

A DIS major entails an intellectually coherent sequence of course work, seminars, and supervised reading/research projects culminating in a substantial written and/or creative senior year thesis. Students are required to meet with their FAC and file a progress report each semester.

Applicants must have a university GPA of 3.3 and a letter of reference from an adviser chosen from the FAC attesting to the applicant’s self-motivation. B.A. and B.S. DIS degrees must include a minimum of 45 semester credit hours of DIS course work, at least 36 of which must be at the upper-division level at Montana State University. The senior thesis project must represent at least 9 semester credit hours at the upper-division course level. A final oral presentation of the thesis will be presented before the FAC and members of the DIS Oversight Board.

A minimum of 120 semester credit hours is required for graduation. Students will not be eligible for the DIS degree unless they have also satisfied the Montana State University Core Curriculum requirements. Upon satisfaction of the requirements established for each DIS student by the DIS Oversight Board and approval of the student’s college, students will be recommended to the President of Montana State University and the Board of Regents for the B.A. or B.S. in Directed Interdisciplinary Studies (with citation of thesis and GPA honors as determined by established Montana State University regulations).

For details about admissions and an application, contact the University Honors Program Office in Quad D, call 406-994-4110, or send e-mail to honors@montana.edu.

Division of Health Sciences

Montana State University has a strong commitment to and focus on health professions education. To promote, support and expand the institutional capacity to meet health related needs of the people of Montana, the Division of Health Sciences (DHS) was created and many of the health related activities on campus are united under the DHS. Notably the Division houses the Health Professions Advising Office which offers guidance to students interested in pursing careers in Medicine, Dentistry, and other health related fields. The DHS is the home of the Montana WWAMI Medical Education Program, a cooperative partnership with the University of Washington School of Medicine that admits 20 Montana residents into the program leading to the degree of Doctor of Medicine. Montana WWAMI students spend their first year of medical school on the MSU campus.

The DHS encompasses several important outreach organizations, including the Montana Area Health Education Center (AHEC) and the Montana Office of Rural Health (MORH). The AHEC and the MORH work with Montana communities in many capacities, including programs to interest K-12 students in health care professions, programs that address wellness issues in rural communities and programs that focus on communities needs regarding health issues. The Montana Family Practice Residency program, the “cousin” to the WWAMI medical program that provides training for new physicians in primary care, is affiliated with the DHS. The DHS extends into the biomedical research arena by fostering integration of biomedical research activities at MSU, where there are strong programs in biotechnology, neurobiology, immunology, cell biology, molecular biology, microbiology, proteomics and genom-
ics. Many of these programs support undergraduate research and introduce students to biomedical research. The American Indian Research Opportunity (AIRO) program is a well established program within the DHS that provides opportunities for Native American students to do research in laboratories at Montana State University while taking classes at MSU. Also housed within the DHS is the Montana Medical Laboratory Scientist training program. Medical Laboratory Scientists (also known as Medical Technologists or Clinical Laboratory Scientists) are important health care providers that perform laboratory analyses used in the diagnosis and treatment of disease and maintenance of health.

For further information see the DHS web site at http://www.montana.edu/dhs, contact the DHS Executive Director by calling 406-994-4411, or send e-mail to jshelby@montana.edu.

Health Professions Advising

The DHS is committed to the undergraduate community interested in the health sciences by providing information and assistance so students can best achieve their ultimate career goals. The role of the office of Health Professions Advising (HPA) is extensive and serves students from across the campus as well as alumni considering career changes. There are many academic departments that support pre-health career majors including the biomedical option in Cell Biology and Neuroscience and majors in Engineering, Microbiology, Chemistry and Biochemistry, and Veterinary Molecular Biology to name but a few of the more common choices.

Beginning at freshman summer orientation, students interested in learning more about the health professions may attend a special session describing the opportunities at MSU. Prospective students are also encouraged to meet with the Health Professions Advisor. In the freshman year students may take a one-credit class focused on the variety of health professions and academic opportunities available at MSU. During the sophomore or junior year an introduction to dentistry course and undergraduate clinical observation courses are offered as well as opportunities for continued counseling through the HPA office. During the spring of junior year, as students begin to prepare for the formal application process to a health professions school, detailed application workshops are available and strongly encouraged. Also during this critical time, the pre-professional health advisory committee (PPAC) conducts interviews with students planning to apply to pre-health programs and offer their advise. Evaluations are prepared by the committee and used as part of the student’s application materials. During the senior year, students’ applications are processed and monitored by the Health Professions Advisor and/or the office staff. Importantly, students are counseled throughout the decision making process.

Supplementing the formal activities of the HPA, the pre-professional clubs, and the only Montana chapter of Alpha Epsilon Delta (AED), the national pre-health honors society, hosts a series of presentations to introduce students to practical aspects of health careers. Students are also encouraged to join the electronic mailing list provided by the HPA to stay abreast of events and opportunities. The success rate of MSU students applying to medical and dental schools is substantially higher than the national average.

For further information, visit the Health Professions Advising website at http://www.montana.edu/dhs/hpa/, or contact us by email at hpa@montana.edu or by phone at 406-994-1670.

WWAMI Medical Program

Montana State University is one of six universities participating in a program to decentralize medical education in five states: Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI). The WWAMI Program is supported by the State of Montana and guarantees that 20 qualified students can be admitted to the University of Washington School of Medicine each year.

Sponsored by the University of Washington School of Medicine at Seattle and leading to an M.D. degree from that institution, the program is designed to make medical education available to citizens of the Northwest and to educate medical students in a way that will encourage them to practice primary care medicine in areas that lack a sufficient number of physicians.

Montana students receive the first year of their medical education at Montana State University. The curriculum is similar to and compatible with the University of Washington School of Medicine curriculum which emphasizes an integration of the basic and clinical sciences.

Course subject matter at Montana State University includes human gross anatomy, histology, human physiology, medical biochemistry, introduction to clinical medicine, musculoskeletal anatomy; immunology, infectious diseases, behavioral systems and the nervous system. A clinical preceptorship program has been developed, which involves the students with local physicians for several hours each week and for four weeks during the summer.

Following this first year of study at Montana State University, students join the portion of the class that began their studies in Seattle at the University of Washington as well as students from the other WWAMI regions (Wyoming, Alaska and Idaho).

At the conclusion of the first two years, students enter the phase of their education which is predominantly clinical in nature. During this phase, students receive a portion of their training at the University of Washington School of Medicine and a portion of their clinical education from physicians in the communities where the physicians live and practice (community phase). These latter “Community Clinical Units” are established for a given educational need (e.g., pediatrics, family medicine). Seven Community Clinical Units have been established in Montana. These are located in Billings (Internal Medicine and Obstetrics), Great Falls (Pediatrics), Missoula (Internal Medicine and Obstetrics), Havre (Family Medicine), and Whitefish (Family Medicine).

To be eligible for the Montana State University WWAMI Program, the prospective medical student must be a legal resident of Montana for one year prior to application and must satisfy the admission requirements of the University of Washington School of Medicine. It is not necessary for a student to complete his or her premedical (undergraduate) education at Montana State University in order to be eligible for the WWAMI Program. Students admitted to the program are selected.
by the Admissions Committee 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 at Montana State University for the first year of the program.

For further information see the WWAMI web site at http://www.montana.edu/wwami/, contact the Montana WWAMI Director at MSU by calling 406-994-4411, or send e-mail to wwami@montana.edu.

Montana Area Health Education Center

Until the fall of 2007, Montana was a regional AHEC for the University of Washington WWAMI Program, along with other states in the WWAMI system. The Montana AHEC at MSU was allowed to apply for funding through the College of Nursing in collaboration with the Montana WWAMI Program in the Division of Health Sciences. This new grant has allowed Montana to create its own AHEC system, with four regional centers and the Program Office which is located at Montana State University in Bozeman. The first center is in Billings and is hosted by Yellowstone City County Community Health Center, home of the Montana Family Practice Residency Program and the 3rd Year WWAMI Program. The second is located in Dillon, hosted by the Montana Hospital Association. A third center is located in Western Montana, in conjunction with the 3rd Year WWAMI Program in Missoula. In the fall of 2009, a center was established in North Central Montana. Each center has up to six years of funding that will total approximately $1.5 million. After six years of start up funding, the centers receive a more modest grant and are expected to be self-sufficient. The purpose of the regional centers is to connect health professions education to rural and underserved communities. Programs developed at the centers will focus on creating a pipeline of health professionals; placing WWAMI students and other health professions students in rural rotations; and continuing education programs for health professionals. AHECs are designed to strengthen the healthcare workforce and improve health by forging connections between health professions education and communities.

The mission of the Montana Area Health Education Center is:

- To improve the supply and distribution of health care professionals, with an emphasis on primary care, through community/academic educational partnership, to increase access to quality health care.

The mission is accomplished by pursuing goals, objectives and activities which are common to all AHECs. These are changed and/or modified each year in response to decisions made by the federal granting agency. The following guidelines are used in establishing annual goals, objectives and activities:

- Form productive linkages between healthcare units to the benefit of underserved and rural communities.
- Foster and encourage collaborative community-based health programs.
- Serve as a resource, clearinghouse and disseminatory of health information.
- Promote improved health and disease prevention through educational interventions.
- Respond to emerging community-based needs regarding health issues.
- Provide technical assistance on healthcare-related issues to underserved communities.
- Help implement collaborative community-based, multidisciplinary education and training for health professionals and health professions students.

For further information, see the AHEC web site at http://healthinfo.montana.edu/, contact the AHEC office at MSU by calling 406-994-6003, or send e-mail to kjuliar@montana.edu.

Montana Office of Rural Health

The Montana Office of Rural Health is funded through the Federal Office of Rural Health Policy. MORH is a resource for information on rural health issues, data, research and funding opportunities. MORH participates in 3RNet, a multi-state rural health professions recruitment program; manages the Small Hospital Improvement Program; and provides technical assistance to rural communities on rural health projects.

The mission of the MORH is “to serve its communities through: (1) collecting and disseminating information within the state, (2) improving recruitment and retention of health professionals into rural areas, (3) providing technical assistance to attract more federal, state, and foundation funding for rural health, and (4) coordinating rural health interests and activities across the state.”

All of the SORH are required to conduct activities which will accomplish three core and two additional functions:

- Establish and maintain a State clearinghouse for collecting and disseminating information on rural health care issues, research findings related to rural health care, and innovative approaches to the delivery of health care in rural areas.
- Coordinate activities carried out in the state that relate to rural health care; including providing coordination to avoid duplication in such activities.
- Identify Federal, State and non-governmental programs regarding rural health and provide technical assistance to public and nonprofit entities regarding participation in such programs.
- Encourage recruitment and retention of health professionals in rural areas.
- Participate in strengthening State, local and Federal partnerships in rural health.

For further information, see the MORH web site at http://healthinfo.montana.edu/ , contact the MORH office at MSU by calling 406-994-6003, or send e-mail to kjuliar@montana.edu.

Medical Laboratory Scientist Training Program

The Montana Medical Laboratory Scientist training program was created to help alleviate the critical need for medical laboratory scientists in the state of Montana, especially in rural communities. The program is a cooperation between Montana State University-Bozeman, the University of Montana and Montana State University-Billings.
Key Aspects of MSU’s MMLS Program:
- Program trains up to 15 students each year, the next class starting in May of 2009
- Students train during the summer at MSU and then move for fall and spring semesters for clinical rotations at nine major hospitals in Montana
- Students also do a two week rural rotation near the end of their clinical training
- Students can complete their training in four years and become certified Clinical Laboratory Scientists and work in clinical laboratories throughout Montana
- Funding to develop the program was obtained in 2007 with appropriations from the state legislature and donations from 16 hospitals in the state.
- This will help alleviate a critical healthcare workforce need in Montana and nationally

For further information send e-mail to microbiology@montana.edu.

International Programs

Office of International Programs

Responding to fundamental trends which pull the United States and Montana into the global marketplace and put us into daily contact with other nations, Montana State University seeks to bring international education to the core of the academic and cultural life of the campus. The Office of International Programs (OIP), located in Culbertson Hall (Fourth Floor), offers a full range of international programs and services to MSU students, faculty, and staff.

OIP provides quality educational opportunities abroad for MSU students at 240 universities in 50 countries. OIP also offers services and programs which make MSU accessible to capable students from around the world and ensure they have worthwhile academic experiences.

At the faculty level, OIP assists faculty to pursue their fields at the global level. OIP provides information and assistance to members of the faculty wishing to engage in international research, participate in a faculty exchange program, or develop international dimensions to their courses. In addition, OIP assists departments and offices in obtaining visas and making other arrangements necessary to host visiting scholars from abroad.

OIP is also responsible for developing and maintaining international institutional relationships between MSU and selected universities throughout the world. At present, MSU maintains active relationships with over 40 universities throughout the world, and more sister institution relationships are under development.

OIP reports to the Office of the Provost and works closely with the MSU International Programs Committee in conducting its programs.

Global Studies Minor

Montana State University-Bozeman offers a Global Studies Minor (GSM) administered through the Office of International Programs. The minor is intended to provide students with the fundamental international and intercultural skills they need to succeed in the “borderless careers” they will enter in virtually any career path they choose. The concept of the minor is to draw curricular resources together into a defined program that can provide a strong foundation in international studies, foreign languages, and intercultural communication for MSU graduates.

To fulfill the minor, students must complete three requirements. First, students must complete three GSM-support courses and 14 hours of approved electives. Second, students must complete at least the first semester of the second year in a modern language or demonstrate equivalent proficiency. Third, students must fulfill an education abroad requirement by earning at least six credit hours on an approved study abroad program. This requirement can also be fulfilled through approved academic internships, service learning, or faculty supervised research abroad.

Study Abroad

MSU encourages students to study abroad, both to build the international skills which are increasingly needed in all professions, and for the intrinsic educational value of studying outside one’s home country.

In addition to hundreds of study abroad options for individual students, numerous special programs are developed by MSU faculty members which allow groups of MSU students to travel and study abroad. Students earn full credit while participating in MSU-sponsored study abroad programs, and in most cases can maintain regular progress toward their MSU degree while studying abroad. Some MSU-approved study abroad experiences also satisfy the University Core Curriculum Multicultural/Global or Diversity requirement. These decisions will be made on a case-by-case basis.

For many study abroad programs are based on MSU tuition rates, enabling students to study abroad for little additional cost than remaining on the Bozeman campus. In addition, students eligible for financial assistance may apply their aid package to meet study abroad costs.

OIP’s International Opportunities Resource Center, located on the fourth floor of Culbertson Hall, offers students professional study abroad advising services and extensive reference materials on MSU-sponsored and non-MSU-sponsored study abroad programs.

International Institutional Partners

MSU maintains sister-institutional relationships with many specially selected universities around the world. With these institutions, MSU offers student and faculty exchanges, conducts collaborative research activities, and provides other cooperative programs. Current sister institutions abroad are listed below. Additional international partnerships are under development to meet the growing need for international educational opportunities for MSU students and faculty.

**Australia**
- Flinders University, Adelaide
- Macquarie University, Sydney
- University of Southern Queensland, Toowoomba
- University of Western Australia, Perth
- University of Wollongong, Wollongong
- University of Western Sydney, Sydney

**Costa Rica**
- Universidad Veritas, San Jose
- University of Sheffield, Sheffield

**France**
- Euromed Marseille Ecole de Management, Marseille
- Universite Paul Valery (Montpellier III), Montpellier

**Germany**
- Eberland-Karls-Universitat, Tubingen
- Martin-Luther-Universitat, Halle
- Free University, Berlin
Montana Space Grant Consortium

The Montana Space Grant Consortium (MSGC) was established in 1991 as a component of NASA’s National Space Grant College and Fellowship Program. The Montana program is one of a national network of 52 consortia, working to strengthen aerospace research and education in the United States.

Montana State University is the Lead Institution of MSGC, which has eighteen additional academic affiliates across Montana, as well as other educational and industrial members.

MSGC offers a variety of programs to support students and faculty wanting to pursue activities consistent with NASA’s interests.

Fellowships, Scholarships and Student Research

Each year MSGC offers graduate fellowships and undergraduate scholarships to students pursuing NASA-related studies. Applications are available early in the spring semester and are due April 1st of each year.

In addition to fellowships and scholarships, the Montana Space Grant Consortium offers support for undergraduate research at MSU throughout the year through the Undergraduate Scholars Program (USP). Stipends and fee waivers are available through this program and may be requested by submitting a research proposal to the USP office.

Program Opportunities for Students

The Montana Space Grant Consortium supports a number of programs at MSU, which provide opportunities for students from all majors to participate in NASA-related work. The BOREALIS high altitude ballooning program flies student-designed and built scientific experiments to altitudes over 100,000 feet above Montana, to the edge of space. MSGC, together with MSU’s Space Science and Engineering Laboratory, offers undergraduate and graduate students the chance to design, build, fly, and operate real spacecraft, including MEROPÉ, the first satellite built in Montana, and Explorer 1 [Prime], the next-generation of MEROPÉ. Explorer 1 [Prime] is slated to be on the first NASA launch of student-built satellites. MSGC’s Space Public Outreach Team offers MSU undergraduates the opportunity to become involved in outreach efforts of major NASA Space Science missions. MSGC also coordinates opportunities for students at NASA Academy and other internship programs at NASA Centers around the country. Seven MSGC student teams, selected in national competition, have flown with their experiments on NASA’s “Vomit Comet” astronaut training aircraft, at the Johnson Space Center in Houston, Texas.

Campus Wide Programs

MSGC funds a variety of faculty-proposed research and education enhancement programs across the MSU campus and throughout the state of Montana. These efforts allow students to work with faculty on cutting edge research and also provide opportunities for faculty to develop projects which share aeronautical and space sciences and engineering with diverse audiences. Funding for innovative, NASA-related programs is awarded annually through a competitive proposal process.

For more information, please visit spacegrant.montana.edu or contact the Montana Space Grant office at msgc@montana.edu or 994-4223.

National Student Exchange

The National Student Exchange, a consortium of 190 state-supported colleges and universities, offers students the opportunity to attend another participating institution for a semester or full academic year. By bringing together students from different parts of the country, the exchange encourages participants to broaden themselves academically, socially, and culturally to experience personal growth.

To qualify for participation in theNSE program, a student must 1) be a full-time student, 2) have a minimum cumulative grade point average of 2.5, 3) be a student in good standing academically, financially, and, socially, and 4) have completed at least 24 credits.

Students with Montana residency (in state) are able to enroll at their host institution with the same financial benefits enjoyed by in-state students. Nonresident students (out-of-state) may attend schools that allow them to con-
multicultural perspective in pursu-
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Pre-Law at MSU

Many students at MSU are interested in exploring possible careers in law and every year MSU students are accepted at excellent law schools across the country. MSU offers a variety of resources and advising to students who wish to pursue a career in law after graduation. These resources include:

- FAQs about law school, available at http://www.montana.edu/wwwprov/lawfaq.html
- Personal law school advising by faculty members and administrators who are experienced attorneys
- Legal career and law school information sessions scheduled several times during the academic year
- Courses about and/or relating to law, including:
  - AGEC 337–Agricultural Law
  - BUS 361–Introduction to Law
  - HDCF 425–Family Law and Public Policy
  - NAS 426–Federal Indian Law and Policy
  - PSCI 210–Intro to American Government.
  - PSCI 306–Legislative Process
  - PSCI 434–International Law
  - PSCI 461–Administrative Law
  - PSCI 471–American Constitutional Law
  - SOCI 313–Principles of Criminal Law and Procedure
  - SOCI 357–Occupational and Corporate Crime
  - SOCI 358–Crime and Inequality
  - SOCI 435–Law and Society
  - SOCI 436–Law and Inequality
- Many other courses that help students acquire the knowledge and skills necessary to be successful in law school and in a legal career.
- Law School Admission Test (LSAT) administration at MSU three times per year

Because there is no required or preferred set of courses for law school, MSU does not offer a formal pre-law curriculum. In fact, although Political Science is a common major for law school applicants, many law schools are delighted to see applicants who have majored in such apparently non-law related fields as engineering, biology and nursing because law schools seek variety and diversity in their applicants. What a student majors in is far less important than developing the skills necessary for a successful career in law, including critical thinking, logical reasoning, and excellent written and oral communication skills. All of these skills can be acquired and strengthened in any major a student chooses.

For more information about pre-law resources at MSU, please visit http://www.montana.edu/wwwprov/lawfaq.html.

Pre-medical/Pre-Health Professional Programs at MSU

The premedical option is part of a broader pre-health professions program at Montana State University administered through the Health Professions Advising Office (http://www.montana.edu/dhs/hpa/). Students interested in attending medical, dental, pharmacy, physician assistant, optometry, or chiropractic school are encouraged to participate in this program. Students considering a health professional career can major in any curriculum within the institution. To facilitate this academic decision-making process, the Health Professions Advising Office, in conjunction with University Studies, is offering an optional ‘Pre-Med’ entry major. As part of the entry major, student academic and health care exploration will be supported. Students will be poised to choose a major going into the sophomore year. The office will continue to provide information, advising, counseling and application support to all students interested in becoming health care professionals. An overview of services available through the Health Professions Advising Office is provided during orientation week at the start of the academic year. At this orientation session, students are given information about the courses required for making application to health professional school and encouraged to keep in contact with the Health Professions Advising Office. The Director of the Health Professions Advising Office is available to meet with students enrolled at Montana State University and high school students considering attending MSU. The office provides guidance throughout the process of making application to health professional schools. Students are invited to attend meetings of the pre-health professions club, the pre-dental club, the American Medical Student Association, and/or the pre-health professional honor society (Alpha Epsilon Delta) and become eligible for membership in the society during the sophomore year.

Contact Information:
Health Professions Advising Montana State University 315 Leon Johnson Hall Bozeman, MT 59717 hpa@montana.edu
Phone 406 994-1670 Fax 406 994-4398
Preveterinary Medicine Program
http://vmb.montana.edu/undergrad/prevet.htm

Montana State University-Bozeman has the largest number of preveterinary medicine students in the Montana University System. The preveterinary program is distinguished by its dedicated pre-vet advisor who works with all students in the program to assist them in preparing to apply for admission to schools of veterinary medicine.

MSU’s preveterinary curriculum is not a degree. Rather, it is an advising program coupled with a series of required undergraduate classes that prepare students for admission into schools of veterinary medicine. It is recommended that students choose a major in Biotechnology-Animal Systems, Animal Science, Microbiology, Organismal Biology, or Biochemistry while simultaneously completing the course work necessary for an application to veterinary school.

Since Montana does not have a veterinary school, the State of Montana contracts with veterinary schools in Colorado, Washington, and Oregon to accept applications from Montana students under a Professional Student Exchange Program (PSEP) within the Western Interstate Commission for Higher Education (WICHE). Montana students who are selected may attend one of the WICHE veterinary schools and pay the in-state resident tuition of that school. The State of Montana sends a support fee to the school to offset the cost of educating Montana residents.

At this time, the state of Montana supports nine Montana students each year in veterinary school, which makes this a very competitive program at the undergraduate level. Currently at MSU there are approximately 100 students enrolled in various areas of undergraduate study intending to pursue a career in veterinary medicine. In the past five years, 62% of the Montana students accepted into a WICHE veterinary school completed their undergraduate education at MSU. The students in veterinary school who completed their undergraduate course work at MSU are ranked in the top half of their veterinary school classes.

Service Learning at Montana State University

Service Learning courses provide Montana State University students with the opportunity to link academic study with community involvement. Students use information from these courses to address real needs of local and global communities. Student learning and service to the community are essential elements of these educational experiences. Through critical reflection, students integrate the knowledge and skills they are learning in class with applications in the real world.

Service learning courses enhance academic learning by helping students develop work-related skills, enhance their sense of civic responsibility, clarify their academic goals/aspirations, and increase awareness of moral and ethical issues while providing valuable assistance to non-profit community organizations. For many students, service learning enlivens the course and further engages them in meaningful understanding of academic content.

Courses which utilize the service learning instructional method are designated as a Service Learning Course in each semester’s Schedule of Classes.

Summer Session

The MSU Summer Session program is committed to providing a variety of classroom, outdoor, and online opportunities for students to advance or complete their educational goals.

Summer Session offers an exciting mix of courses designed to meet the needs of a diverse audience. For example:

- Students who work, or leave Bozeman for the summer, can still begin or continue their MSU education by enrolling in one or more online courses.
- Incoming freshmen can jump-start their college careers by fulfilling a core requirement or two.
- Students looking for something different can earn college credit while studying subjects such as photography, wildlife, music, and more.
- Post-baccalaureate students planning to apply to medical or dental school can explore a series of science and mathematics courses designed to meet the special academic needs of pre-med students.
- Summer master’s degree programs, designed to be completed in three to four summer sessions, enable students to earn master of science degrees in mathematics education or science education.

And when not in class, students enjoy a variety of activities in and around Bozeman, including cultural events in the city, and outdoor recreational opportunities in the nearby mountains.

Spend a summer at MSU—and make it a season of learning, adventure, and discovery!

For more information, contact:
Office of Summer Session
(406) 994-7136
summer@montana.edu
www.montana.edu/summer

Dates of future Summer Sessions are available in the Term Calendar.

The Space Science and Engineering Laboratory

MSU’s Space Science and Engineering Laboratory (SSEL) is a center of expertise with faculty, staff, and facilities for space research and space technologies. The charter of the laboratory is to bring together students and faculty in the science and engineering disciplines to conduct space flight experiments within an interdisciplinary research and student training environment. As described below the program has involved building the capability at MSU to conceive, design, build and operate sounding rocket payloads and small satellites. A fundamental tenet of the organization is to pursue state-of-the-art research while focusing strongly on student involvement, education and training in experimental space science. Upon graduation, participants in this program can enter the workforce with direct experience in space technologies.

Our hardware projects are space science motivated while simultaneously directed at major involvement by students at the undergraduate and graduate levels. Students undertake major responsibilities for design, engineering, development, testing, and flight operation, thereby gaining the essential beyond-the-classroom experience of working in an interdisciplinary team environment. SSEL students develop neces-
sary workforce skills through hands-on experience gained by building complex systems requiring formal documentation, configuration management, and adherence to schedule and budget. The students encounter and solve systems engineering challenges beyond those usually presented through the standard engineering and science curriculum. This deep involvement provides the extra experience that prepares these students to embark immediately on highly productive positions upon entering the workforce.

Students interested in becoming involved in the programs of the Space Science and Engineering Laboratory should contact the Director, Dr. David Klumpar. For more information, including details of current and past projects, go to http://www.ssel.montana.edu/

The Spectrum Lab

The Spectrum Lab charter comprises three missions: 1) develop multi-spectral optical concepts into prototype systems that provide computational, communication, sensor, or measurement capabilities that exceed state-of-the-art capabilities; 2) provide an educational environment for graduate and undergraduate students that prepares them directly for the goal-oriented, time-critical, team project emphasis of corporate research; and 3) establish corporate partnerships to transition emerging applications to commercial products, boosting economic growth and infrastructure in Montana. To accomplish these goals, multidisciplinary teams from diverse technical areas assemble to pursue specific development projects. Optical and electronic laboratory facilities support research efforts complemented by departmental programs, drawing on the combined expertise of Spectrum Lab personnel and affiliated faculty. A 32-processor SGI Origin 2000 supercomputer, shared with the Center for Computational Biology, provides superb scientific modeling capability.

Several projects are ongoing. An all-optical correlator project will process signals continuously at 10 Gbit/sec. One application consists of identifying patterns in multiple-probe data from neural bundles to establish their adaptive cooperative function. More generally, this correlator can contribute to iterative computation, used in adaptive imaging. Cache memory for a next generation (petaflop-scale) supercomputer will be built using all-optical technology. Application of this concept extends to buffer memory for data routing in communication networks. Supplementing this capability, all-optical routing switches are being devised with intended application in storage area networks - large distributed data banks, regionally interconnected. Frequency references for spectroscopic measurement and clocks have been demonstrated in compact implementations, and their application in precision-timing measurement instruments is under development.

The common thread throughout these projects is the exploitation of the spectral attributes of optical fields to provide either immense bandwidth in information processing or exquisite precision in oscillator stability. A spectroscopic discipline called spectral hole burning (or optical coherent transient) sustains much of the technology development. Other core techniques include ultra-short optical pulse shaping for data multiplexing, and the development of optical micro-resonators for wavelength discrimination and switching devices.

The Spectrum Lab staff consists of research scientists and engineers as well as postdoctoral fellows. It currently recognizes faculty affiliates in Physics, Electrical and Computer Engineering, and Chemistry and Biochemistry. Collaborations with Computer Science and Mematical Sciences are anticipated. The Spectrum Lab has close connections with other MSU centers: the Optical Technology Center (OpTeC), the Center for Computational Biology (CGB), and the Center for Biofilms Engineering (CBE).

Both graduate and undergraduate students are supported to participate in Spectrum Lab projects. Research that contributes to these projects, pursued under the supervision of either Spectrum Lab research professor staff or affiliated departmental faculty, can partially satisfy educational requirements or serve as the independent work toward advanced degrees.

For more information, go to http://www.spectrum.montana.edu/ or call (406) 994-7596.

Undergraduate Scholars Program

The Undergraduate Scholars Program (USP) encourages and facilitates undergraduate research in collaboration with faculty mentors by awarding grants and/or academic credit. Research projects may include any scholarly or creative activity ranging from traditional scientific experimentation to the creation of new artistic works, and can stem from a faculty mentor’s research or a student’s original idea.

A quick glance at the focus of some recent projects highlights the range of opportunities supported by USP: geology of underground coal beds, characteristics of biofilm, nursing stereotypes, bioprospecting in Yellowstone National Park, and an unusual exhibit of original photography. Projects are selected according to scholarly standards of the relevant disciplines(s).

For more information about the Undergraduate Scholars Program, visit the USP Web site at www.montana.edu/usp, e-mail to: usp@montana.edu, or call (406) 994-3561.

University Honors Program

University life serves many ends, but an essential component of higher education is to prepare students to better understand themselves, others and the increasingly complex world around them. Undergraduate education in particular has the goal of helping students become, in time, their own best teachers. At Montana State University, the University Honors Program addresses this goal by providing academically motivated students with unique opportunities to undertake interdisciplinary course work and undergraduate research leading to a university honors degree. Such studies, in addition to courses within their chosen discipline, provide extraordinary preparation for professional and technical careers, or graduate and advanced studies.

Entering students have the opportunity to undertake innovative studies during their freshman year. Texts and Critics: Knowledge and Imagination are both semester-long seminars that address fundamental issues in the humanities, social
Honors students have been remarkably successful in earning other scholarships for further study, both in the United States and abroad. Special attention is given to preparation for professional and graduate schools. Extracurricular, outdoor, and social activities are an important feature of the daily life of the program.

Enrollment in University Honors Program courses is restricted to students officially admitted to the program. Admission is normally limited to students in the upper ten percent of their high school class and who have high ACT or SAT scores, or to those already enrolled in the University who have demonstrated academic achievement and personal initiative.

To maintain good standing in the program, students must demonstrate significant and continuing progress toward their specific degree in addition to satisfying the particular standards of Honors course work or research. Graduation in the program requires the accumulation of a specific number of Honors credits as determined by the category of Honors degree the student pursues. All such credits may be acquired through successful completion of Honors courses; a minimum 3.5 overall grade-point average; and one-year (or its equivalent) of a foreign language. To graduate with Highest Distinction, a thesis and a minimum 3.7 GPA are required. Students with energy, self-reliance, and imagination should discuss their interest with the Director.

For details about admission and graduation requirements, contact the University Honors Program Office by calling 406-994-4110, or by sending an e-mail to honors@montana.edu. In addition, we encourage you to visit the Honors website at www.montana.edu/honors.

University Studies Program

The University Studies Program fulfills a variety of interests and needs at MSU. Most typically, freshmen choose University Studies when they are uncertain about a major field of study or want to explore a variety of curricula before making a final choice. Approximately one-third of entering freshmen choose University Studies as their initial curriculum.

Based on the student’s interests, goals, and academic background, a University Studies academic adviser assists the student in the preparation of an individualized program to explore various areas and at the same time fulfill course requirements or electives in any curriculum. Required University Core courses are particularly well-suited for this purpose.

University Studies students have the opportunity to enroll in First-Year Seminar. This academic Core course focuses on helping students reach their academic and intellectual potential through a concentration on critical thinking, verbal and written communication, and collaborative learning.

Undergraduate students may take up to 60 semester credits (through the sophomore year) in University Studies before declaring a major, although they are encouraged to select a suitable degree plan well before the 60-credit limit.

The program also serves students who plan to pursue specialized degrees at other institutions but wish to take basic courses at MSU for one or two years before transferring.

Transfer students may enter University Studies to fulfill requirements and explore MSU degree programs before declaring a major.
Housing

Residence Halls
Montana State University offers convenient and affordable on-campus housing for up to 3,200 students. The Residence Life Department is committed to providing an environment which is socially stimulating while enhancing the academic experience of the students who live on campus.

Application for Housing
Apply online at http://www.montana.edu/reslife

To request a paper application contact:
Residence Life and University Food Services
Montana State University
Hedges Complex
P.O. Box 172080
Bozeman, MT 59717-2080
E-mail: housing@montana.edu
Phone: 406-994-2661

Students with fewer than 30 earned credit hours (while in a residence hall setting) are required to live in the residence halls.

Prospective students are urged to submit an application at the earliest possible date since assignments are made in the order they are received based on the date of receipt. A limited number of private rooms are available.

Exemptions from On Campus Living
All incoming freshmen with fewer than 30 credits earned in a residential setting are required to live on campus for their first two academic semesters. However, there are some criteria that, if met, may qualify a student for an exemption from living on campus.

Qualifications for exemption are as follows: (1) Married; (2) Single Parent; (3) Have completed one full academic year at MSU; (4) Have completed one full academic year at another college/university; (5) Have a special hardship; (6) Will be living at home with an immediate family member (mother, father, brother, sister); (7) Will be taking fewer than six credit hours; or (8) Have other extenuating circumstances. To initiate the exemption process, you must submit the required written documentation. This must be received by the Residence Life Office prior to the academic period requested. Exemptions received after the start of any term will be considered, but rarely approved.

Part time students (3 - 11 credits) wishing to live on campus may be granted a waiver. Please contact the Residence Life Office at 406-994-2661 for more information.

The specific opening/closing dates for the residence halls will be sent to students with their room assignments. If this information is needed earlier, please contact the Residence Life Office at 406-994-2661 @ www.montana.edu/reslife.

The residence halls will be closed during Thanksgiving Break, Winter Break, and Spring Break.

Students may request University housing during break periods for an additional fee. Roskie Hall, Johnstone Hall, and the North Hedges Suites will remain open to accommodate students requesting break housing. Students not currently living in one of the previously mentioned halls will be required to move to an unoccupied room in one of the breaking housing halls. Other halls will only remain open based on the discretion of the Residence Life Administration. Guests are not allowed during break periods.

Prepayment
A $200 prepayment is required when submitting a Residence Hall Application. The University will not process housing requests until the student has submitted a completed housing application and the $200 non-refundable prepayment. The $200 will be applied to the total housing costs upon payment of fees.

Prepayment Forfeiture
Failure to occupy the room or cancellation of the contract before or during the contract period will result in the forfeiture of the $200 prepayment.

Residence Hall Association (RHA)
All students residing in the residence halls are members of the Residence Hall Association. Organized on floor, hall, and interhall levels with programming, judicial, and governmental committees, RHA strives to uphold and promote the interests of students residing in the residence halls and to provide an active voice in residence hall administrative policy and operating procedures.

Living Options
There are many living options available that encompass academic and social enrichment for our residents; however, living options do change from year to year, based on student need, academic interest areas, and national trends. Our current living options are listed below:

1. Male Hall (Langford)
2. Female Hall (Hapner/Hannon)
3. 21 and older building (Johnstone)
4. Co-ed Hall: Co-ed living environments are comprised of both men and women living on either separate floors or wings of the same hall (Mullan, South and North Hedges, Roskie, Johnstone.)
5. Freshmen Year Experience Floor: Housed in South Hedges, this co-ed option is open to students enrolled in the University Studies program. Resident Advisors integrate course curriculum into floor activities and programs.
6. Outdoor Pursuits: Housed in Roskie, Hapner and Langford, these floors provide an excellent living environment for students interested in experiencing additional outdoor recreational opportunities.
7. Academic Theme Floors: Dedicated to academic success, Residence Life offers floors designed to assist students with common majors. Currently, Nursing, Business, Arts and Architecture, Science, and Engineering floors are scattered throughout all seven halls.

8. Double as Single Floors: Designed for students who have already experienced the roommate living arrangement, double as single floors offer students a more private atmosphere.

9. Deluxe Floors: Roskie Hall is the home of two newly remodeled sophomore and above floors. These floors consist of single rooms with the same square footage as a double room in Roskie.

10. Sophomore and Above Floors: This quiet, yet active, living option provides an opportunity for those students who want a change of pace from the traditional freshmen energy.

11. Sophomore Year Experience: Designed to meet the needs of all second year students by creating programs that deal directly with the issues they are currently facing.

Please visit the Residence Life web site www.montana.edu/reslife, contact the Residence Life Office at 406.994.2661 or e-mail housing@montana.edu for the specific halls and floors which provide the living options outlined above.

Residence Hall Visitation Policy

Members of the opposite sex may visit in the privacy of individual rooms. Cohabitation is prohibited.

- Definition of a resident, as it pertains to this policy: A student who has contracted with the university to live in a specifically assigned hall/room for a designated period of time.

- Definition of visitor: Visitors are in the room for less than overnight periods. They may use the facilities in a manner in which they would not be considered regular hall residents. They do not sleep in the room. Visitors are subject to university regulations.

- Definition of guest: Guests pay room rental fees and are provided facilities and sleeping accommodations for a period not to exceed three (3) days. Guests are considered hall residents for the duration of their stay and are subject to university regulations.

In an effort to accommodate a variety of student lifestyles, the residence halls offer twenty-four hour visitation, in which residents may have visitors at their discretion and with the consent of their roommate.

Board Charges and Meal Plans

All residence hall students are required to participate in a meal plan. Meals are not served in the residence halls during Thanksgiving Break, Winter Break and Spring Break; which is reflected in the meal pass charges. Meal plans available for residents living in the halls are outlined below.

Meal Plan Options: Residence Hall students have two meal plans from which to choose. The meal plans are designed to offer students the flexibility and freedom to eat when, where, and what they want while on campus. Both plans allow unlimited entry into the dining rooms and unlimited food servings. The dining rooms are open from 7 a.m. to 7 p.m. daily, and the residence hall students can come in whenever they want, whether it is for a full meal or just a snack. In addition, students have a food cash account of $100 (Flex Money) that comes with their meal plan. By using this food cash account at any of the food service locations on campus, students receive a 10% discount on their purchases.

Choosing A Meal Plan: Students can choose either a 7-day or a 5-day meal plan. Both plans offer the same options and services except the 5-day plan does not allow students to use the dining rooms on the weekends. The 7-day plan offers the greatest value to students.

Semester Charges

Prices for the current academic year/semester can be obtained through the Residence Life web site (www.montana.edu/reslife).

In addition to these meal plans, off-campus students (only) have the option to purchase a variety of meal plans with five, seven, ten, or fourteen meals per week.

Pricing for additional room options are available at the Residence Life Office and University Food Service Office.

Payment of Charges

Room rent, board, ResNet and the RHA social fee are paid in full at the beginning of each semester during fee payment. Installment payments for room and board must be arranged in advance with the Office of Student Accounts. There are no deductions for room or board for late arrivals (at the beginning of the semester) or for early departures (at the end of the semester).

Work Opportunities

For students needing to work while attending Montana State University, there are a number of employment opportunities available in residence halls, at front desks, and with the various food services on campus. Information regarding employment may be obtained by contacting the Residence Life Office and University Food Service. Work study/financial aid status is not necessary to qualify for student employment.

Facilities:

Room Equipment and Furnishings

All rooms have closets, single beds, chests of drawers, study desks, waste baskets, chairs, and window coverings. The University supplies study lamps for students assigned to South Hedges, North Hedges, and Roskie. Each room is wired for cable television. A mattress pad and a pillow are provided for each student. Also, a linen service is available at the Residence Life Office and University Food Service.

ResNet

MSU ResNet is a campus network that provides a dedicated network connection for students living in the Residence Halls and Family & Graduate Housing. The direct network connection allows access to the Internet and campus resources easier and faster.
(about 300 times faster) than through conventional modem, without tying up the phone line. If you own a computer or plan to purchase one, you’ll be able to browse the Web from the comfort of your own room. ResNet is available as part of your room and board plan. For those residents not bringing a computer to school, ResNet also provides computing facilities with ResNet access, Microsoft Office software and high speed printing in six computer labs located in the Residence Halls.

Laundry
Laundry rooms exist in every hall with the exception of the North Hedges Suites and are equipped with Cat Card-operated automatic washers and dryers. Ironing boards and a limited number of irons are available at the hall desks.

Refunds of Room and Board Payments
Students who terminate class registration during a semester will receive a prorated refund of their board and room payments.

There are no refunds for early departures at the end of the semester or late arrivals at the beginning of the semester. Rooms are held until the first hour of classes on the first class day of the semester.

A student who is absent from his/her residence hall for one or more weeks of consecutive meals due to his/her own illness or participation in University-sponsored activities will be refunded board at $2 per meal, provided the student notifies the University Food Services Meal Pass Office in advance of the University-sponsored activity. Requests for refunds based on absence due to illness must be submitted to the Residence Life Office, accompanied by a statement from the Director of Student Health Services, or the student’s own doctor, indicating required hospitalization or home care.

Personal Funds and Property
Students are urged to help safeguard their personal funds by establishing local checking accounts. All other valuable personal property should be adequately protected. Montana State University is not insured nor responsible for the loss or destruction of any personal property of students. Students are encouraged to carry their own personal property insurance. Montana State University has strict regulations regarding firearms on campus; contact the Office of Residence Life for details.

Family & Graduate Housing
The Family & Graduate Housing Office is pleased to offer convenient affordable housing as a service to enable families, married couples, graduate students, second degree undergraduates, single parents, single upper classmen with 75 credits or more, and those in a legally dependent relationship to continue their education.

Family & Graduate Housing consists of 704 units in one, two, and three bedroom apartment/house configurations in eight different communities, located both on campus and within walking distance to all campus buildings and amenities. While each apartment complex varies, available options include: smoking and nonsmoking units, washer/dryer hookups, free laundry (in apartment complexes without washer/dryer connections), ResNet connection, dishwashers (in several Julia Martin and Braneagun units), storage areas, playground equipment, picnic tables, barbecues, and cable Television.

Apartments rent for considerably less than the “current market rate” in Bozeman. (click here for a rate list). In addition, basic utilities are included in all units except McIntosh, Paisley, and the West Side Houses. Water, sewer, and garbage are included in the rental price of all units.

As a benefit to our residents, the Family & Graduate Housing Office offers a variety of services to assist with making the transition to campus life: a newsletter is published twice-monthly to inform residents of upcoming campus and community events; a computer lab is available; a staff of part-time student community assistants (CA’s) are available to answer questions; a full-service Day Care Center is available for children 2-1/2 years through kindergarten within walking distance of ASMSU Daycare; a mediation program is available to assist with conflict resolution; children’s seasonal events are planned throughout the year; a staff of skilled craftsmen are available to assist with any maintenance problems; a 24-hour call-out service is available to assist with emergencies.

To receive a brochure, application, or to inquire about Family & Graduate Housing’s eligibility requirements, please contact:

Family & Graduate Housing Office
1502 West Garfield
Bozeman, MT 59714
406-994-3790

E-mail: fgho@montana.edu
Web page: http://www.montana.edu/fgh

MSU Family & Graduate Housing provides an equal housing opportunity. Discrimination based on race, color, national origin, religion, creed, physical or mental disability, gender, marital status, familial status, or age is prohibited.

Montana Campus Compact
The Montana Campus Compact (MTCC) is a statewide coalition of college presidents and chancellors committed to renewing the public purposes of higher education by promoting campus and community collaborations and civic engagement activities. Since 1993, these campus leaders have represented two and four-year, public, private, religiously affiliated, community and tribal colleges across Montana. MTCC supports and encourages activities such as volunteering, community service, and service learning through its programs, which include:

- Campus Corps Stipended and Non-Stipended Programs
- MTCC VISTA Project
- Raise your Voice Campaign
- MTCC Community Service Scholarship
- Montana Athletes in Service
- Jimmy and Rosalynn Carter Partnership Award for Campus Community Collaboration

For information on MTCC programs and projects available at Montana State University, please contact Kathryn Tanner in the MSU Office for Community Involvement (OCI) at 994-6902, or via email to community@montana.edu or visit OCI in room 330 Culbertson Hall. For more information regarding MTCC member benefits and services please contact the MTCC headquarters office at (406) 243-5177 or visit http://www.mtcompact.org.
Student Activities

Student Activities Office
Student Activities, located in 282 SUB (406-994-3591), and on web at www.montana.edu/wwwstuac, provides assistance and advice to individual students, approximately 140 registered student organizations, the ASMSU Campus Entertainment staff, and the ASMSU Homecoming chairpersons. Assistance is available in planning and development for programs and activities directed toward meeting the wide variety of interests of the students and the University community. The office is also responsible for coordinating experiences that enhance academic programs.

Campus Entertainment
The Director of Student Activities acts as adviser to the following Campus Entertainment Committees: Arts and Exhibits, Concerts, Films/Videos, Lectures and Lively Arts, and Technical Services.

Day of Student Recognition
Day of Student Recognition is a campus-wide awards ceremony recognizing students for outstanding achievements in both scholarship and leadership. Awards and scholarships presented at this program are sponsored by MSU academic departments, on- and off-campus organizations, alumni and friends of the University, and Student Activities. For further information contact the Office of Student Activities.

Student Organizations
On average, there are over 140 student organizations which reflect all facets of university life. Student organizations register each year with the Student Activities Office. Approved registration permits an organization to hold meetings in the Strand Union and to use its facilities for fundraising events. The Director of Student Activities serves as a resource to campus student organizations.

University-wide Scholastic Honoraries
Alpha Lambda Delta is a national scholastic honor society for freshmen whose grade-point average is 3.5 or better.

Mortar Board is a national senior honorary. Members are elected in the spring of their junior year. Scholarship, leadership, and participation in activities are the basis for election.

Phi Kappa Phi is a national honor society for faculty and students. Senior students are elected to membership on the basis of scholarship and leadership attainments. Top ranking junior students are also eligible.

Golden Key National Honor Society honors academic excellence.

Septemviri is a local honor organization of seven top seniors selected on the basis of grades, activities, and contributions to the university during their junior year.

Other Honor Societies
There are a number of national honor societies whose membership is limited to students in specific fields of study: Alpha Kappa Delta (sociology), Alpha Zeta (agriculture), Kappa Kappa Psi (band), Kappa Delta Pi (education), Phi Alpha Theta (history), Sigma Lambda Chi (construction), and Sigma Theta Tau (nursing).

Residence Hall Association (RHA)
Please see the earlier description of the Residence Hall Association.

Service Organizations
Fangs: This is a sophomore service organization for men, whose purpose is to ensure that university traditions are upheld. Membership is selected from the freshman class. Upon request, members serve at all types of campus activities and functions.

Spurs: This sophomore service honorary for women, was founded on this campus in 1921, and has since become a national organization with chapters at a number of colleges and universities. Service to the university community is the function of Spurs. Members are selected during spring semester. A 2.5 grade-point average and sophomore standing (30 credits) by the following fall semester are requirements for membership.

Circle K: Sponsored by the Kiwanis Club, Circle K serves the campus and community. Membership is open to all interested MSU students.

Arnold Air Society: This nationally affiliated service organization offers services to the campus and community. Male and female students enrolled in Air Force ROTC are eligible for membership.

Social Sororities and Fraternities
The international/national women’s sororities at Montana State University are Alpha Gamma Delta, Alpha Omicron Pi, Chi Omega, and Pi Beta Phi.

International/National men’s fraternities include Alpha Gamma Rho, Kappa Sigma, Pi Kappa Alpha, Sigma Alpha Epsilon, Sigma Chi, and Sigma Phi Epsilon.

The Interfraternity Council for men and the Panhellenic Council for women, composed of representatives from each sorority/fraternity organization, serve to coordinate activities of the Fraternity and Sorority Community.

A student is eligible for recruitment who 1) has been officially admitted to MSU in good standing, or 2) has attended MSU or another institution and obtained twelve credits with at least a 2.0 grade-point average the previous semester. Individual sororities and fraternities may set higher requirements.

Sororities and fraternities hold recruitment at the beginning of fall semester. Informal recruitment continues during each academic term.

ASMSU Administration and Student Government
About ASMSU
The Associated Students of Montana State University (ASMSU) has been organized to provide numerous services to its student members and to be a voice for student concerns. Students taking seven or more credits pay an activity fee making them members of ASMSU.

The governing body, the senate, consists of twenty-one students. The senate’s greatest responsibility is the annual allocation of approximately three-quarters of a million dollars to about twenty-seven committees. The committees are administered by an elected student body president and vice-president, and a business manager who is appointed. ASMSU hires
approximately 250 students a year. Experience in responsible management of student funds, knowledgeable decision making, and representation of student concerns, as well as experience in working with people, are gained through involvement in ASMSU. The ASMSU Office is located in Room 281 of the SUB (406-994-2933). This office provides a variety of services to students such as a Notary Public, various pamphlets, and information about our committees.

**ASMSU Legal Services**
A full-time professional lawyer is retained by ASMSU for student consultation. For a nominal fee, students can meet with the attorney to get advice. Legal advice on a variety of student issues such as traffic tickets, landlord/tenant disputes, divorces, name changes, and simple wills is also available at a reasonable cost. Legal Services is located in the ASMSU office. For information, call 406-994-2935.

**Streamline Transit**
A Bus Transit System is provided through a student bus fee. Commuter route buses arrive throughout the day if front of Roberts Hall. Shuttle route buses also provide transportation to the downtown business area and the Main Mall. Schedules are available at the ASK-US Desk and the ASMSU Office. For further information call 406-587-2434 or visit www.streamlinebus.com.

**ASMSU Day Care Center**
A Day Care Center supported by ASMSU and the University is provided in the family housing area. Children aged two-and-a-half to six, of MSU students are eligible, with priority given to those living in family housing. Pamphlets and applications are available in 281 SUB, or call the Day Care Center at 406-994-4370 for more detailed information.

**ASMSU Exponent**
The ASMSU Exponent, an independently student run newspaper, is published weekly during the academic year. The ASMSU Exponent and is produced by and for the students of Montana State University. Student positions offer experience in publication design, professional editing, journalistic writing, ad campaign creation, and professional management. Call 406-994-2224 or e-mail the editor at editor@exponent for more information.

**Homecoming**
A highlight each autumn is the Homecoming celebration. The ASMSU Homecoming committee, advised by the Office of Student Activities, organizes the student barbeque, morning parade and king-queen competition as well as several other events.

**Recreational Sports and Fitness**
The ASMSU Intramurals and Recreation office is located in 202 Shroyer Gym. Objectives of the program are to provide activities which promote physical fitness, social contact, improved self-esteem, and foster a permanent interest in wellness through organized recreation. The program provides opportunities for participation in both team and individual sports, offering about seventy different activities throughout the academic year. Currently over eighty percent of the student body takes advantage of this program! Call 406-994-5000 for more information or check out our Web page at http://www.montana.edu/wwwimrec/.

**ASMSU KGLT**
KGLT, the campus public radio station, uses student help with news reporting, production, and announcing. An apprentice class, which begins every school year, prepares students for on-air announcing. KGLT is located at 91.9 on your FM dial. If you have any questions, stop by KGLT in 320 SUB or call 406-994-3001.

**ASMSU Outdoor Recreation Center**
When students need a diversion from the academic routine, the ASMSU Outdoor Recreation Center provides opportunities which meet a variety of interests. Services include equipment rental, coordinated group outings, a resource center, seminars, and the Bicycle/Ski Shop.

- The low-cost equipment rental service, available to students and staff, offers rafts, tents, sleeping bags, bicycles, stoves, lanterns, cross country skis, and other outdoor equipment.

- Outings conducted during the year include day hiking, backpacking, river floating, white water rafting, cross country skiing, and car camping. Destinations range from local recreation areas to Yellowstone, Grand Teton, and Glacier National Parks, as well as the Pacific coast, Canadian Rockies, and southwest desert. Nominal fees are charged.

- Maps, magazines, trail guides, catalogs, and other publications are available at the Outdoor Recreation Center, a clearinghouse for outdoor information. A ‘common adventurer’ outings board is maintained for persons who wish to initiate their own trips and are interested in having others join them. A current events bulletin board serves for posting upcoming activities and public notices, and for the exchange of personal equipment and services.

- Seminars are presented dealing with an array of topics including safety in bear country, avalanche awareness, river running skills and techniques, mountaineering expeditions, international travel, and other outdoor activities.

- Maintenance and repairs on personal equipment can be done at the Bicycle/Ski Shop. A staff person is present to offer advice and assistance. Fees are low and tools are provided.

For information on services, hours, and policies, call 406-994-3621 or visit the Center, which is located on Lincoln Avenue across from Rockie Hall. Visit them on the web at http://www.montana.edu/outdoorrecreation/.

**ASMSU Campus Entertainment**
Campus Entertainment (CE) is located in Room 282B SUB (406-994-4839).

- **ASMSU Arts and Exhibits:** displays paintings, photographs, and sculptures of locally, regionally, and nationally known artists in the Exit Gallery (student run and funded) in the North West entrance at the base of the steps in the SUB. In addition, the committee also provides workshops and lectures by visiting artists and Upheavel; the student art show and sale during the spring semester. For more information contact exhibits@montana.edu or 406-994-1828.
ASMSU Concerts: is a committee designed to provide MSU students, staff, and faculty with a wide range of professional music and entertainment, including major recording artists and local talent. Phone 406-994-5821.

ASMSU Films: provides new entertainment each week. Films are shown in the Procrastinator Theater at 125 Linfield Hall on the weekends for a nominal charge for students. Free videos are shown in the SUB Northwest Lounge during the week. For more information call 406-994-5827 or stop by SUB 282B. The “Movie Hotline” number is 406-994-3312.

ASMSU Comedy Spotlight: is responsible for laughter! Shows range from stand-up comedy routines and big-name comedians to FUN interactive events that have been successful in the past. Take a break from studying and come join us for a few laughs! Phone 406-994-1829.

ASMSU Lively Arts/Lectures: provides culturally oriented entertainment ranging from solo classical instrumentalists to modern theater and dance companies. Local, regional, and national acts with a variety of performance styles are showcased. Several nationally and regionally known speakers are sponsored each year. Activities may range from forums on controversial issues to educational and fun lectures. This committee’s purpose is to broaden the horizons of the students of MSU. Phone 406-994-5828.

ASMSU Technical Services: provides lighting and sound reinforcement equipment and a technical workforce to ASMSU programs, university functions, and to anyone else affiliated with the University who may need such equipment or expertise. Phone 406-994-5823.

ASMSU Public Relations

ASMSU Public Relations has the purpose of increasing the communication between ASMSU, the community and the students we serve. PR provides informational advertising for ASMSU on the pack page of the Exponent, promoting ASMSU at MSU Fridays during the school year. The committee’s main purpose is to convey ASMSU awareness and inform the student body of the operations of ASMSU. The PR Committee is located in 325 SUB, 406-994-5824.

ASMSU State Legislature Committee

ASMSU ensures that student voices and concerns are heard and acted upon by the MSU administration, the local community, the Board of Regents, and the State of Montana. The ASMSU State Legislature committee exists primarily to lobby the state legislature. Student input is always welcomed, particularly during state legislative sessions. Students interested in serving on this committee should contact the ASMSU Senate Office in 281 SUB, 406-994-2933.

ASMSU Community Outreach

An awareness group run by students for students, Wellness offers information on date rape, drug and alcohol abuse, as well as opportunities for student involvement. Community Outreach also helps organize multiple blood drives throughout the year and works with the Gallatin County DUI taskforce. Many Wellness employees and volunteers receive college credit. Peer Education Internships are also available. For more information call 406-994-5800.

ASMSU Tutorial Program

This program is designed to help students deal with the rigors of college by offering high-quality tutorial services at a reasonable price. A student can be tutored for five hours per class per semester at a discounted rate. An attempt will be made to locate a tutor for any class requested. In order to use this service, a student should go to room 281 SUB (next to the ASK US Desk). A list of qualified tutors for the course requested will be provided, and tutoring will occur based on the tutor’s and the student’s schedules. For more information call 406-994-2933, however tutor information is not available over the phone or to students who are not enrolled full time.

ASMSU Leadership Institute

The Leadership Institute is charged with providing leadership opportunities and inspirations to MSU students. The Institute works towards developing leaders and problem solvers who effectively empower both self and others. Our objective is to work on a system-wide basis providing, coordinating, planning and organizing leadership opportunities for students, faculty, staff and community members throughout MSU and Montana. For more information call 406-994-7275 or visit www.montana.edu/leadership.

Music

Opportunities exist for all interested students to participate in a variety of ensembles and classroom activities in the Department of Music. Many music courses are specifically designed for non majors and several satisfy University Core requirements.

Department of Music concert ensembles are open to all university students, some through audition. Three choral ensembles—The Montanans, Chorale, and University Chorus—provide performance opportunities for vocalists. Instrumentalists may choose from five performing bands—Wind Ensemble, Symphonic Band, Marching Band, Jazz Lab I, and Jazz Ensemble II; two orchestras—Chamber Orchestra and the Bozeman Symphony Orchestra; a percussion ensemble; and numerous faculty-coached chamber music groups. Many students also enroll in private or class instruction with teachers in piano, voice, guitar, and all band and orchestral instruments.

Howard Hall, home of the Department of Music, is equipped with a number of private teaching studios, classroom facilities, and an electronic piano laboratory. In addition to a 265-seat recital hall, Howard Hall contains a large ensemble rehearsal room and several acoustically-efficient practice rooms.

On-campus performances occur frequently. Recitals by faculty and guest artists, and concerts by musical organizations are scheduled throughout the year. Informal musical entertainment, special musical events, appearances by musical organizations at athletic events, statewide tours, and performances for professional conferences are other features of the music program.

Students seeking additional information should contact the Department of Music, Howard Hall, 406-994-3562.
Theatre Arts

Generally two mainstage productions and two student-produced Underground Theatre productions are presented each academic year through the theatre arts production program. In addition, MSU provides the home base for Montana Shakespeare in the Parks during the summer months.

Theatre Arts is under the direction of an academically and professionally qualified faculty. Any enrolled student is eligible to participate in theatre arts productions regardless of major, providing the student has the interest, ability, and sufficient time. For students who are interested in pursuing theatre arts on an academic basis, a Bachelor of Arts in Film and Photography is offered. Information regarding the theatre arts production and academic programs can be obtained from the department office in the Visual Communication Building, 406-994-2484.

Athletics

Intercollegiate athletic competition plays a vibrant role on the Montana State University campus.

Bobcat varsity athletic programs compete as NCAA Division I members, with I-AA membership in football. Montana State’s membership in the Big Sky Conference offers rivalries with regional institutions throughout the West. Not only does MSU annually lead the Big Sky Conference in Academic All-Conference selections, but it is also annually near the top of the league in the All-Sports Trophy race. MSU is among the regional attendance leaders in all sports, and Bobcat athletic programs generate enthusiasm throughout the Bozeman community as well as on campus.

Montana State competes for Big Sky titles in football, men’s and women’s basketball, women’s volleyball, women’s golf, men’s and women’s track and field, men’s and women’s cross country, and men’s and women’s tennis. Women alpine and nordic skiers compete in the Rocky Mountain Intercollegiate Skiing Association, and the Bobcat ski program has recently hosted a pair of NCAA skiing championship meets.

The reputation of the championship-level athletic program is further enhanced by the fact that MSU has successfully hosted conference championships in recent years in men’s and women’s basketball, indoor and outdoor track and field, and tennis.

MSU also competes in the National Intercollegiate Rodeo Association, the top level of college rodeo competition. MSU rodeo teams have won several team and individual national championships.

Community Involvement

The MSU Office for Community Involvement connects hundreds of MSU volunteers with projects that provide valuable human and community services in the Bozeman area and throughout other parts of our state and nation. In addition to the bi-annual “Into the Streets” event, the office coordinates service opportunities during the winter and spring breaks and awards mini-grants and stipends to student community project leaders.

The office facilitates students’ self-initiated community outreach through the Community Involvement Calendar, which lists the current needs of over thirty local helping agencies. The calendar is updated weekly and posted near the ASK US Desk in the Strand Union and in the residence hall lobbies.

A simple way to get involved is the “Into the Streets” event held at the beginning of each semester, when an array of community service organizations visit campus with opportunities for all interested students. From building houses or assisting in grade schools, to teaching swimming or building local trails, you have a full menu of options. There are part-day and full-day projects so you can savor this opportunity and still have time for school work and other extracurricular activities.

Check the campus paper and listen for announcements in your residence hall about “Into the Streets.”

If you are looking for an enjoyable way to meet other students and to become better acquainted with Montana’s communities, involvement in off-campus community service activities is for you! It can also help you explore a career or major option, make off-campus contacts, and apply your classroom knowledge to the “real world.”

If you want more information, you may contact the Office for Community Involvement at 406-994-6902, visit the office in room 247 of Reid Hall, or go to http://www.montana.edu/community/.

Student Services

Dean of Students’ Office

The purposes of the Dean of Students Office are to act as an advocate for students, to consult and work with individual students and student groups, and to work with other campus offices in creating a sense of community at MSU. Assistance is available on a “drop-in” basis or by appointment. A few of the services available are:

• Processing withdrawals from the university
• Consulting with or troubleshooting for students
• Coordinating fraternities and sororities
• Coordinating conduct/discipline actions
• Hearing student grievances and appeals
• Providing general information or assistance
• Administering and interpreting the Student Conduct Code

The Dean of Students Office is located in SUB room 174. Call 406-994-2826 for more information.

New Student Orientation

All new students are required to attend an Orientation/Registration session. Summer Orientation Programs are offered to new freshmen and transfer students. Programs for freshmen, transfers, and graduates are offered prior to each semester. Orientation assists students in course selection and registration, and location and use of campus facilities and services. It also highlights University academic assistance and special service programs as well as recreational and social programs. We believe that Orientation assists all new students in their transition to MSU and increases their chances for academic success.

Upon acceptance to MSU, all students receive information on the Orientation Program. All new students pay a one-
time New Student Fee of $65. All new transfer students pay a one-time New Transfer Student Fee of $50. This fee is included on the fee statement of the first semester in which a student attends MSU. Contact the Orientation Office at 406-994-2827 or visit http://www.montana.edu/admissions/orientation for more information.

First Year Initiative (FYI) Program
The First Year Initiative (FYI) Program is a retention initiative for both students and families. FYI strives to make contact with all first year students through orientation info sessions, one-on-one advising meetings, in-class workshops, residence hall programs, and several grand scale campus events. The program is housed in two locations on campus, the SUB and South Hedges, making it easy for students to visit with our advisors at their convenience. We have also expanded our hours in South Hedges to include several late nights to accommodate busy student schedules. Our office will meet with any MSU student or prospective MSU students regardless of age or year in school.

FYI has four primary vehicles for helping students achieve success:

• The College Student Inventory (CSI): This survey, taken at Orientation, is interpreted by our advisors on an individual basis. The CSI is a way for a student to further understand his or her personal strengths, weaknesses, opportunities and obstacles that may come into play during a career in higher education. Our advisors will sit down with each student on a one-on-one basis to consider which resources on campus would be most effective to a student, based on his or her concerns or questions. This meeting is recommended for all first-year students.

• D and F Meetings: FYI works with faculty on campus to create an early warning system if a student is in danger of receiving a D or a F in a course. Our advisors will provide students with options and help formulate a success plan for the semester. Advisors can also answer questions about how academic performance may affect financial aid, living arrangements, and academic standing.

• Mid-year Retention Intervention (MRI): The MRI meeting is a great option for students on academic probation. FYI advisors can create an personalized strategy for students based on current class load, work or activity schedules, learning styles, and personal motivations. FYI guides students through the probationary process by explaining not only what probation is, but what performance is required to return to good academic standing.

• Academic Workshops: The FYI program hosts one-on-one, small group, in-class, and residence hall workshops. Our advisors will create a customized meeting for a student or faculty requesting a new workshop or may select one from our established collection of workshops. These workshops include:
  - College Expectations
  - Test Taking
  - Overview of Study Skills
  - Time Management
  - How to Take Better Notes
  - Test Anxiety
  - How to Read Textbooks More Efficiently

• Events: FYI wants students to excel both in and out of the classroom. As a result, FYI coordinates Catapalooza and Study Breaks. Catapalooza is our multi-day welcome event at the beginning of each fall semester, bringing hundreds of businesses and groups to campus. It is a unique opportunity to score freebies and find out about available student opportunities. Meanwhile, our study breaks provide a venue for stress relief, free entertainment, activities, and free food at the close of fall semester.

• FYI Helpline: Questions? FYI also hosts the Helpline, making MSU’s best resource for student success only a phone call away. Parents, family members, and students are welcome to call (406) 994 - 7359 for questions about courses, living options, curriculums, programs, resources, and any of the other confusing logistics of college!

Students and parents are also invited to email, chat, or instant message our advisors. Please email retent@montana.edu or visit www.montana.edu/freshmen for more information. Our parent site is available at www.montana.edu/parents.

Cat Card
The Cat Card is your MSU Student ID, an optional on-campus debit card, and after hour access card to the residence halls. The Cat Card also serves as a meal pass card and is used to gain entrance to Marga Hosaeus H&PE Center and student functions such as athletic events.

The magnetic strip on the back of the Cat Card contains information about the student’s current status. When swiped at various locations on campus, this information determines, if the student is permitted to participate in the services or activities at a specific location.

Deposits can be made at the Cat Card and Meal Pass Offices to use the card as an on-campus debit card. You can also manage your account and make deposits online at www.montana.edu/catcard. The Cat Card can then be used to make purchases in all food areas, MSU Bookstore, Health Service, Dental Service, Strand Union retail areas, copy machines, laundry machines in the residence halls, various vending machines, parking areas, and other areas on campus that accept Cat Cards.

Your Cat Card is your “key” to the campus. For more information about the Cat Card visit the Cat Card Office in the lower level of the Strand Union Building or call 994-CARD. You may also visit our web site at www.montana.edu/catcard.

Counseling and Psychological Services
Counseling & Psychological Service (CPS) provides free, confidential counseling to eligible MSU students. CPS see approximately 900 students each year for a variety of concerns, including adjustment difficulties, academic struggles, depression, anxiety, relationships, substance use, eating disorders, current/past trauma or abuse, problematic behaviors, identity concerns or sexual health/sexuality issues and couples/relationship counseling.
In addition to counseling services, CPS staff is available to speak on an array of topics of general interest to the college population, such as time/stress management, wellness, healthy relationships, and awareness/prevention of depression, anxiety, substance use and suicide. They also provide consultation and training to student organizations, faculty and staff.

CPS is staffed by licensed PSYXchologists and counselors, as well as advanced graduate students. On campus for over 20 years, the agency is accredited by the International Association of Counseling Centers and the training program is accredited by the American PSYXchological Association. For more information, see their website at www.montana.edu/careers or call 406.994.4353.

Career, Internship, and Student Employment Services Office

Career Services, located at 177 Strand Union, offers a full range of career planning and employment services to students, alumni, the campus community, and employers. A primary goal of the office is to help students find satisfying career positions and to gain experience and career skills which will clarify goals and facilitate entry into the job market. Main services include:

1. **Networking opportunities** for students and alumni to building relationships with employers, including but not limited to four career fairs annually.
2. **Workshops** on career planning, job searching, interviewing, resume writing, and various career options.
3. **Career counseling** to assist individuals with choice of major, career, job search preparation, career changes, or return to school (undergraduate or graduate programs).
4. **Career assessment**, including career interest inventories, computerized guidance systems, and a personality indicator.
5. A **career library** with job listings, an annual career survey of MSU graduates, career information, employer directories, literature and videotapes, and graduate school information. Internet connection to the World Wide Web is an integral source of career information and employment sources.

6. **Internships** in a variety of fields and assistance in arranging academic credit for internship experience. Graduate internships for students interested in the career planning field are available in the office.

7. **On-campus interviews** for summer, internship, and career positions with a variety of employers in business, industry, government, and education.

8. A **credential file service** for teacher and graduate school candidates, in which files containing personal, educational, and employment/experience data and letters of recommendation are maintained.

Students concerned about choice of major or career, or with questions on career options, job search, or graduate school, should visit the Career Services Office in the Strand Union or at www.montana.edu/careers or call 406.994.4353.

Disability, Re-entry, and Veteran Services

The following support services for students are located in the Strand Union Building, Room 180.

**Disabled Student Services**

Disabled Student Services personnel determine eligibility for specific disability accommodations, assure the provision of approved accommodations, and provide direction, advice, and referral services for persons with verified disabilities. Students seeking accommodations for a disability must request services through Disabled Student Services, 155 Strand Union Building, Voice phone - 406-994-2824, TDD - 406-994-6701, fax - 406-994-3943, e-mail - DRV@montana.edu or byork@montana.edu.

**Re-entry Student Services**

Non-traditional-age students (25 and over) can find direction, support, and assistance in this office. Consumer information is available. Re-entry Student Services is located in 155 Strand Union, Voice phone - 406-994-2824, TDD - 406-994-6701, Fax - 406-994-3943, e-mail - DRV@montana.edu or byork@montana.edu

**Office of Veteran Services**

The Office of Veteran Services provides service and assistance for veterans, dependents, and members of the guard and selected reserve who receive educational benefits from the U.S. Department of Veterans’ Affairs (DVA). DVA educational benefits recipients must have school enrollment certified each term by the MSU’s certifying official. Applications for the MUS Honorably Discharged Veteran Fee Waiver (see Special Exemptions for full fee waiver information) are also reviewed by the certifying official for approval. Veteran Services is located in 155 Strand Union Building. Voice phone - 406-994-5661, TDD - 406-994-6701, Fax - 406-994-3943, e-mail - vets@montana.edu or byork@montana.edu.

**Community Involvement**

The MSU Office for Community Involvement (OCI) connects campus resources to meet pressing community needs. Thousands of MSU students volunteer with area non-profit and tax-exempt organizations annually to provide valuable human and community services in the Bozeman area and throughout the western United States. In addition to hosting the annual “Into the Streets Community Involvement Fair,” the office coordinates immersion service opportunities over spring break and manages the MSU America Reads*America Counts program which works with and supports area children to achieve and succeed academically. The OCI provides over 300 AmeriCorps Service Scholarships each year to students serving in community settings as part of their academic requirements or as extra-curricular activities. These scholarship funds available to MSU students total nearly $500,000 per year!

A simple way to get involved is by attending the “Into the Streets” event held at the beginning of fall semester, when an array of community service organizations visit campus with opportunities for all interested students. From building houses or assisting in grade schools, to teaching swimming or building local trails, you have a full menu of options. There are part-day and full-day projects so you can savor this opportunity and still have time for school work and other extracurricular activities. These opportunities also
include ongoing work-study positions with area non-profit groups and internship opportunities where your service is both rewarding and meeting academic requirements. Check the campus paper and listen for announcements in your residence hall about “Into the Streets.”

If you are looking for an enjoyable way to meet other students and to become better acquainted with Montana’s communities, involvement in off-campus community service activities is for you! It can also help you explore a career or major option, make off-campus contacts, and apply your classroom knowledge to the “real world.” You can combine a commitment to service with an AmeriCorps Service Scholarship and also earn funds to help pay for future higher education expenses!

If you would like more information, you may contact the MSU Office for Community Involvement at 406-994-6902, or via email to community@montana.edu or visit the office in room 330 Culbertson Hall.

TRiO/Student Support Services
TRiO/Student Support Services (TRiO/SSS) is a federally funded program designed to increase the retention and graduation rate of eligible students. In order to receive services, a student must qualify under one of the following criteria: low income, first generation college student, or an individual with a disability. TRiO/SSS offers tutoring, a Learning Strategies course, math preparation courses, and individual academic support. TRiO/SSS is funded by a grant from the U.S. Department of Education. TRiO/SSS is located at 185 Strand Union Building; call 406-994-4541 or fax 406-994-4560.

Women’s Center
The Women’s Center is open to women and men students, faculty and staff, and community members who are considering returning to school, to assist in meeting academic and personal needs. Located in Strand Union Building, Room 372, the Center is open 9 a.m. to 4 p.m. Monday through Friday, when school is in session. Services and resources include: weekly Sack Lunch Seminars; assistance to re-entry women; a library with books, periodicals, tapes, and other resources addressing women’s concerns; career and scholarship information; programs and events celebrating National Women’s History month in March; the annual Shannon Weatherly Lecture; a bimonthly newsletter; and a variety of other services and programs.

Testing Service
The Testing Service coordinates the scheduling and administration of national testing programs such as the College-Level Examination Program (CLEP), the ACT, Proficiency Examination Program (PEP), the General Educational Development Program (GED), Graduate Record Examination (GRE), Law School Admission Test (LSAT), Medical College Admission Test (MCAT), and the Graduate Management Admission Test (GMAT). The Testing Service proctors the High School Days scholarship test, correspondence course exams, and exams for professors and resource students with disabilities who qualify for special test considerations.

Strand Union
The Strand Union Building (SUB) is the center of campus activity at MSU. The SUB provides daily services, amenities, and out-of-classroom opportunities for informal interaction among members of the college community. Through student government, organizations, and employment, the SUB provides a cultural, social, and recreational environment to complement classroom and study experiences.

Strand Union Administration, 280 SUB, includes the offices of Director, Building Supervisor, Cashier, and Marketing Manager. Visit www.montana.edu/sub or call 406-994-3082 for more information.

Focused on serving the needs of students, staff, faculty, and University guests, the Strand Union has four student-managed, student-staffed service centers. The “ASK US” Information Center/Ticket Office provides campus information, handles lost and found, stamps, student paycheck distribution, and ticket sales. Visit www.montana.edu/askus for MSU Events and Schedules, MSU Info and Directories, Community Info, and other helpful sites. Copy Cats provides a convenient copy service, color copies and output, postal and binding services, class notes, and greeting cards. Strand Union Graphics offers poster, identity and web design services, and scanning and color output. The Recreation Center provides a social gathering place and stress relief with bowling, billiards, foosball, videos, snacks, tournaments, and classes.

The Strand Union offers meeting rooms (seating from 10 to 1700), the MSU Bookstore, full-service banking, student lounges, and ATMs. There are also USPS, Federal Express, and United Parcel Service drop boxes. Strand Union food services include Avogadro’s Number, Bobcat Food Court, Catering, S.R.O. Espresso, Sweet Shop, Freshens, and the Union Market.

The SUB is home to the Associated Students of Montana State University (Campus Entertainment, Exit Gallery, Exponent newspaper, Legal Services, Leadership Institute, KGLT radio), the Mainstage Theatre, Theatre Arts Box Office, Shakespeare in the Parks, and the MSU Cat Card Office. These Student Affairs Division are also in the SUB: Vice President for Student Affairs, TRiO/Student Support Services, Career Services, Conference Services, Dean of Students’ Office, Disability, Re-entry and Veteran Services, Financial Aid Services, and the Office of Student Activities.

Student Health Service
The Swingle Student Health Center is located at the east end of the Strand Union Building. The Student Health Service provides a wide range of out-patient medical care and health promotion services for MSU students and spouses. In addition to routine health care, the Student Health Service has a clinical laboratory, x-ray, pharmacy, and nutrition services. The Student Health Service is accredited by the Accreditation Association for Ambulatory Health Care and is a member of the American College Health Association. All MSU students who carry four or more credits are charged the health fee each semester and are eligible for care at the Student Health Service. Students carrying less than four credits and non-student spouses may also receive care at the Student Health Service if they pay the health fee. For more information call 406-994-2311.
Immunizations
All MSU students are required to show proof of current immunizations against the following vaccine-preventable diseases: measles, mumps, rubella (two doses of each unless born before 1/1/57). New students must also complete the Student Health Service’s tuberculosis screening form. Students identified by the screening process as high risks for tuberculosis must be tested. Students will not be permitted to register for classes until the Student Health Services receives verification of immunizations, screening, and (if required) testing.

Medical Insurance Plan
Montana State University students who carry four or more credits are required to carry medical/surgical insurance. Medical insurance is available for all MSU students through a health insurance program coordinated by the Student Health Advisory Committee. Students who already have adequate insurance may request a waiver of the insurance fee upon providing proof of other health insurance coverage.

Health Promotion
The student Health Promotion program is a comprehensive set of evidence-based programs, activities and campaigns designed to enhance the academic, social and personal health of MSU students. Health Promotion utilizes a public health approach and works to create a safe, healthy and learning-conducive environment via policy, research, education, marketing and programming that focuses on known health risks among college students. Objectives involve the reduction of harm associated with heavy alcohol, tobacco and drug use, violence, unsafe sexual practices and unhealthy eating. Efforts also involve promoting mental health, protective behaviors and healthy norms within the student population. Health Promotion involves students as paid interns and volunteers, and works collaboratively with other campus and community entities. For more information call 406-994-7337.

The VOICE Center
This program is part of MSU Health Promotion with the goal of providing free confidential support, advocacy, and referral services to survivors of rape, sexual assault, relationship violence, and stalking. Trained student advocates and professional staff work with faculty, other campus professionals, and the Bozeman community to provide campus-wide advocacy and education. Services include walk-in hours as well as a 24-hour crisis line. Students of any age or gender are invited to stop in or call for information: 406-994-7069.

Dental Clinic
The Dental Clinic is located at the south end of the Swingle Student Health Center. The Dental Clinic is a preventive and urgent care facility. Services include: check-ups, cleaning, emergency treatment, consultations, and referrals. Some limited routine services can be provided as time permits. Treatment is by appointment only, except for emergencies which can be seen on a walk-in basis. Students who have paid the Health Service fee are eligible to utilize the clinic. Part-time students taking less than seven credits may pay this fee optionally. For appointments or more information, phone 406-994-2314.

Graphic and Media Services
Several agencies on the University campus provide photography, design, printing, and copying services.

Graphic Services
Complete professional graphic design, typesetting, print production, photography, and darkroom services are available from University Graphic Arts, 321 Culbertson Hall, a branch of the Office of Communications Services. Graphic and web design, scanning, and color output services are also available from Strand Union Graphics.

MSU Media Services
The College of Education, Health and Human Development operates a laboratory located in 422 Reid Hall for preparation of audiovisual presentations. Equipment rental is also available. Services are provided to all students, faculty, and staff. For more information please visit our website at www homepage montana edu / -iedbf/ MediaSrv

Copying Service
The Renne Library has a copy service in the basement and coin-operated copiers in lobby areas. Copy Cuts and University Printing Services (see below) also offer complete copy services.

Computer Services
For student use, the Information Technology Center operates microcomputer facilities in Reid, Roberts, and Cheever Halls. A wide variety of software packages are available, including word processing, spreadsheets, database managers, and drawing and design packages.

University Printing Services
Located in the basement of Culbertson Hall, University Printing Services provides copying and a large variety of specialized printing services for all university departments, faculty, staff, students, and university organizations. University Printing Services strives to provide the highest quality printing and copying in a timely fashion at a price below on- or off-campus services.

Audio Tape Duplication
The Multimedia Language Center in the Department of Modern Languages and Literatures can duplicate audiotape cassettes, provided the requestor has copyright permission to do so and supplies the proper cassette materials. Generally, there is one-day copy service.

Audio Video Listening and Viewing
The Renne Library has facilities for listening to audio cassettes, phonograph records, and compact discs, as well as viewing video cassettes and slides.

Campus Post Office
A full-service post office is located at Culbertson Hall on Harrison Street. All services are available Monday through Friday from 8:30 a.m. to 4:00 p.m. Stamp sales and a letter drop are available at Ask-US in the Strand Union; weekday pickup is at 8:45 a.m. and 2:00 p.m. A USPS mailbox with 3:00 p.m. Monday-Saturday pickup is located outside the Strand Union south entrance. Priority Mail, stamp sales, and a letter drop are available at Cards ‘N’ Copies, which has a 2:00 p.m. weekday pickup.
University Regulations

Student Academic and Conduct Guidelines

Montana State University expects each student to maintain acceptable standards of behavior on campus and in the community and to manifest a serious purpose by maintaining a satisfactory scholastic standing in the courses undertaken. No student who shows persistent unwillingness or inability to comply with these requirements will be permitted to continue his or her affiliation with the University.

A complete statement of the guidelines and procedures concerning academic integrity and student conduct is contained in the pamphlet titled: "Conduct Guidelines and Grievance Procedures for Students." The pamphlet is revised regularly and is the official statement of guidelines and procedures for the University. Copies of the pamphlet are available from the Dean of Students’ Office, Room 174 in the SUB.

Personal Property

Valuable personal property should be adequately protected. Montana State University is not responsible for the loss or destruction of any of the personal property of students.

Vehicles

All persons operating vehicles on the University campus should be familiar with MSU vehicle regulations, copies of which are available at the University Police Department, Roy Huffman Building, 7th and Kagi. Students, faculty, staff, and visitors must register any motor vehicles they park on the university campus for any reason.

The regulations are considered to be part of the terms and conditions of enrollment for students and of employment for staff members. Students must register their vehicles within one week after classes begin; faculty and staff must register within one week after beginning employment. A vehicle registration fee is payable at the time each vehicle is registered.

Registration is not considered complete until the registration decal is mounted on the left side of the rear bumper so that it is plainly visible from the rear. The registration decal designates areas in which the vehicle may be legally parked on campus.

All visitors are required to have a parking permit to park at Montana State University Monday through Friday, 6:00 a.m. to 6:00 p.m. Parking permits may be purchased at the Visitor Information Booth located at 7th and Grant or the University Police Department at 7th and Kagi.

Montana State University assumes no responsibility for the care or protection of any vehicle or its contents while operated or parked on the campus. The University reserves the right to revoke student use or possession of vehicles for conduct or scholastic reasons. The Board of Regents has authorized Montana State University to levy fines against students, faculty, and employees for violations of parking, traffic, or vehicle registration regulations. These fines and penalties are listed in the vehicle regulations.

Bicycles must be registered if they are used on campus. They should be operated in a prudent manner and parked only in racks provided, except in the campus family housing area. Violators are subject to fine. Bicycles must be walked, not ridden, though designated areas in the central campus.

All matters concerning parking and traffic should be referred to the University Police Department. The University Police are sworn peace officers of the State of Montana and have authority as vested in these officers by law.

Alcohol/Drug/Tobacco Policy

Montana State University is an environment where inappropriate use of alcohol and the use of illicit substances are prohibited. This belief shall be reflected in this University policy and in an institutionally-supported commitment to provide requisite resources for assessment and education with respect to drugs (alcohol, nicotine, and illicit substances) and enforcement of related policies.

The standards set forth will be upheld with described sanctions imposed where appropriate. Refer to the Schedule of Classes booklet (issued each semester) and/or the Dean of Students’ Office for standards of policy and enforcement. The Alcohol and Drug Policy is also available on the Internet.

Campus Crime Report

Crime is a reality at Montana State University. Preventing crime is everyone’s responsibility. Unreported crime is a criminal’s greatest ally. Suspicion that a criminal act has taken place is the only justification needed to call the University Police Department. Whether you are a victim, witness, or have information about a criminal offense or suspicious activity, contact the University Police:

- On campus call 911
- Off campus call 994-2121
- 24 hour emergency dispatch
- Report a crime anonymously by e-mail to: witness@montana.edu

Refer to the Schedule of Classes booklet (issued each semester) or consult with the University Police Department regarding complete policies, procedures, and annual crime statistics. The Campus Crime Report is also available on the Internet. Copies of the Campus Safety & Security Handbook are available at several locations on campus including Admissions and New Student Services and the University Police Department.

Sexual Assault Policy

Montana State University recognizes the need for a safe and secure environment, an informed student population, and specialized services and assistance to support student wellness, personal growth, and academic success.

The university’s sexual assault policy meets with both the spirit and intent of its philosophy toward student victims and complies with the Federal Crime Awareness and Campus Security Act of 1990. Under this Higher Education Act (HEA), the university’s policy includes: education, a range of sanctioning, procedures for the victim and the institution to follow in the event of an incident, procedures for on-campus disciplinary action, the student’s option to notify law enforcement, existing campus and community assistance and services, and options for the victim relevant to academic course and living modifications.
Refer to the Dean of Students’ Office (994-2826) and/or the V.O.I.C.E. (Victim Options In the Campus Environment) office (994-7069) for policy and professional assistance.

Right of Appeal and Grievances

Student Grievances
Student grievances are handled by approved university procedures. Grievances may be of at least four types: 1) academic, 2) student conduct, 3) discrimination or sexual harassment, or 4) other non-academic grievances.

1. Academic Grievances: Academic grievances are grievances involving coursework, grades, etc. All such grievances are to be handled in accordance with approved university guidelines and procedures. Copies of the approved procedures are available from offices of department heads, college deans, the Provost’s Office, and the Dean of Students’ Office.

2. Student Conduct Grievances: Student conduct grievances are those which do not involve academics or alleged discrimination or sexual harassment. Copies of university conduct guidelines and appeals procedures for conduct grievances at the Dean of Students’ Office.

3. Discrimination or Sexual Harassment: Montana State University guarantees the right to file a grievance on grounds of discrimination to all students, employees, or applicants for admission or employment. Any student who believes he or she may have experienced unlawful discrimination on account of race; sex; color; national origin; religion; age; veteran, parental, or marital status; or physical or mental disability should visit the Affirmative Action Office to discuss his or her concerns and to initiate any formal grievance procedure. In addition, Montana State University prohibits all forms of sexual harassment of employees by coworkers or supervisors, or of students by peers, staff, faculty, or administrators. Students seeking advice on or wishing to file a grievance related to alleged sexual harassment should contact the university affirmative action/human resources officer. A copy of the university-approved policy and procedures regarding sexual harassment is available from that officer.

4. Other Non-Academic Grievances:
   a. Traffic Violation Appeals: The Traffic Appeals and Regulations Committee handles appeals of traffic violation citations. This committee is composed of four students, three faculty, three classified staff, and three professional non-faculty members. The University Police Director is an ex-officio non-voting member. The decision of the committee is final on all appeals. Contact the University Police Department for appeal forms and additional information.
   b. Student Financial Aid Appeals: Appeals of actions of the Financial Aid Services Office, which relate to financial aid awards, may be addressed to the Financial Aid Appellate Board. The student should first contact the Director of Financial Aid and, if the grievance cannot be resolved at that level, the director will refer the student to the chair of the Financial Aid Appellate Board. Appeals must be in writing.
   c. Appeals of Residency Status Classification for Fee Purposes: Residency status for fee purposes is initially determined for undergraduates by the Office of Admissions and for graduates by the College of Graduate Studies. Requests for reclassification are handled by the Registrar. Appeals of registry decisions made by these offices may be made to the Residency Appeals Board. Information about reclassification and appeals can be obtained from the Office of the Registrar.
   d. Student Athletic Grievances: Student athletes who have grievances should contact the Director of Athletics. Regulations and requirements are published by the Athletics Department as well as by the directors for each sport.
   e. Residence Life Grievances: Grievances related to living in the residence halls can be made through the residence hall judicial system. This is described in detail in the Residence Hall Handbook, which is available from the Residence Life Office. Family housing residents should contact the Family Housing Office if they have grievances.

Appeal
The student should be aware that, in cases of disagreement with the decision of a staff member, an appeal for review of the decision may be made to the next higher official or body unless otherwise stated in the grievance policy. If the student is in doubt concerning the person to whom the appeal should be made, he or she should consult the Dean of Students’ Office.

Affirmative Action/Nondiscrimination Policies
Montana State University does not discriminate on the basis of race, color, national origin, sex, sexual preference, marital status, age, religion, creed or political belief, mental or physical disability, or status as a Vietnam era or disabled veteran in admission, access to, or conduct of its educational programs and activities nor in its employment policies and practices.

Montana State University is committed to providing a working environment for all employees and an educational environment for all students that supports and rewards career and academic goals on the basis of ability and work or academic performance. Harassment based on race, color, national origin, religion, sex, gender, sexual orientation, age, or disability is a form of discrimination and is prohibited.

The University is committed to a program of affirmative action in the recruitment, hiring, training, and promotion of persons in all classes of employment to help overcome the present effects of past discrimination and prevent underutilization of qualified women and minorities, persons with disabilities, and Vietnam era and disabled veterans. In addition, Montana State University assumes particular responsibility for providing opportunities for education and training for the state’s Native American peoples in the various disciplines and professions that
are characteristic of this land-grant university. The university’s Affirmative Action Plan is available in the Human Resources/Affirmative Action Office.

Employees or students who commit or supervisors who knowingly condone or fail to report incidents of discrimination are subject to disciplinary actions when instances of discriminatory actions are identified and confirmed. Knowingly filing false complaints of discrimination or knowingly providing false testimony will likewise result in disciplinary or corrective action when instances of such conduct are identified and confirmed. Retaliation against persons who file complaints or serve as witnesses is also a violation of laws prohibiting discrimination and will lead to appropriate disciplinary action against offenders.

Montana State University affords any student, employee, applicant for employment or admissions, or person who believes he or she was discriminated against by the University, the right to file a grievance on grounds of discrimination. As a condition of their employment and enrollment, employees and students are expected to cooperate in formal investigations of complaints of discrimination. Failure to cooperate will result in disciplinary action.

The person responsible for the University’s compliance efforts is Marjorie Brown, Human Resources/Affirmative Action Director, Suite 7 Hamilton Hall, Montana State University, Bozeman, MT 59717-2430, (406/994-2430; Fax 406/994-7999.)

Complaints of discrimination, including harassment on the basis of race, color, national origin, sex, gender, sexual orientation, religion, age, or disability should be reported to the Human Resources/Affirmative Action Office. The complete Non-Discrimination policy is available electronically www2.montana.edu/policy/affirmative_action or in print copy or alternate formats from the address above.

Sexual Harassment and Sexual Intimidation

Sexual harassment includes unwelcome sexual advances, requests for sexual favors, or other verbal or physical conduct of a sexual nature when:

Submission to such conduct is made implicitly or explicitly as a term or condition of an individual’s employment or education,

Submission to or rejection of such conduct is used as a basis for employment or educational decisions, or

Such conduct has the purpose or effect of unreasonably interfering with an individual’s work or academic performance or of creating an intimidating, hostile, or offensive environment.

Sexual intimidation includes any unreasonable behavior, verbal or non-verbal, which has the effect of subjecting members of either sex to humiliation, embarrassment, or discomfort because of their gender.

Sexual harassment is a form of sex discrimination and is prohibited by state and federal non-discrimination laws. Sexual intimidation in education is prohibited by state rules.

Sexually Explicit Materials in the Workplace

In keeping with the university’s policy on sexual harassment, Montana State University desires to create a working environment for employees and a learning environment for students which is free of sexual harassment and intimidation. Materials such as calendars, posters, post cards, photography and cartoons that contain sexually explicit images or language can create an intimidating, hostile, or offensive environment and may subject persons of either sex to humiliation, embarrassment, or discomfort because of their gender. Such materials are inappropriate and should be removed from the workplace.

This policy applies to space provided by the University such as offices, shops, classrooms, hallways, lounges and study carrels.

This policy does not apply to: 1) libraries, resource rooms or research collections; 2) materials related to course content or assignments used in the educational setting; 3) displays and exhibits in galleries and museums; or 4) private rooms or family housing units rented from the University.

Consensual Relationships

(Same as Faculty Handbook Section 445.00, Conflict of Interest)

Consensual romantic relationship in which one party is in a position to evaluate the work of the other is a potential conflict of interest.

When such a potential conflict of interest results between employees or an employee and a student, the employee(s) shall disclose the potential conflict of interest to his or her supervisor. The supervisor and the employee shall take steps to ensure that there is no conflict of interest.

The employee’s failure to disclose such a potential conflict of interest may require appropriate resolution.

Accommodation for Persons with Disabilities

The University is committed to the elimination of disability-based discrimination against qualified persons with disabilities. The University make appropriate reasonable accommodation for any known disability that interferes with an applicant’s ability to compete in a selection process, an employee’s ability to perform the essential functions of a job, a student’s ability to meet the essential requirements of an academic program, or a person’s ability to benefit from a university service or participate in a university-sponsored or hosted event.
All applicants, employees, students, or participants, including those with disabilities, are expected to be able to perform the essential functions of the position or program, with or without reasonable accommodation. It is the responsibility of the applicant, employee, student, or participant with a disability to inform the appropriate person, as indicated below, that an accommodation is needed:

1. To request accommodation in a job application or interview process, contact:
   - the hiring authority or chair of the search committee of the search, as indicated on the vacancy announcement,
   - Personnel and Payroll Services (406/994-3651; TDD: 406/994-4331) if the position is for classified employment
   - Human Resources/Affirmative Action (406/994-2042; TDD: 406/994-4191) if the position is for faculty or contract professional employment.

2. To request accommodation in employment, including concerns about job duties, contact the direct supervisor.

3. To request accommodation when applying for housing or to request housing accommodation, contact:
   - Residence Life and University Food Service (406/994-2661) if applying for housing in the residence halls
   - Family Housing (406/994-3750, TDD 406/994-5808), if applying for family or graduate housing.

4. To request accommodation related to an academic program or requirement, class, or other educational opportunity or activity, contact the office of Disability, Re-entry and Veterans Services, Room #155, Strand Union Building, (406/994-2824). A student who desires accommodation for a disability must submit appropriate documentation of the disability and request for accommodations to this address.

5. To request public accommodation or accommodation to participate in a university-sponsored or hosted event, contact the event sponsor or the University Compliance Officer (406/994-2042).

**University Compliance Officer**

The person responsible for the University’s compliance efforts is:

Diane Letendre
Human Resources/ Affirmative Action Director
210-C Montana Hall
Montana State University
Bozeman, MT 59717-2430

Phone: 406/994-2042
TDD: 406/994-4191
Fax: 406/994-2893
E-mail: marjb@montana.edu

Alternate Formats

This and other University policies and procedures are available in alternate formats upon request.

**References**

- Civil Rights Acts of 1866 and 1871
- Civil Rights Restoration Act of 1988
- Civil Rights Act of 1991
- Title IX of the Education Amendments of 1972 (20 U.S.C. 1681 et seq.)
- Equal Pay Act of 1963
- Equity in Athletics Disclosure Act of 1994
- Age Discrimination in Employment Act of 1975, as amended (29 U.S.C. 621)
- Americans With Disabilities Act of 1990
- Sections 503 and 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794)
- Vietnam Era Veteran’s Readjustment Act of 1974
- Montana Veteran’s Employment Preference Act
- Montana Human Rights Act
- Executive Orders 11246 as amended by Executive Order 11375 and 12086 and implemented by Revised Order 4
- Montana Board of Regents of Higher Education, Policy and Procedures Manual, Sections 703 and 1902
- Fair Housing Act 942 VSC 360 1 et.seq.
Kiteskiing near the stadium

Photo: Kelly Gorham
The Board of Regents of Higher Education approves all student fee charges. Fees are subject to change at any time.

Student charges and refunds are posted under the student’s name, not the parent’s. Therefore, all fee statements and bill notifications are e-mailed to the student, not the parents. Refund checks are mailed to the student. (Exception: Refund checks generated as a result of a Parent PLUS loan are mailed to the parents unless the Financial Aid Office has written authorization to disburse the funds to the student.)

Students are personally responsible for meeting their financial obligations at the times stated in the term calendar. A student’s registration is not complete until all fees are paid.

All students are urged to safeguard their personal funds by establishing checking accounts. It is most helpful for a student to be able to write checks for exact amounts for fees, board and room, and other necessary expenses. A local bank account is also good identification while on campus.

A check presented to MSU which is subsequently returned by the bank for insufficient funds or other reasons may cause the cancellation of a student’s registration, reporting to federal agencies, and/or a request to terminate board and room. A returned check service charge of $25 is assessed for all returned checks.

### Estimated Expenses

#### Academic Year Cost Estimates

The expenses shown below reflect estimated costs for a student carrying a full-time load (12 or more credits) for fall and spring semesters, 2010-2011. These expenses include fees and other charges. Actual fees may vary based on specific course fees or the number of credits carried each semester. These figures are subject to change at any time and should be regarded as estimates only.

#### Undergraduate Resident Students

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<thead>
<tr>
<th>Category</th>
<th>Semester</th>
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<td>Tuition/Fees*</td>
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<tr>
<td>Room/Board**</td>
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<td>Books/Supplies***</td>
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<td>Personal/Transportation****</td>
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#### Undergraduate Non-Resident Students

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<tbody>
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<td>$18,290</td>
</tr>
<tr>
<td>Room/Board**</td>
<td>$3,600</td>
<td>$7,200</td>
</tr>
<tr>
<td>Books/Supplies***</td>
<td>$565</td>
<td>$1,130</td>
</tr>
<tr>
<td>Personal/Transportation****</td>
<td></td>
<td></td>
</tr>
<tr>
<td>**Total</td>
<td>$13,310</td>
<td>$26,620</td>
</tr>
</tbody>
</table>

**MSU’s undergraduate tuition rate applies to undergraduate students at all class levels (Freshmen, Sophomores, Juniors, and Seniors). There is not a higher rate for junior and Senior students. These figures do not include a supplemental health insurance for required of students who do not have proof of insurance coverage.

**For an campus residents, these costs include in-room 100MB high speed internet service, unlimited entry into residence hall dining areas, cable TV and unlimited local phone service. Room and Board above is based on a double room, 5 day meal plan (add $250 per semester for 7 day plan). Food and housing costs will vary depending on a student’s living arrangement and lifestyle.

***The actual cost of books and supplies will vary depending upon curriculum.

****Financial Aid budgets include a personal/transportation/miscellaneous figure of $1,540 per semester ($3,080 per year). Personal/miscellaneous expenses will vary depending on individual circumstances.

### Fall/Spring Fee Schedules

Please go to the following websites for the most up-to-date information:

- **Undergraduate fees**: [http://www.montana.edu/wwwcat/Fee%20Forms/Undergrad%20F10_S11.pdf](http://www.montana.edu/wwwcat/Fee%20Forms/Undergrad%20F10_S11.pdf)
- **Graduate fees**: [http://www.montana.edu/wwwcat/Fee%20Forms/Undergrad%20F10_S11.pdf](http://www.montana.edu/wwwcat/Fee%20Forms/Undergrad%20F10_S11.pdf)
- **Post Baccalaureate fees**: [http://www.montana.edu/wwwcat/Fee%20Forms/PostBac%20F10_S11.pdf](http://www.montana.edu/wwwcat/Fee%20Forms/PostBac%20F10_S11.pdf)

#### Exemptions from Payment of Certain Fees

- **Course fees**: [http://www.montana.edu/wwwcat/expenses/FeeCourse.html](http://www.montana.edu/wwwcat/expenses/FeeCourse.html)
- **Fee descriptions**: [http://www.montana.edu/wwwcat/expenses/FeeDescriptions.html](http://www.montana.edu/wwwcat/expenses/FeeDescriptions.html)

### Other Charges

The following fees are in addition to those listed in the fee schedule. Fees are subject to change at any time. Non-matriculated students pay the same fees as regularly enrolled students. See also Course Fees.

- **Ski Fee** (does not include transportation, lift fees, or equipment rental)
  - Alpine: ................................. 95.00
  - Nordic: ................................. 104.00
- **Reading Improvement Lab**, per semester: .... 40.00
- **Residence Hall Social Fee**, per semester, to defray costs of activities and projects: ........ 10.00
- **Late Payment assessed the first day after regular payment**: .... 40.00

For the most up-to-date catalog information:

- [www.montana.edu/wwwcat](http://www.montana.edu/wwwcat)
### EXPENSES

**Additional Fees Paid by Out-of-State Students**
- Resident or non-resident status for fee purposes is determined by Montana statutes and regulations of the Board of Regents. A copy of these regulations may be obtained by visiting or writing the Office of Admissions.
- Students of legal age and minors whose parents have not established residence for fee purposes are required to pay the non-resident fees. See Residency Requirements for Fee Purposes.

### Non-matriculated Fees
- An adult not regularly enrolled at Montana State University may, with permission of the instructor, register for a non-laboratory class upon the payment of the same fees as students enrolled for credit. The person so registering may not participate in class discussion or take examinations. Applications for non-matriculated enrollment should be made through the Registrar, who will provide a form for approval by the instructor.

### Extended Studies
- Extended Studies courses are open to regularly enrolled MSU students as well as non-MSU students. Courses of particular interest to MSU students are listed along with their fees on a special page in the Schedule of Classes. For information contact the Office of Extended Studies at (406)994-6683, e-mail at outreach@montana.edu or online at btc.montana.edu/outreach

### Testing Fees
- The Montana State University Testing Service administers certain testing and examination programs for which fees are charged. The fees are established by testing agencies (companies) other than MSU.

### Nursing Students
- Nursing students are charged a program fee each semester which covers such costs as mandatory liability insurance while taking clinical courses, pre-NCLEX testing fees, fingerprinting costs, specialized equipment and distance delivery support.
- Costs for board, room and transportation will vary in relation to the facilities available in the community where assigned for upper division. If a student does not have a car, she/he must make arrangements for transportation.

### Health Insurance
- Students carrying four or more credits are automatically enrolled in the student insurance plan each semester. Students carrying fewer than four credits, spouses, and dependents must contact the Student Insurance Office if they desire coverage. Students wishing to apply for exemption from the insurance plan must do so on-line.
- Complete information on student insurance may be obtained from the Student Insurance Office in the Swingle Student Health Center.

### Special Fees and Charges for Foreign Students
- An additional administrative fee will be charged to all foreign students who come to the University.

### Special Exemptions

#### Honorably Discharged Veteran Fee Waiver
- A veteran who meets all of the following conditions is eligible for a waiver of tuition:
  1. “Honorable” discharge (“General Under Honorable Conditions” will not be accepted) from any branch of the U.S. Armed Forces for service on active duty for other than training purposes.
  2. Bona fide resident of Montana for tuition and fee purposes.
  3. At some time eligible for VA educational benefits but benefits were exhausted or have expired (VEAP eligible veterans who withdrew a portion of their VEAP contribution before benefits expired are not eligible for the tuition waiver).
  4. Qualifies under one of the following:
     a. Served anytime prior to May 8, 1975. Waiver available to all otherwise qualified undergraduate and graduate students.

### Special Fees and Charges

#### Application Fee
- A $30 application fee must accompany all applications for admission. This fee is not refundable nor is it applied toward the payment of any other fee. The application fee is honored for one year from the semester for which the student is applying.

#### Additional Fees Paid by Post-Baccalaureate and Graduate Students
- Graduate students or students who have already received one undergraduate degree (post-baccalaureate) will be charged fees at a higher rate than undergraduates. (Please see the Fee Schedule.)

#### Uniforms and shoes (estimate) 200.00
- College of Nursing pin (estimate) 45.00
- Health and Human Development
- Field Trip Fee consult the department.
- Program Fees consult the department (Architecture, Art, College of Business, Engineering, MTA, Nursing, Math). 25.00
- I.D. Card Fee 15.00
- Duplicate I.D. 15.00
- Vehicle Registration for Students and Staff Varies per lot; minimum annual fee 159.00
- Transcript Fee, charge per copy 3.00
- Intensive English Language Fee (per credit) 234.90
- Foreign Student Administrative Fee, per semester (including summer) 125.00
- Graduation Fee 30.00
- New Student Orientation Fee Freshman 65.00
- Transfer 50.00
- Graduate 50.00
- In Absentia Registration Fee 30.00
- Challenge Fee (per credit) 30.00
- Distance Learning Fee (per credit) varies by course/program
- Residence Hall Prepayment 280.00
- Student Teaching fees consult the department.
or
b. Working on initial undergraduate degree and has been awarded an Armed Forces Expeditionary Medal;

c. Working on initial undergraduate degree and received the Southwest Asia Service Medal for service in the Persian Gulf between August 2, 1990 and April 11, 1991;

d. Working on initial undergraduate degree and has been awarded the Koson Campaign Medal; or served in a combat theater in Afghanistan or Iraq after September 11, 2001, and received either the Global War on Terrorism Expeditionary Medal, the Afghanistan Campaign Medal, or the Iraq Campaign Medal.

Qualified recipients must maintain satisfactory academic progress. Application for this waiver must be made through the MSU Office of Veterans’ Affairs, Montana State University, P.O. Box 173960, Bozeman, MT 59717-3960 at least two weeks before fee payment for the semester in which the recipient expects to qualify. Phone 406-994-3661 for additional information.

State Benefits
The tuition is waived at any of the units of the Montana University System for children of members of the United States armed forces who served on active duty during World War II, the Korean, Vietnam, Iraq or Afghanistan conflicts and who, at the time of entry into service, had legal residence in Montana and who were killed in action or who died as a result of injury, disease, or other disability incurred while in the service. Children who desire to study under the “War Orphans” educational law must enter any of the Montana University System institutions before the age of twenty-five to be eligible for waiver of tuition. Application for the waiver of tuition must be made, well in advance of the date of anticipated enrollment, to the Commissioner of Higher Education (2500 Broadway, Helena, Montana 59620-3101), who

will determine eligibility and notify the student and the Office of Financial Aid Services of the institution.

American Indian Tuition Waiver
Persons of one-fourth American Indian blood or more who are Montana residents are eligible for a tuition waiver upon demonstration of financial need. Contact Financial Aid Services for more information.

Senior Citizen Tuition Waiver
In state tuition may be waived for Montana citizens who are (65) sixty-five years of age or older. The application for Senior Citizen Tuition Waiver may be found at http://www.montana.edu/wwwfa/forms.html or at Financial Aid Services located in Room 183 Strand Union Building (SUB). Submit the completed application and supporting documentation to Financial Aid Services for processing. A completed application is required for each semester of attendance.

Staff Members
Professional and non-professional staff employed at least three-quarter time for the entire term may, as employees of MSU, be exempt from payment of the user fees, and tuition on the first six credits. The Faculty & Staff Tuition Waiver Request form may be downloaded at http://www.montana.edu/wwwfa/forms.html. These forms are also available at Financial Aid Services. Once this form is completed and signed by the required parties, it can be submitted to Financial Aid Services for processing. A completed application is required for each semester of attendance and due by the 15th class day.

Refund of Fees
Drop/Add
Students dropping courses during the first fifteen class days are currently given a full refund for those courses. Fees for courses dropped after the fifteenth class day will not be refunded. The drop refund policy is subject to change. For summer term, please see the refund schedule located here.

The health, dental, and athletic activity fees will not be refunded to students dropping to a credit load of less than seven credits if services have been provided.

University Withdrawal
Fees except those listed below will be refunded based upon the following schedule, unless otherwise required by the Higher Education Act of 1965 as amended. The Dean of Students’ Office records will establish the date used for refunding. Refunds will not be granted for withdrawals after the completion of the term.

Non-refundable fees are: registration fee, ID fee, orientation fee, late fee, deferred installment fees, social fees, foreign student fee, dorm deposit, new student fee, and transfer student fee.

If health and/or dental services have been provided, NO refunds of those fees will be given.

If health and/or dental services have NOT been provided, the refund amount will be based upon the following schedule:

<table>
<thead>
<tr>
<th>Days of Instruction</th>
<th>Percent Refunded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration Day</td>
<td>100</td>
</tr>
<tr>
<td>1-5</td>
<td>90</td>
</tr>
<tr>
<td>6-10</td>
<td>75</td>
</tr>
<tr>
<td>11-15</td>
<td>50</td>
</tr>
<tr>
<td>16+</td>
<td>0</td>
</tr>
</tbody>
</table>

Financial Aid and Student Employment
Office of Financial Aid Services
The Office of Financial Aid Services at Montana State University administers federal, state, and institutional aid programs designed to help eligible students pay for their educational expenses. Amounts of awards vary and depend upon the student’s demonstrated and verified financial need as well as the amount of funds available for distribution.

To apply for financial aid, students and parents of dependent students must file the Free Application for Federal Student Aid (FAFSA) each year. The FAFSA can be filed electronically at www.fafsa.gov, or by mailing the paper application. Paper applications can be requested from the Department of Education at: 1-800-433-3243.

To be eligible for financial aid, an individual must be a citizen or permanent resident of the United States and have applied for admission to the
University as a degree-seeking student. Priority consideration is given to students who apply by MSU’s financial aid priority filing date, which is March 1 of the preceding year (e.g., March 1, 2010 for the academic year beginning in September 2010). Students applying for financial assistance are considered for all aid programs for which they are eligible. Assistance is offered in the form of grants, scholarships, tuition waivers, long-term loans that must be repaid after leaving school, and work opportunities. Publications describing the different programs, eligibility criteria, satisfactory progress, and application procedures are available via the Internet at www.montana.edu/wwwfa/, or at the Office of Financial Aid Services, 183 Strand Union, P.O. Box 174160, Bozeman, MT 59717-4160. Our telephone number is: (406) 994-2845.

Both undergraduate and graduate students may apply for aid. Assistance to graduate students is generally limited to long-term loans and work opportunities. Information on graduate fellowships, scholarships, and assistantships may be obtained from the Division of Graduate Education.

Although student expenses will vary according to differences in courses of study, residency status, housing arrangements, transportation costs, and other factors, the table of estimated expenses may be used to determine the projected cost of education for a school year (two semesters). In estimating costs, between-semester expenses should not be overlooked.

Please remember that policies and procedures governing financial assistance at MSU are subject to change at any time, without prior notification or publication, due to changes in university, state, and/or federal guidelines and regulations.

The Office of Financial Aid Services is open Monday through Friday from 8:30 AM to 4:30 PM or as otherwise posted. Our phone lines are open Monday through Friday from 8:00 AM to 5:00 PM. The office is located in Room 183 in the Strand Union Building which is equipped with an elevator for disabled students.

**Fee Descriptions**

**Registration Fee** is a flat non-refundable processing fee of $30.00 charged to each student.

**The Tuition and Fees** on the student bill is the total of the tuition fee, registration fee, building fees, information technology fee, computer fee, student equipment fee, health and dental fees, ASMSU fees, athletic fee, and SFEP fee. The Tuition and Fees for more than 12 (twelve) credits is the same as for 12 (twelve) credits.

**Tuition** is a mandatory per credit hour fee based on the number of credits selected and the status of the student (resident, non-resident, Western Undergraduate Exchange Program, or graduate/post-baccalaureate). On the fee chart, the Non-Resident Tuition Fee consists of the Resident Fee (paid by resident students) plus the Non-Resident Fee, which is the portion of the Tuition Fee covered on behalf of resident students by Montana state taxes.

**Building Fees** are mandatory per credit hour fees and are used to repay bonds that financed the construction and/or remodeling of university buildings. Students have also voted to continue paying some building fees for major maintenance needs after the bonds have been repaid. The Building Fees for state resident students include: Student Building Fee; Academic Building Fee; PE Complex; Health Operations; Strand Union Operations; and PE Building Fee. The Building Fees for non-resident students include all of those for resident students plus the Non-Resident Building Fee. The Non-Resident Building Fee is that portion of bonds that are covered on behalf of resident students by Montana state taxes.

**Computer Fee** is a mandatory per credit hour fee used to provide and enhance student computer labs and access.

**Student Equipment Fee** is a mandatory per credit hour fee used to provide and enhance classroom and student lab equipment.

**Information Technology Fee** is a mandatory per student fee for partial funding of the student administrative software.

**Health and Dental Fees** are mandatory fees charged to all students registered for seven (7) credits or more. These fees are for maintaining the Student Health and Dental Clinic.

**The Associated Students of Montana State University (ASMSU) Fees** are mandatory fees charged to all students registered for seven (7) credits or more. ASMSU Fees are set by student vote.

**ASMSU Activity Fee** provides for the operation of the student government (ASMSU) and its committees.

**ASMSU Intramural Fee** contributes to the operational cost of the intramural facilities and programs.

Payment of the ASMSU Activity Fee and the ASMSU Intramural Fee entitles the student to participation in ASMSU student government and use of gym, swimming, weight room facilities, day care facilities, legal aid, tutoring, and other sponsored activities.

**ASMSU Bus Fund** funds a local bus system for students.

**ASMSU Student Sustainability Fee** contributes to the promotion and implementation of sustainable practices.

**ASMSU Student Organization Fee** supports registered student organizations.

**Athletic Fee** is a mandatory fee charged to students registered for seven (7) credits or more that is used to support the Bobcat Athletic program.

**SFEP Fee** includes funds pledged for debt service on the Student Facilities Enhancement Project, as well as Operations & Maintenance fee for the Health & PE Complex.

**Student Medical Insurance Fee** is a mandatory medical insurance program (by ASMSU vote) for all students registered for four (4) credits or more. Students may waive the insurance if they have other medical insurance. Dependent coverage is available by contacting the Student Insurance Office at 104 Swingle or 994-3199.
GENERAL CURRICULAR REQUIREMENTS

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

Catalog and Curriculum

Catalog in Effect

MSU-Bozeman undergraduates may elect to follow the catalog in effect when they began their freshman year at MSU, or any subsequent catalog, if there has not been a break of more than one academic year in their attendance and if they fall within the six-year catalog limitation policy. Undergraduate students transferring from any accredited United States college or university may follow the MSU catalog which was in effect when they first entered the institution from which they transferred, or any subsequent catalog in effect prior to graduation, provided there has been no break in attendance of more than one academic year. The six-year catalog limitation policy applies to transfer students.

MSU undergraduates who change majors may follow the catalog in effect when they began their freshman year at MSU or any subsequent catalog in effect prior to their graduation, provided there has been no break in attendance of more than one academic year. The six-year catalog limitation policy applies to both undergraduates who changed majors as well as to transfer students.

Six-Year Catalog Limitation Policy

Each MSU-Bozeman catalog covers a specific time period, usually two years, beginning fall semester of the first year and ending summer session two years later. From the time a student enters Montana State University, he or she has six years to fulfill the curricular requirements stated in the catalog in effect when he or she entered. If a student does not complete the requirements in six years, he or she must select a subsequent catalog. This policy applies to both undergraduates who changed majors and to transfer students.

Change of Curriculum

A change of curriculum card may be obtained from the Registrar’s Office or the college dean’s office. The approval of the new academic adviser is required. A change of curriculum becomes official when the change of curriculum card is filed with the Registrar’s Office.

On-Line Catalog

Students are encouraged to consult the online version of the MSU-Bozeman catalog for the most current information regarding academic policies and curricular requirements. The online catalog, found at www.montana.edu/wwwcat/, is updated on an ongoing basis as changes are made to programs and courses. It is the responsibility of the student to check with his or her department to confirm any changes in curricula.

Second Majors and Degrees

Second Major

A student who completes all the degree requirements for a first major may earn a second major by fulfilling the degree requirements for the second major. The student is not required to complete additional core requirements for the second major since these requirements will have been fulfilled in the major area for which the student’s undergraduate degree is being awarded.

A student who wishes to earn a second major must so inform, in writing, both the department and college in which he or she is earning the degree and the department of the second major. The department of the second major will assign an adviser for the student and will furnish the appropriate form, titled Second Major/Second Degree Declaration form. The catalog in effect at the time a student files the Declaration for a Second Major in the Registrar’s Office is the one that governs the requirements for a second major.

The second major will be posted on the student’s transcript at the time of graduation upon verification by the Registrar of completion of the courses listed on the Application for a Second Major, which must be submitted with the student’s Application for Baccalaureate Degree. Both forms must be submitted to the Registrar’s Office by the end of the semester one year prior to the semester the student plans to graduate. Former returning students may do this during the first week of classes.

Second Bachelor’s Degree

There are two distinct methods for obtaining more than one bachelor’s degree:

A student who has already completed requirements for one bachelor’s degree must complete a minimum of thirty additional credits, all course
requirements of the second degree curriculum, and two semesters in residence at Montana State University after completing the requirements for the first degree. Nine of the total minimum number of credits required for the second degree must be upper division. All courses listed on the student’s transcript at the time the first degree is granted are considered as required for and/or applied toward the first degree. A student may have completed more credits than the minimum required for the degree, but the completion of the first degree “closes the books,” i.e., none of those extra credits will be counted as part of the thirty credits necessary for a second degree. A second degree student will not be required to complete University Core requirements, with the exception of students who have international degrees.

A student may work concurrently toward receipt of two bachelor’s degrees. These degrees may be awarded at the same time. In this case, the student must complete the courses required in both curricula and at least 30 credits beyond the larger number of credits required for the two degrees he or she is seeking. Fifty-one credits (forty-two credits for the first degree; nine for the second) of the total minimum number of credits required for both degrees must be upper division. A student working under this option must notify, in writing, the deans of the colleges in which the curricula are offered, the department heads involved, and the Registrar, by submitting the Second Major/Second Degree Declaration form. The application for baccalaureate degree for the second degree must be submitted to the Registrar’s Office by the end of the semester one year prior to the semester the student plans to graduate.

A student may not work concurrently toward the receipt of an undergraduate and a graduate degree. A graduate student may not work toward an undergraduate degree.

All students working for a second bachelor’s degree are required to earn a 2.0 average or better on the 4.0 system, only on those courses taken after the first degree. Students working on two bachelor’s degrees concurrently must have a total cumulative average of 2.0.

Non-teaching Minors

All applications for a non-teaching minor must be submitted to the Registrar with the Application for Baccalaureate Degree by the end of the semester one year prior to the semester of completion. Former returning students may do this during the first week of classes. The minimum number of credits required for a non-teaching minor is twenty-one, with nine of those being upper-division credits.

Non-teaching Minor Application forms may be obtained from department offices or the Registrar’s Office.

CORE 2.0

Purpose

As a land grant university, MSU-Bozeman is charged, through the Morrill Act of 1862, with providing “liberal and practical education...in the several pursuits and professions of life.” In addition, as a member of the Montana University System, MSU is charged with providing programs that “stimulate critical analysis, clear and effective communication, and the creative process.” Students should also “broaden their cultural horizons by contact with the creative arts, sciences and the humanities, and achieve an understanding of the political, social, economic and ethical problems of the contemporary world and the relation of their studies to these problems.”

To this end, the faculty of MSU have developed a common core curriculum, called CORE 2.0, for all undergraduate students in the belief that it will enable students to reach their intellectual potential, to become contributing members of society, and to compete more successfully in our rapidly changing and increasingly complex world.

The purpose of the CORE 2.0 curriculum is to ensure a wide-ranging general education of consistent and high quality to all Montana State University students regardless of their major or area of study. Core courses allow students to reaffirm their common experiences, redefine their common goals, and confront their common problems. Core courses emphasize communication and techniques of creative inquiry in a variety of disciplines.

One of the goals of the Core is to provide students with the opportunity to develop their creative and intellectual potential. Therefore, Core courses will require students to do the following:

1. Think, speak, and write effectively, and evaluate the oral and written expression of others.
2. Develop learning objectives and the means to reach them, thus developing lifelong patterns of behavior which increase the potential to adapt to and create change.
3. Exercise and expand intellectual curiosity.
4. Think across areas of specialization and integrate ideas from a variety of academic disciplines and applied fields.
5. Use complex knowledge in making decisions and judgments.
6. Make discriminating moral and ethical choices with an awareness of the immediate and long-term effects on our world.
7. Develop a critical appreciation of the ways in which we gain and apply knowledge and understanding of the universe, of society, and of ourselves.
8. Understand the experimental methods of the sciences as well as the creative approaches of the arts.
9. Develop an appreciation of other cultures as well as an understanding of global issues.

Credit Policies

1. University Core requirements cannot be satisfied by the CLEP procedure.
2. Advanced Placement credits (AP), if equivalent to MSU Core courses, can be used to fulfill Core requirements.
3. Credit earned in repeatable Core courses may be applied only once to University Core requirements.
4. Some study abroad programs, upon approval, may satisfy the Diversity requirement.
5. Students in good standing in the University Honors Program may fulfill part of their University Core curriculum requirements with designated honors courses. Specific information is available in the Honors Program Office, Quad D.
Grading Standards
1. College-level competence in all areas of the Core curriculum is necessary for adequate performance in the Core and beyond. A grade of C- or better is required in all University core courses.
2. No University Core course may be taken on a pass/fail basis.

Appeals
Unusual circumstances that warrant an appeal of the established policies and procedures must be initiated by the student and sent through his/her adviser to the Core Equivalency Review Board via the Registrar’s Office.

Accommodation for Students with Math Learning Disabilities
Accommodation to the Quantitative Reasoning (Q) Core Curriculum Requirement may be made for students with Math learning problems caused by disabilities. Accommodations, when permitted, apply only to the Core Curriculum Requirement; they do not change requirements in majors, minors, or certificates.

MSU recognizes that some students with specific learning disabilities may experience difficulty completing the Core Quantitative Reasoning requirement. Students with learning disabilities who believe that they need an accommodation to meet the Quantitative Reasoning requirement should contact the office of Disabled Student Services (DSS) to begin the process to certify the disability. Learning Disability documentation must meet established MSU requirements as developed by DSS. This documentation is available from:

Disabled Student Service
P.O. Box 173960
Strand Union, Room 155
Montana State University
Bozeman, MT 59717-3960

Core Curriculum Requirements
Beginning Fall 2004, MSU replaced its core requirements (the “old core”) with CORE 2.0. The mission of CORE 2.0 is to enhance students’ use of multiple perspectives in making informed critical and ethical judgments in their personal, public, and professional lives. Continuing and returning students (those entering MSU prior to Fall 2004) may convert to CORE 2.0 or graduate by satisfying the old core requirements. Continuing and returning students should visit www.montana.edu/core2 for more information about these options.

Note: Changing faculty staffing, departmental course offerings, and other factors will affect the list of courses available to satisfy Core requirements. Students should consult the latest updates of Core offerings, which will be widely available on campus, including departmental and deans’ offices.

Foundation Courses
• University Seminar (US):
The University Seminar provides an introduction to college studies aimed at expanding students’ intellectual interests, improving critical thinking and communication skills, and creating a community of learners. It emphasizes discussion, critical interpretation of important texts, multi-disciplinary perspectives, exploration of diverse perspectives and interpretations, and examination of arguments and evidence.

Students choose from the following:
- AGED 251US - Leadership Development for Agribusiness & Industry Employees
- BUS 101US - First Year Seminar
- CLS 101US - University Seminar
- CLS 201US - University Seminar
- COLS 101US - First Year Seminar
- COM 110US - Introduction to Public Communication
- LS 101US - Ways of Knowing
- UIH 201US - Texts and Criticisms: Knowledge
- US 101US - First Year Seminar
- Any other course with the “US” suffix

• College Writing (W):
College Writing focuses on expository (vs. creative or personal) writing with sections organized around topics/themes of the instructor’s choosing. With some variation, typical sections incorporate a wide range of learning components in support of major paper assignments: reading of essays, study of writing instruction texts, short compositions in response to reading, in-class writing, small group workshops, peer review of writing, draft conferences, and class discussion.

Students choose from the following:
- WRIT 101W - College Writing I
- Any other course with the “W” suffix

Students whose scores meet or exceed any one of the following are exempt from the College Writing requirement: ACT English score of 28; SAT Critical Reading score of 650; Montana University System Writing Assessment of 5.5; or ACT/SAT essay/writing subscore of 11. The credits will have to be made up in other coursework in order to meet the minimum graduation requirements.

• Quantitative Reasoning:
Every person is inundated daily with numerical information, often in the form of graphical representations, statistical summaries, or projections from Mathematical models. Comprehension of the elementary quantitative concepts, development of quantitative reasoning skills, and the ability to reasonably ascertain the implications of quantitative information are goals of Quantitative Reasoning courses.

All courses in this category focus on identified classical Mathematical concepts and modern techniques of mathematical thought and critical reasoning. These courses require prerequisite competencies at the level of M 096/097 or higher. One way to demonstrate prerequisite competency is by passing the Mathematics Placement Exam (MPLEX) at the appropriate level.

Students choose from the following:
- M 121Q - College Algebra
- M 141Q - Math for K-8 Teachers II
- M 145Q - Math for the Liberal Arts
- M 147Q - Language of Mathematics
- M 149Q - Secrets of the Infinite
- M 151Q - Precalculus
- M 161Q - Survey of Calculus
- M 165Q - Calculus for Technology I
- M 166Q - Calculus for Technology II
- M 171Q - Calculus I
- M 172Q - Calculus II
- M 181Q - Honors Calculus I
- M 182Q - Honors Calculus II
- M 275Q - Multivariable Calculus
- M 283Q - Honors Multivariables Calculus
- STAT 216Q - Introduction to Statistics
- STAT 271Q - Intermediate Statistical Concepts
- STAT 298Q - Honors Introduction to Statistics
- Any other course with the “Q” suffix
GENERAL CURRICULAR REQUIREMENTS

• **Diversity (D):** Graduates of Montana State University face an ever changing and increasingly complex world. An understanding of and sensitivity to other cultural perspectives prepares them to function in the global community and creates a campus climate that is conducive to academic growth for all students. Diversity courses address the study of identities (e.g. race, class, gender, sexual orientation, ability, etc.), societies, nations, or national languages and cultures.

Students choose from the following:
- AMST 201D - Introduction to American Studies
- ANTH 101D - Anthropology & the Human Experience
- ANTH 252D - Social Issues in Contemporary Japan
- CHIN 102D - Elementary Chinese II
- CHIN 130D - Historical and Literary Journey Into Modern China
- EDCI 240D - Multicultural Education
- FRCH 102D - Elementary French II
- FRCH 201D - Intermediate French I
- FRCH 220D - French Language & Culture
- GPHY 121D - Human Geography
- GPHY 141D - Geography of World Regions
- GRMN 102D - Elementary German II
- GRMN 201D - Intermediate German
- GRMN 220D - German Language & Culture
- HHED 205D - Dance as Cultural Expression
- HSTR 130D - Latin American History
- HSTR 140D - Modern Asia
- HSTR 145D - History of Japan
- HSTA 160D - Introduction to the American West
- HSTR 169D - Modern World History
- HSTR 232D - Religion in Latin America
- JPNS 102D - Elementary Japanese II
- JPNS 201D - Intermediate Japanese I
- JPNS 202D - Intermediate Japanese II
- LIT 214D - Regional Lit
- LIT 285D - Mythologies
- MGMT 245D - Cultural Dimensions of International Business
- MKTG 242D - Introduction to Global Markets
- MTA 218D - International Film and Television
- NAS 100D - Introduction to Native American Studies
- NAS 212D - American Indians in Montana
- PHIL 208D - Philosophy & Culture
- PSOR 201D - Introduction to International Relations
- PSYX 235D - Contemp Issues in Human Sexual
- RELS 105D - Introduction to Religion
- RELS 110D - Religion, Conflicts & Politics
- RELS 201D - Religion in Latin America
- RELS 202D - Asian Religions: Hinduism and Buddhism
- RELS 203D - Asian Religions: Taoism to Zen
- SOCI 150D - Social Difference
- SOCI 201D - Social Problems
- SPNS 102D - Elementary Spanish II
- SPNS 201D - Intermediate Spanish I
- SPNS 220D - Spanish Language & Culture
- Any other course with the “D” suffix

• **Contemporary Issues in Science (CS):** Contemporary Issues in Science courses focus on natural science or technology. These courses examine the ways in which science contributes to the study of significant problems in the contemporary world to help individuals and society make informed decisions about these issues.

Students choose from the following:
- ANTH 225CS - Bones, Apes, & Ancestors
- BIOL 106CS - Environmental Science and Society
- BIOL 106CS - Insects and Human Society
- CE 220CS - Civil Engineering and Construction-From the Ancient to the Modern
- CHEM 260CS - Energy and Sustainability
- CHMY 102CS - Applying Chemistry to Society
- CS 140CS - Spinning Webs
- CS 215CS - Social & Ethical Issues in Computing
- ENGR 125CS - Technology, Innovation, and Society
- GEO 103CS - Introduction to Environmental Geology
- GPHY 111CS - Intro to Physical Geography
- HISTR 205CS - Science, Technology, and Risk
- HSTR 207CS - Science & Technology in World History
- HSTR 282CS - The Darwinian Revolution
- HSTR 294CS - Introduction to Water Resources
- MB 105CS - Molecules of Life
- MB 110CS - Introduction to Biotechnology
- MUSI 225CS - Science, Pseudo-Science and Subjectivity
- MUSI 298CS - Other Animals
- PSPP 101CS - Intro to Biotechnology
- PSPP 102CS - Plant Sciences, Resources, and the Environment
- PSYX 203CS - Psychology of Film
- TE 250CS - Technology & Society
- UNIV 125CS - Microbes in the Environment
- VIMB 101CS - Introduction to Biotechnology
- Any other course with the “CS” suffix

Students in science majors may be able to substitute courses for this requirement. See the Permitted Substitutions at the end of this section.

**Ways of Knowing Courses**

All Ways of Knowing Courses emphasize the methods used to discover and create the factual and theoretical knowledge of the discipline. Inquiry courses (indicated with an I) do this primarily through classroom instruction but do require at least one major learning activity based on methods of inquiry appropriate to the discipline. Research courses (indicated with an R) require students to have autonomous experience in the research and creative process and to generate a scholarly product. Lower-division R courses are intended to introduce students to the discipline and thus also satisfy a Ways of Knowing area (RA, RI, RN, or RS). Upper-division R course are often intended for majors and do not have a Ways of Knowing designation. These courses are listed separately with an R following the number.

All students must take at least one (1) Inquiry or one (1) Research & Creative Experience course in each of the following areas:

• **Arts (IA or RA):**

Courses in the Arts explore the production and consumption of meaning and value through forms of expression that communicate, in both logical and emotional terms, the arts.

Students choose from the following:
- ARCH 121H - Introduction to Drawing
- ARCH 322H - Architectural History, World Architecture I
- ARCH 323H - Architectural History, World Architecture II
- ART 292HA - Ancient-Medieval Art
- ART 293HA - Renaissance-Modern Art
- CAA 310HA - History of Film Music
- DANC 230HA - Dance Appreciation
- MTA 101HA - Film in America
- THTH 122HA - Acting for Non-majors
- MTA 112HA - Exploring Digital Photography
- MUSI 101HA - Enjoyment of Music
- MUSI 211HA - Masterworks in Music
- MUSI 293HA - American Popular Music
- MUSI 130HA - History of Jazz
- MUSI 219HA - Honors Music & Society
- MUSI 307HA - World Music
- AMST 202RA - The Arts in America
- ARCH 151RA - Design Fundamentals I
- ART 110RA - 2D Art Fundamentals
- ART 111RA - 3D Art Fundamentals
- ART 112RA - Drawing Fundamentals
- ART 143RA - Web Design
- ART 289RA - Ceramics
- ART 235RA - Representational Drawing
- CS 145RA - Web Design
- MTA 103RA - Introduction to Photography
- MUSI 103RA - Fundamentals of Musical Creation
- Any other course with the “IA or RA” suffix

• **Humanities (IH or RH):**

Courses in the Humanities explore ethical and moral, aesthetic and creative, historical and descriptive dimensions of human cultural traditions, emphasizing methods of reaching a conclusion, formulating an interpretation, or making a judgment in the discipline.

Students choose from the following:
- ART 299HA - Exploring Artists on Film
- ENGL 121HA - Theory & Methods in Linguistics
- FRCH 306HA - French: From Reflection to Revolution
- GRMN 303HA - Issues of German Cinema
- GRMN 366HA - German Myths: The Lorelei, Faust, and Vampires
• **Natural Sciences (IN or RN):**

Courses in Natural Sciences emphasize a coherent body of scientific principles and the methods scientists use to create knowledge of the natural world.

Students choose from the following:

- BIO 100IN - Organism Function
- BIO 101IN - Organismal Biology
- BIO 204IN - Insect Biology
- CHMY 121IN - Intro to General Chemistry
- GEO 101IN - Intro to Physical Geology
- GEO 111IN - Dinosaurs
- LRES 201IN - Soil Resource
- MB 101IN - Unseen Universe: Microbes
- PIDS 101IN - Mysteries of the Sky
- PIDS 102IN - Mysteries of the Universe
- PIDS 103IN - The Physics of How Things Work
- PIDS 201IN - Physics by Inquiry
- UH 400IN - Origins
- BCHM 104RN - The Biochemistry of Health for Non-Science Majors
- BIO 316RN - Introduction to Research in Molecular Biology
- ERTH 212RN - Yellowstone Scientific Laboratory
- MB 121RN - Principles of Environmental Health Science
- PIDS 353RN - The Art and Science of Holography
- Any other course with the “IN or RN” suffix

**Social Sciences (IS or RS):**

Courses in the Social Sciences emphasize methods and principles used by social scientists to systematically study human behavior.

Students choose from the following:

- AGEC 210IS - Agribusiness and Farm Management
- ANTH 201IS - Human Prehistory
- ANTH 204IS - Culture & Society
- ANTH 221IS - Mysteries of the Past
- ECNS 101IS - The Economic Way of Thinking
- ECNS 204IS - Introduction to Microeconomics Theory
- ECNS 251IS - Honors Economics
- HDFC 150IS - Lifespan Human Development
- MGMT 231IS - Business Inquiry
- NAS 249IS - Critical Inquiry into Native American Studies Themes & Methods
- PSCI 210IS - Introduction to American Government
- PSYX 214IS - Principles of Political Science
- PSYX 206CS - Psychology of Film
- SOC 101IS - Introduction to Sociology
- SOC 110IS - Honors Sociological Inquiry
- SOC 221IS - Criminal Justice System
- UH 150IS - The Economics of Life
- AGEC 451RS - Economics of Agricultural Policy
- ANT 288RS - Undergraduate Research Experience in Anthropology
- UH 459RS - The Art and Science of Medicine

Any other course with the “IS or RS” suffix

**Additional Research & Creative Experience Courses:**

Important: All students must take at least one (1) approved Research & Creative Experience course or a total of three credits of independent undergraduate research (289R, 290R or 489R, 490R). Students may take an approved Research & Creative Experience course in one of the four Ways of Knowing areas or they may take a separate Research & Creative Experience course in any discipline, including the Undergraduate Scholars Program (USP 489R/490R). Any course with the “R” suffix satisfies this requirement.

- Studies Themes & Methods
- ACTG 321R - Accounting Information Systems I
- AGED 312R - Communicating Agriculture to the Public
- ANTH 425R - Social Organization
- ARNR 416R - Meat Processing
- ARNR 454R - Beef Cattle Management
- BCHM 444R - Biochemistry & Molecular Biology Methods
- BIO 458R - Biomimetic Intelligent Systems
- BIO 466R - Gene Construction
- CE 457R/458R - Senior Project I & Senior Project II
- CET 409R - Construction Project Management
- CHBE 411R - Chemical and Biological Engineering Design I
- CHBE 412R - Chemical and Biological Engineering Design II
- ECNS 432R - Benefit-Cost Analysis
- EDEL 313R - Teaching Social Studies: Grade K-8
- EDSD 471R - Methods of Teaching Middle School Mathematics
- EE 492R - Electrical Engineering Design II
- ENGR 310R - Introduction to Engineering Design
- ERTH 432R - Surface Water Resources
- ERTH 450R - Snow Dynamics and Accumulation
- FIN 457R - Financial Markets and Institutions I
- GPHY 441R - Mountain Geography
- GPHY 484R - Applied GIS and Spatial Analysis
- GRMN 450R - Seminar: German Lit and Culture
- HDFC 425R - Family Law and Public Policy
- HDFC 455R - Administration of Human Service Programs
- HDFN 445R - Culinary Marketing: Farm to Table
- HDFN 451R - Sustainable Food Systems
- HDPE 323R - Biomechanics
- HDPE 445R - Athletic Sport Psychology
- HSTR 499R/HSTA 499R - Sen Capstone: Hist in Kinesiology
- I&ME 444R - Senior Design Project
- I&ME 445R - Independent I&ME Senior Design
- JNPS 450R - Seminar: Japanese Literature & Culture
- LIT 463R - Seminar: Integrative Teaching Methods
- LRES 442R - Capstone 1/Field Applications in LRES
- M 388R - Software Applications in Mathematics
- ME 404R - Mechanical Engineering Design II
- ME 409R - Mechanical Engineering Design III
- MET 457R - Mechanical Engineering Technology Capstone Experience II
- MGMT 473R - Management Practicum
- MKTG 442R - Marketing Research
- MUST 499R - Senior Project/Capstone Experience
- N 387R - Research in Health Care
- PSCI 499R - Senior Project/Thesis
- PSPP 427R - Senior Capstone II
- PSPP 465R - Health, Agriculture, Poverty: Concepts & Action Research
- PSYX 499R - Senior Thesis Capstone
- SOC 318R - Sociology Course with a grade of C- or better satisfies the Contemporary Issues in Science and Society: Common Experience program (USP 489R/490R). Any course with the “R” suffix satisfies this requirement.

**Permited Substitutions**

1. Completion of at least two of the following courses, normally taken by students in science majors, with a grade of C- or better satisfies the Contemporary Issues in Science (CS) and the Inquiry Natural Science (IN) requirements. Individual substitutions for one requirement or the other are not permissible.

   - ARNR 240
   - BIOL 101, 102, 207, 208, 213, 214, 215, 251
   - CHMY 121, 123, 141, 151, 153, 211
   - GEO 101, 103, 205, 211
   - GPHY 111
   - HSTR 201
   - MB 201
   - MBEH 210
   - PIDS 205, 206, 211, 212, 213, 221, 222
   - PSPP 101, PSPP 102

2. The University Honors course UH 202, with a grade of C- or better, may substitute for the Inquiry Humanities (IH) requirement.
Credits For Degree Completion

Correspondence Credits and Extension Courses
No more than thirty semester credits earned by correspondence, extension, or continuing education from accredited colleges or universities may be counted toward graduation. Normally, correspondence, extension, and continuing education courses are not accepted toward degrees in the College of Engineering. However, special circumstances may warrant consideration, and approval of such courses is on a case-by-case basis.

Special Topics and Individual Problems Courses
No more than twelve credits of Special Topics 280 or 480 combined in each rubric will count toward graduation. No more than six credits of 470 Individual Problems in each rubric will count toward graduation. Some departments have established lower limits than these, and students are responsible for checking course listings to ensure that they do not exceed the allowable number of credits in each category.

Credits
A candidate for the bachelor’s degree must complete the minimum number of credits required for the degree selected. The minimum number of credits must be composed of credits earned for graduation. The required number of credits varies among the four-year curricula leading to the bachelor’s degree.

Credits Earned for Graduation
Credits earned for graduation shall mean the total number of credits for which passing grades (A through C-, and P) have been received in courses numbered 100 or above. If students repeat courses in which they have passing grades, the most recent grade will be the effective grade for graduation.
A course taken by an undergraduate or a non-degree student may not be repeated and applied toward requirements for a graduate degree.

For further credit-use restrictions, see Special Topics and Individual Problems, or refer to the Course Descriptions for maximum allowable credit limits placed on certain courses.

Upper-Division Credit Requirement
A minimum of forty-two credits for the first degree and at least nine additional credits for the second degree must be earned in courses numbered 300 and above (upper-division courses). As required by the Minimum Competency Requirements, a grade of C- or better is required in all courses that will be counted toward the upper-division credits required in all degrees.

Transfer Student Credit Requirements at MSU-Bozeman
To graduate from Montana State University, transfer students must complete two full-time semesters of fifteen weeks or more in residence at Montana State University and earn not less than thirty MSU credits and a minimum 2.0 cumulative GPA, as well as meet the curriculum requirements for a degree.

Deficiencies, I, and F Grades
All deficiencies, make-up grades, transfer work, advanced standing, and challenge examinations must be completed and transcripts filed in the Registrar’s Office at least one month before the end of the semester of expected graduation.

Graduation Requirements for Baccalaureate Degrees
Registration Required the Semester of Graduation
A student must be registered at Montana State University the semester of his or her graduation. If the student is not required to take any courses at Montana State University during the final semester, he or she must process an “in absentia” registration and pay a registration fee of $30 before the end of the third week of the semester he or she expects to earn a degree. Arrangements for this registration must be made by the student with the Registrar. Registration in Extended Studies courses does not fulfill this requirement. Graduate students must have the written permission of the Graduate Dean to register in absentia.
Except for certain pre-professional curricula (e.g., pre-medicine), twenty-three of the last thirty credits earned to meet the graduation requirement must be MSU credits. Specific majors may have program-specific requirements for courses that must be taken from MSU to meet graduation requirements. Such requirements are clearly identified in the curriculum description for that department.

Notification of Degree Eligibility
Students are expected to submit an Application for Baccalaureate Degree form no later than the 15th class day of the academic semester preceding the semester they plan to graduate. A $30 degree application fee is assessed at the time the Application for Degree form is filed. Returning former students must file the application during the first week of university instruction of the semester of completion. Application for Degree forms can be moved from one semester to the next within the academic year only. If, however, it is necessary to delay graduation beyond the originally scheduled academic year, one must file a new Application for Degree form.

Satisfaction of Financial Obligation
All candidates for degrees must fully satisfy their financial obligations to the University (or make arrangements with Montana State University 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.

Graduation Grade Point Average
In order to graduate, students must earn a cumulative grade point average of 2.00. Further restrictions and graduation requirements may be imposed by the various curricula.
To receive a graduate degree from MSU-Bozeman, students must earn a 3.00 grade point average required in the major and minor for the degree.
Students must also earn 3.00 grade point average taken at MSU-Bozeman which are required in the major and minor.

**Graduation with Honors**

Graduation with honors or highest honors applies only to baccalaureate degrees.

To receive honors, a student must earn a cumulative grade-point average of 3.25 through 3.69. To receive highest honors, a student must earn a minimum cumulative grade point average of 3.70. Cumulative grade point averages are computed at the end of the semester of graduation.

All MSU credits attempted and grades received will be used in computing graduation with honors or highest honors.

Transfer students must meet the cumulative grade-point average requirements stated above and complete a minimum of sixty semester credits at MSU. The credits earned at MSU must compute to minimum grade point averages of 3.25 or 3.70 for graduating with honors or highest honors respectively.

For second degree or subsequent baccalaureate candidates, the grade-point average of the first or subsequent degrees and any transfer work will be included in the determination of honors or highest honors. Transfer credit and grade-point average requirements apply.

**Commencement**

Students who are unable to be present at commencement must make arrangements with the Registrar to have their diplomas mailed to them.

Diplomas are dated the last day of the semester in which the requirements for the degree are completed. Degrees are conferred once a year at May commencement.

**Appeals of Graduation Requirements**

The Admission and Graduation Requirements Board (GARC) is composed of the Assistant Vice Provost for Undergraduate Education (chairperson), the assistant dean of the college concerned, and the Registrar. This board considers appeals and/or petitions from undergraduate and non-degree students seeking waivers of established requirements in special situations.

Instructions for submitting appeals and petitions are available through the Registrar’s Office.

These submissions should be forwarded by letter to the Registrar and should originate with the student in conjunction with the student’s adviser.
Academic Policies

Family Educational Rights and Privacy Act (FERPA)

Student’s Rights. The Family Educational Rights and Privacy Act of 1974 grants certain rights, privileges, and protections related to students’ educational records maintained by the University. Students’ educational records (with the exception of directory information) will not be released to third parties outside of the University, except with the written consent of the student. Students have the right to inspect their own educational records, except for those to which students have expressly waived this right (e.g., Career Services placement files or graduate school recommendations). Students have the right to request amendment of their records, if they are found to be inaccurate, misleading, or otherwise in violation of the students’ privacy or other rights. Such requests should be made as soon as the student becomes aware of the inaccuracy or any other problem.

Any student may file a complaint with the U.S. Department of Education concerning any alleged failure on the part of the University to comply with the requirements of the Family Educational Rights and Privacy Act.

Directory Information

The Family Educational Rights and Privacy Act permits the release of information designated as directory information to third parties outside the University without the written consent of the student.

Currently registered students have the right to request that information designated as directory information be withheld from release by the University. Any student wishing to exercise this right must inform the Registrar in writing no later than the tenth class day of the academic term.

The Information Release Policy Checklist provides an outline of the information in the records and the University’s policy on release of such information. Additional information is available in Family Educational Rights & Privacy Act Notification. Any questions regarding educational records should be directed to the Registrar.

Residency Requirements for Fee Purposes

In-state admission and fee status is granted to those persons who have demonstrated over a period of time that their permanent residence is Montana, a state which they have supported through the payment of appropriate taxes. In general, a person must meet all seven requirements listed below to qualify for in-state status:

1. A person must be physically present in Montana for twelve or more consecutive months without an absence in excess of a total of thirty days. One must demonstrate by appropriate actions during the twelve month period the intent to make Montana one’s permanent home. The required twelve month period does not begin until specific actions are taken to change legal ties to Montana.

2. The twelve month period does not begin until one or more acts, that clearly indicate the intent to become a resident, are taken. Mere presence in Montana alone will not serve to start this period. The legal action date must occur in the preceding year, on or before the fifteenth day of class of the term for which reclassification is requested. Sufficient actions to begin the period are:
   a. Montana vehicle registration
   b. Montana driver’s license
   c. Montana voter registration
   d. Purchase of a principal residence where a Montana title is obtained
   e. Filing of a resident Montana income tax return
   f. If none of the above is applicable, an affidavit of intent may be filed with the Registrar’s Office.

3. An individual must be at least fifty-one percent financially self-sufficient during the entire twelve month period, and that person must not be claimed as an exemption under federal income tax regulations by someone filing an out-of-state federal tax return, commencing with the tax year in which the twelve month period begins.

4. A person must file a Montana income tax return

5. If a person drives a motor vehicle in Montana or possesses a driver’s license from another state, he or she must obtain a Montana operator’s license within the required legal time limit.

6. If a person owns a motor vehicle in Montana, he or she must license the vehicle in Montana within the required legal time limit.

7. An individual must register to vote in Montana if she or he expects to exercise the right to vote.

An individual who is enrolled for more than half-time status during any semester that falls within the twelve month period is presumed to be present in the state primarily for educational purposes, and such periods may not generally be applied toward the physical presence requirement of the policy. At Montana State University, six credits is considered half time enrollment.

There are additional regulations concerning married persons and others with special circumstances. Persons interested in gaining residency should request the pamphlet “Montana University System Student Guide to Montana’s Residency Policy.” For more information, new students should contact the Office of Admissions. Currently enrolled students and former students can obtain petition forms and more information from the Registrar’s Office.
ACADEMIC AND REGISTRATION POLICIES

Academic Advisers
Academic advisers are available to help students plan their programs of study and make informed choices about courses. Although students are fully responsible for their academic decisions, they should recognize the advantages of close cooperation and understanding between themselves and their advisers.

Because academic advisers are usually associated with a students’ major department or field, students should contact their major departmental offices or the offices of their college deans to determine the names and locations of their advisers. In some programs such as University Studies, Native American Studies, University Honors, pre-health professions, or WAMI, special assistance is available from advisers in those areas.

Student Records
The Information Release Policy Checklist (103 K) provides an outline of the information in the records and the University’s policy on release of such information. Additional information is available in Family Educational Rights & Privacy Act Notification. Any questions regarding educational records should be directed to the Registrar.

Name Change
Notice of legal change of name, resulting from marriage, divorce, or other reason, must be promptly filed with the Registrar. Name change forms are available from the Registrar’s Office and must be submitted with copies of a legal court document, driver’s license and Social Security card with new name before academic records can reflect any name change.

Transcript of Record
For every transcript request, a fee of $3 per copy will be charged. Transcript requests must be made to the Registrar’s Office. Transcripts are sent only at the written request of the student.

Advanced Standing
Advanced Standing by Challenge
Under certain circumstances, if students can demonstrate mastery of course work not taken at the University, they may receive advanced standing and University credit for the course. Two mechanisms are available for obtaining advanced standing:

College Level Examination Program (CLEP)

Montana State University awards credit toward graduation for successful performance in certain Subject Examinations of the College Level Examination Program conducted by the College Entrance Examination Board. Students may arrange to take these examinations on campus or at designated centers throughout the country. Passing grades are determined

<table>
<thead>
<tr>
<th>MSU Course</th>
<th>Title</th>
<th>CLEP Exam</th>
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<tbody>
<tr>
<td>ARNR 101</td>
<td>Nat Resource Conservation</td>
<td>Natural Resource Conservation</td>
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<tr>
<td>BIOL 101</td>
<td>Biology of Organisms</td>
<td>Gen Biology</td>
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<tr>
<td>BIOL 102</td>
<td>Molec &amp; Cellular Biology</td>
<td>Gen Biology</td>
</tr>
<tr>
<td>ECNS 101</td>
<td>Econ Way of Thinking</td>
<td>Intro Microecon</td>
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<tr>
<td>ECNS 202</td>
<td>Prin of Macroeconomics</td>
<td>Intro Macroecon</td>
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<tr>
<td>EDCI 208</td>
<td>Ed Psych Hum Dev Sch Age</td>
<td>Educ Psych</td>
</tr>
<tr>
<td>LIT 110</td>
<td>Intro to Lit</td>
<td>Analysis &amp; Interp of Lit</td>
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<tr>
<td>HSTR 101</td>
<td>Western Civilization I</td>
<td>Western Civilization I with essay</td>
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<tr>
<td>HSTR 102</td>
<td>Western Civilization II</td>
<td>Western Civilization II with essay</td>
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<td>American History I</td>
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<td>M 151</td>
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<td>M 171</td>
<td>Calculus I</td>
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<tr>
<td>FRCH 101</td>
<td>Elementary French I</td>
<td>Col French I</td>
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<tr>
<td>FRCH 102</td>
<td>Elementary French II</td>
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<td>GRMN 101</td>
<td>Elementary German I</td>
<td>Col German I</td>
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<tr>
<td>GRMN 102</td>
<td>Elementary German II</td>
<td>Col German I &amp; II</td>
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<td>GRMN 201</td>
<td>Intermediate German I</td>
<td>Col German I &amp; II</td>
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<tr>
<td>SPNS 101</td>
<td>Elementary Spanish I</td>
<td>Col Spanish I</td>
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<tr>
<td>SPNS 102</td>
<td>Elementary Spanish II</td>
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<td>SPNS 219</td>
<td>Intermediate Spanish I</td>
<td>Col Spanish I &amp; II</td>
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<td>PSIC 210</td>
<td>Intro to American Government</td>
<td>Am Govt</td>
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<tr>
<td>PSPP 102</td>
<td>Plant Science, Resource &amp; Environment</td>
<td>Plant Science, Resource &amp; Environment</td>
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<tr>
<td>PSYX 100</td>
<td>Intro to Psychology</td>
<td>Intro Psy</td>
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<tr>
<td>SOCI 101S</td>
<td>Introduction to Sociology</td>
<td>Intro Soc</td>
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</tbody>
</table>

In general, a department will not give a challenge examination if a CLEP examination is available for the same course.
by Montana State University. These students receive credit and a P grade on the transcript for scores above the passing level; scores below the passing level are not entered on the transcript. CLEP examinations do not apply as a grade waiver for a course previously taken. University Core requirements cannot be satisfied by the CLEP procedures.

In general, a department will not give a challenge examination if a CLEP examination is available for the same course.

Advanced Standing by Challenge

Challenge provides the opportunity to earn college credits and grade points without formal course enrollment. A student who has completed the work of a college course on his or her own initiatives and time, may, with the approval of the student’s academic advisor, the instructor, the department heads, and the college deans, take a comprehensive examination in the subject matter of the course. Performance in the examination will become the basis for a grade in the course, and the results will be recorded on the student’s permanent academic record at the end of the term which the challenge exam is taken. Official permission forms should be secured in advance from the Registrar’s Office. Students must be registered at MSU when they take the challenge examination, and they must have passed ten credits of regular course work at Montana State University before the challenge grade will be recorded on their permanent records.

The challenge examination for credit in a course which is a prerequisite to a second course must be taken before completion of the second course. Students who have enrolled in a regular or an extension course and received a grade other than W or have taken a regular or an extension course for zero credit may not challenge that course. Challenges are not permitted in any 280, 470, or 480 courses.

A fee of $30 per credit is assessed and must be paid prior to taking the challenged exam.

Courses, Credits, and Grades

Definitions

• Course

A course is a unit of instruction in a subject-matter area offered in a single university semester. Resident courses (courses for which resident credit is granted) are those listed in the Schedule of Classes. Continuing education courses are arranged through Extended University.

• Credit

A credit is the unit used in computing the amount of work required for graduation. One credit is equivalent to three hours of work each week for one semester. One lecture hour assumes two hours of work outside of class. In the case of laboratories, library work, or studio classes, the entire time may be spent under the supervision of the instructor.

• Credit Load

Undergraduate students who are enrolled for twelve or more credits and graduate students for nine or more credits, will be certified and reported as full-time students. Completion of a 120-credit undergraduate curriculum in four years requires students to complete an average of fifteen credits each semester.

• Curriculum

A curriculum is a combination of courses that constitutes a program of study leading to a degree.

• Semester

Montana State University operates on a semester system consisting of two semesters and a summer session. The Term Calendar gives the dates of each semester.

• Grades

The quality of the student’s work in each course is denoted by a letter grade according to the following tabulation. In computing scholastic averages, each letter grade is assigned a specific number of grade points for each credit. The general quality of a student’s work is expressed in terms of a grade point average (GPA). Semester grades indicate when students are on University probation, suspend warning, or suspended.

• Passing Grades

<table>
<thead>
<tr>
<th>Grades</th>
<th>Quality of Work</th>
<th>Grade Points for Each Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
<td>4.0</td>
</tr>
<tr>
<td>A+</td>
<td>Excellent</td>
<td>4.7</td>
</tr>
<tr>
<td>A</td>
<td>Excellent</td>
<td>4.3</td>
</tr>
<tr>
<td>B+</td>
<td>Good</td>
<td>3.7</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
<td>3.0</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>Fair</td>
<td>2.5</td>
</tr>
<tr>
<td>C</td>
<td>Fair</td>
<td>2.0</td>
</tr>
<tr>
<td>C</td>
<td>Fair</td>
<td>1.7</td>
</tr>
<tr>
<td>D+</td>
<td>Passing</td>
<td>1.3</td>
</tr>
<tr>
<td>D</td>
<td>Passing</td>
<td>1.0</td>
</tr>
<tr>
<td>D</td>
<td>Passing</td>
<td>0.7</td>
</tr>
<tr>
<td>N</td>
<td>Continuing (Math only)</td>
<td>0</td>
</tr>
<tr>
<td>P</td>
<td>Pass</td>
<td>0.0</td>
</tr>
<tr>
<td>S</td>
<td>Satisfactory</td>
<td>0.0</td>
</tr>
<tr>
<td>W</td>
<td>Withdraw</td>
<td>0.0</td>
</tr>
<tr>
<td>A</td>
<td>Audit</td>
<td>0.0</td>
</tr>
<tr>
<td>NR</td>
<td>Missing Grade</td>
<td>0.0</td>
</tr>
</tbody>
</table>

• Nonpassing Grades

<table>
<thead>
<tr>
<th>Grades</th>
<th>Explanation of Grades</th>
<th>Grade Points for Each Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Failure</td>
<td>0.0</td>
</tr>
<tr>
<td>I</td>
<td>Incomplete</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Minimum Competency Requirements (Instituted Fall, 2005)

The Montana Board of Regents has established a common policy on minimum course grades across all campuses in the system. This policy affects only students who enter or were readmitted to the system starting in fall 2005. According to the policy, a grade of C- or better is required to satisfy requirements for pre-requisite and required courses in majors, minors, and certificate programs and for all core requirements. Further, a grade of C- or better is required in all courses that will be counted toward the 42 upper-division credits required in all degrees. Courses with a passing grade of D-, D, or D+ may only be counted toward the overall 120 credit requirement. This policy creates a minimum requirement, which may be superseded by more stringent requirements within specific majors. Any such requirements are explained within the descriptions of those curricula.

Semester Grade-Point Average

The student’s semester grade-point average is computed by dividing the number of grade points earned by the
number of credits carried. Semester grade-point averages are used in computing fraternity, sorority, and all-university averages.

**Cumulative Grade-Point Average**

The cumulative grade-point average is computed by dividing the sum of grade points earned by the sum of credits carried, except that neither the credits nor the grade points shall be counted for the following:
1. Below college level courses.
2. For repeated courses, only the credits and grades received the last time the course was taken will be included in the calculation of the cumulative grade-point average, and only the credits received the last time the course was taken will be included in the credits counted for graduation. However, all grades received will be listed on the transcript. Repeat waivers are figured manually and will be reflected in the cumulative totals the next semester after the courses have been repeated.
3. Courses passed on a pass/fail basis.
4. Only credits taken at MSU are used to compute the cumulative grade-point average.

**W Grade Eligibility**

After the 16th day of the semester, students may drop courses and receive a grade of W (withdrawal) only if approved by the academic advisor and course instructor. Approval is not guaranteed, and no refund is given. Until the last day of the official registration period for the following semester, students use a Drop/Add form (see advisor, department office, or Registrar’s Office) to drop courses with a W. The W grade is non-punitive; it counts in credits attempted but not in earned credits or in quality points toward the GPA. If a student repeats the course in a subsequent semester, the new grade will count in the GPA but the W will remain on the transcript.

**I Grade Eligibility**

Instructors may assign a grade of I (Incomplete) when students have been unable to complete their academic obligations because of circumstances beyond their control. The University takes the position that when students register, they commit themselves to completing their academic obligations as their primary responsibility. Therefore, the instructor may assign an I grade only in cases when students have suffered extreme personal hardship or in unusual academic situations.

An instructor may assign an I grade in cases of personal hardship when students have been unable to fulfill their commitments because of illness, death or illness in the immediate family, family emergencies, or military orders. The Dean of Students will verify personal hardship cases at the instructor’s request. The instructor may assign an I grade to a student for personal hardship, provided the student has completed three-fourths of the work of the course with a passing grade. If the student has not satisfactorily completed three-fourths of the course work, the instructor must provide written justification for assigning an I grade.

The instructor may also assign an I grade, subject to the department head’s approval, in cases when a student has been unable to complete course requirements for reasons such as apparatus or equipment failure, death or disease in experimental animals, delays in material shipments from suppliers, or in other unusual academic circumstances which are clearly beyond the student’s control. In these situations, the student must have completed three-fourths of the work of the course with a passing grade. If the student has not satisfactorily completed three-fourths of the course work, the instructor must provide written justification for assigning an I grade.

In each instance qualifying for an I grade, the instructor must prepare an I Grade Authorization form. On this form, the instructor will list the make-up requirements and the date beyond which the I will revert to a F grade.

To change the I grade after the make-up work has been completed, the instructor will obtain the proper form from the Registrar’s Office, place the grade on the form, and return it to the Registrar’s Office. The instructor may specify the time period within which the work must be made up. Unless a specified 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), unless extended by the instructor. 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).

**Make-Up of I Grades**

An I Grade make-up is reported to the Registrar on a Grade Change Form. No fee is charged. These grades are not included on the next semester grades. The student’s college dean, academic department, and advisor are notified when I grades are made up.

**Pass/Fail Grading**

As a general policy, courses at Montana State University are graded by the letter grades, A, A-, B+, B, etc. However, in certain courses, pass/fail grading may be more appropriate. Courses may be offered on a pass/fail basis for all students registered in the course, with the approval of the department head and college dean. Courses offered on a pass/fail basis will be identified in the Schedule of Classes. Permission to offer a course on a pass/fail basis is limited to one academic year; if the permission is not renewed, the course reverts to a letter-grade basis.

In pass/fail grading, passing work will receive a P grade on the student’s transcript, but it will not count in the grade point average. However, the course credit will count toward the number of credits required for graduation. Failing work will receive an F grade and will count in the grade-point average.

**N Grade**

An N grade may be assigned to students enrolled in the Tutor Assisted Courses (TAC) in Mathematics only. This grade indicates that, though students have not completed the course, they have made satisfactory progress. These students must re-enroll in the course immediately in order to continue with the course work and complete the course.

**Grade Changes**

Once a grade has been reported by the instructor to the Registrar, it cannot be changed except in case of clerical error or unless it was fraudulently obtained. All grades and credits will stand as recorded in the Registrar’s office.
Undergraduate students may take a pass/fail basis subject to the following restrictions:

1. Students can elect the pass/fail option only for courses that are outside their departments and are not required for graduation. Pass/fail courses may not be applied toward completion of Core requirements. This restriction does not apply to HHD activity courses.
2. A student may not register for more than one pass/fail elective course per semester, excluding one-credit HHD activity courses.
3. Undergraduate students may take a maximum of twelve credits of pass/fail elective courses. This maximum does not include courses that are offered only on a pass/fail basis.
4. Students register for pass/fail courses in the same manner as for other courses, but they must have written permission from their advisers, college deans, and the instructors of the course. The Registrar has forms for this purpose.
5. Students may only change a pass/fail registration to a regular registration, or a regular registration to a pass/fail registration, prior to the end of the tenth day of instruction. Students will follow the regular drop-add procedures, except that students changing to a pass/fail registration must also secure the written permission of the instructor and adviser (see 4 above).
6. Prerequisites will apply for all courses taken on a pass/fail basis.
7. The instructor’s requirement to obtain a grade of P in the course must be submitted with the Request for Pass/Fail form.
8. The Admission and Graduation Requirements Board will review petitions for exceptions to the pass/fail policy.

Absence from Classes
When students enroll in a course, they enter a contractual agreement with the instructor for the duration of the course, and both the student and the instructor are expected to honor the specified terms of that agreement. It is important, therefore, for the student to understand the attendance requirements in each course. The instructor should communicate these requirements during the first or second class meeting in writing in the course syllabus.

Absences from classes are handled exclusively within the purview of the individual instructor. If you have an accident, fall ill, or suffer some other emergency over which you have no control, you should gather what documentation you can (e.g., copies of repair or tow bills, prescriptions, accident reports, or statements from physicians) to show to your instructor. In some instances, you may wish to explore the options available by petitioning for I grades.

The provisions for making up missed class work may vary from one instructor to another. Most but not necessarily all instructors provide for some opportunity to make up missed work; for example, if one is absent from campus to participate in university-sponsored events. If you know that you are going to be involved in such activities during the semester, you should advise your instructor of these plans at the outset of the course and determine then what arrangements are available to make up missed class work.

Registration

Dates for Registration
The dates for registration each semester are published in the Registration Handbook, which is printed prior to registration and is available from the Registrar’s Office. The Registration Handbook is also available on-line through the MyInfo link on the MSU Homepage. Before the beginning of each semester, the Admissions Office mails acceptance letters to new students who have been accepted for admission, and the Registrar’s Office mails letters to former students who have submitted Intent to Register forms. A continuing student in good standing will receive registration times and access information from academic departments. Information on registration and course offerings is also provided in the Registration Handbook.

Class Rolls
During the third day of University instruction and thereafter, those students who have registered but have not attended class may be required by the instructor to drop the course when space and/or equipment is limited and other students have requested to add that class. Students are not automatically dropped; this action requires a student-initiated drop/add form.

Final grades are due within forty-eight hours after the final examination in each course. No grade or credit will be given to students in courses for which they are not properly registered.

Students must pay all fees at the scheduled time of fee payment. (See semester Registration Handbook for fee payment times.)
Undergraduate Student Petitions for Registration and Reservation of Certain Courses

Undergraduate students may petition to register for certain graduate-level courses either to fulfill undergraduate requirements or to reserve for future application to a graduate program. Undergraduate students also may petition to reserve 400-level courses outside their undergraduate major for possible application to a graduate program. Reserved 400-level courses may be applicable to either the major or minor areas of a graduate program.

A successful petition must meet all of the following criteria:
1. The student is of senior standing.
2. The student has a cumulative grade-point average of at least 3.25.
3. All prerequisites for the course(s) have been completed.
4. The course does not have “graduate standing” or an equivalent prerequisite.
5. The student has not reserved more than nine (9) credits total of all 400- and graduate-level courses taken prior to completion of a baccalaureate degree.
6. The petition does not include any of the following courses for either registration or reservation: 470, 570, 589, 590, 689, 690.
7. The petition is filed prior to registering for the course.
8. The student, through a petition, has received approval from the head of the department offering the course, the head of the department from which the student will receive the bachelor’s degree, the instructor(s), and the Division of Graduate Education.

A graduate-level course approved by petition may be used either for fulfilling undergraduate or graduate program requirements, but not for both. The student must indicate on the petition form the intended use of the registered/reserved course credits.

Undergraduate senior students with financial aid should be aware that credits reserved for future application to a graduate program may affect their current financial aid eligibility.

Petition forms may be obtained from the student’s departmental office or from the Division of Graduate Education.

Drop/Add Regulations and Procedures

Add Procedure
Students may add classes online using MYINFO through the 5th day of class. After the 5th day of the semester, all adds require the signatures from the instructor and advisor. After the 10th day of the semester, all adds require the additional signature of the Assistant Dean of the student’s major curriculum on the Drop/Add form.

Drop Procedure
Note that if the student has paid fees and wishes to drop all courses, a University Withdrawal must be obtained through the Dean of Students Office. Each student is responsible for fees of all courses after the 15th day of the semester. See academic calendar for actual dates.

Students may drop classes online through the 10th day of the semester. After the 10th day of the semester, all drops require the signatures of the instructor and advisor. Although no refund will be given after the 15th day of the semester, students may continue to drop one or more courses with a grade of “W” up through the last day of the official registration period for the following semester, with the approval of the academic advisor and their course instructor.

1. Students can obtain the Drop/Add form from their advisor, department, Registrar’s Office or download the form from the Registrar’s homepage www.montana.edu/registrar under Student Forms.
2. The student should discuss the reason for the drop with an academic advisor. If the advisor approves and signs the form, then the instructor’s approval and signature is required on the form.
3. The student must return the completed Drop/Add form to the Registrar’s Office with a picture ID.

Taking Courses for Zero Credit
Auditor
Registered students may, with the permission of the instructor, enroll in a course as auditors and earn zero credit. A student must decide to audit a course by the tenth class day of the semester. Auditors pay the same fees as students enrolled for credit.

Non-matriculated Student (Listener)
Any adult not regularly enrolled may, with the permission of the instructor, register for a non-laboratory class. Application forms for non-matriculated enrollment are obtained from the Registrar’s Office, and the Registrar reviews the completed application for compliance. Payment is required upon approval at the rate charged a regularly enrolled in-state student. A listener may not participate in class discussions or take examinations.

Fresh Start Policy
A former Montana State University undergraduate who returns to the University after a minimum of five years will have the opportunity to petition to begin a new cumulative (or Fresh Start) GPA as follows:

1. After returning to Montana State University, a student must complete thirty credits of academic study with a minimum cumulative GPA of 2.5 for the new course work before petitioning for a Fresh Start GPA.
2. A student who is eligible for a Fresh Start GPA must petition for a new cumulative GPA during the semester following that in which he or she meets the requirements stated in #1.
3. A student may begin a Fresh Start GPA only once.
4. Student petitions will be considered on a case-by-case basis by the Admission and Graduation Requirements Board. The decisions of the Board will be final.
5. When the new GPA is started, all previous grades and credits earned at Montana State University are excluded; it is not possible to select some grades and credits to exclude while retaining others. Only Montana State University grades and credits will be excluded.
6. The new GPA begins the first semester the student is re-enrolled. The transcript will state that a new GPA has been started. The old grades will remain on the transcript. Although old credits will appear on the transcript, they may not be used to fulfill any University requirements.
Students wishing to petition for a Fresh Start GPA should contact the Registrar’s Office to initiate the process.

Classification of Students
At the end of each semester, students are classified as follows:
- **Freshman**: A student who is entitled to regular or conditional admission with less than thirty credits.
- **Sophomore**: A student must have earned thirty or more credits.
- **Junior**: A student must have earned sixty or more credits.
- **Senior**: A student must have earned ninety or more credits.
- **Second bachelor’s degree candidate**: A student who has already earned one or more baccalaureate degrees and is seeking another.
- **Non-degree undergraduate student**: A student taking courses for special interest, but not planning on using the credit toward a degree.
- **Non-degree graduate student**: A student with at least a baccalaureate degree but not seeking another degree.
- **Graduate degree student**: A student who has at least a baccalaureate degree and has been accepted into the College of Graduate Studies.

Examinations

Common Hour Exams
Common hour exams are given during the semester for multi-section courses. Dates and times are published in the Registration Handbook. These exams take the place of one class meeting and are included in the student’s commitment to the course upon enrolling in it.

Final Exams
Final examinations in one-credit courses are given during regular class periods. Final examinations for all other courses are scheduled by the Registrar, and may not be rescheduled or given prior to the start of the final examination period. According to University policy, the examination period is instructional time, and it is expected that some instructional use is made of this period if a final examination is not given.

A student who has three or more final examinations in any one day should first contact the instructors of the courses to see if one exam can be rescheduled. If this rescheduling can’t be resolved, then the student should contact the assistant dean of his or her college at least one week before the beginning of final examination week to assist in resolving the conflict.

CLEP and Challenge Exams
See Advanced Standing.

University Withdrawal
If a student must withdraw from all classes during the semester for personal reasons, he or she should apply at the Dean of Students Office for a university withdrawal.

Students who withdraw before the end of the fifteenth day of instruction will not receive grades for any course taken. After the fifteenth day through the last day of instruction, students who withdraw for “extraordinary reasons” will receive W grades in all courses.

The Dean of Students Office will assign the official date of the university withdrawal.

Students who leave the campus without withdrawing through regular channels or who withdraw late without extraordinary reasons will receive F grades in all course work for that semester.

Retroactive University Withdrawal Policy
A retroactive university withdrawal may be an option for students who were unable to complete a standard university withdrawal during the semester of their departure from the university. A retroactive university withdrawal is an extraordinary remedy that is available only for the reasons set forth below. Students who are granted a retroactive university withdrawal receive W grades in all courses for the semester in which they apply for the retroactive withdrawal. Requests for retroactive withdrawals must be submitted no later than three years from the last day of the semester for which the withdrawal is sought.

Students who leave the campus without applying at the Dean of Students Office for a university withdrawal during the semester of departure or who fail to withdraw through regular channels or who fail to withdraw for extraordinary reasons may apply for a retroactive university withdrawal only if they can provide evidence of the following:

1. The student had a debilitating illness or injury that significantly limited his/her capacity to withdraw in a timely manner; or
2. The student was forced to leave the University abruptly due to health or safety emergency within his/her immediate family; or
3. The student has been recommended to apply for a retroactive university withdrawal by the University Scholastic Appeals Board and meets the other criteria for a retroactive university withdrawal.

To apply for a retroactive university withdrawal, students must submit a formal letter of request to the Dean of Students, no later than three years after the last day of the semester for which the withdrawal is sought. The student must include his/her name, social security number and/or student identification number, dates for the requested retroactive withdrawal, and supporting documentation to verify claims of illness, injury or emergency which precluded the student from applying for a university withdrawal during the semester of departure. The Dean of Students Office will assign the official date of the retroactive university withdrawal.

An Appellate Board will convene to review the request for a retroactive withdrawal upon receipt of appropriate verification of potential eligibility. Requests for a retroactive withdrawal will be considered by the Appellate Board only if sufficient documentation is provided to support claims of extraordinary illness, injury, or emergency. The review process will be limited to a review of documents and student records. The Dean of Students, in his/her capacity as Chair of the Appellate Board, shall inform the student of the Board’s decision with ten working days of the Hearing. The decision of the Appellate Board is final.
Scholastic Probation and Suspension

Probation and Suspension Decisions
When a student’s semester or cumulative grade-point average falls below 2.00, the record of the student’s performance is reviewed by the University Scholastic Appeals Board, which is composed of the Senior Vice Provost for Academic Affairs, the Dean of Students, and the dean or assistant dean of the college concerned. The board meets between semesters and at other times as needed to act upon individual cases recommended for either suspension or transfer out of a curriculum. This board has the authority 1) to suspend a student from the University for scholastic reasons, 2) to reinstate a student who has been suspended for scholastic reasons, and 3) to require a student to transfer out of a curriculum with the consent of both colleges involved. The chairperson of this board will notify students in writing of the action. (The designation probation, suspension warning, or suspension will be entered on the student’s permanent record.) Semester grade reports indicate the status of students, and it is the individual student’s responsibility to review his or her grade report each semester.

Appeal of Suspension
A student who has been suspended may appeal the suspension if he or she believes there were extraordinary circumstances beyond the student’s control of which the University Scholastic Appeals Board was unaware when it reached its decision. Appeal forms are available from the offices of academic deans.

Reinstatement
A student who was suspended for the first time is automatically reinstated after one semester has elapsed (exclusive of Summer Session). In order to enroll again at MSU, however, a suspended student must submit an Intent to Register form to the Registrar’s Office. After a second suspension, one academic year must elapse before the student will be reinstated, again with submission of an Intent to Register form. Intent to Register forms may be obtained from the Registrar’s Office. Completed Intent to Register forms must be received by the following approximate deadline dates (check with the Registrar’s Office for current deadline dates).

Guidelines Used by the University Scholastic Appeals Board

<table>
<thead>
<tr>
<th>Grade-point Average, Semester (top) and Cumulative (bottom)</th>
<th>Previous Status</th>
<th>Good</th>
<th>College</th>
<th>Cont. Coll.</th>
<th>University</th>
<th>Susp. Warn.</th>
<th>Susp. (Ret)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00-0.99 Not Appl.</td>
<td>University*</td>
<td>College</td>
<td>Suspension*</td>
<td>Not Appl.</td>
<td>Cont. Coll.</td>
<td>Susp. Warn.*</td>
<td>Suspension*</td>
</tr>
<tr>
<td>1.00-1.99 Not Appl.</td>
<td>College</td>
<td>Susp. Warn.*</td>
<td>Susp. Warn.*</td>
<td>University*</td>
<td>University*</td>
<td>Susp. Warn.*</td>
<td>University*</td>
</tr>
<tr>
<td>2.00-4.00 Not Appl.</td>
<td>2.00-4.00</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
</tbody>
</table>

Good
A student has both a term GPA and cumulative GPA of at least 2.00 or better or is a new student (transfer students may be admitted on university probation).

College
A student in “good” standing has received the first term GPA between 1.00 and 1.99.

Cont. Coll.
A student previously on College Probation has raised the term GPA above 2.00 but the cumulative GPA is not above 2.00.

University
A student previously on University Probation has raised the term GPA above 2.00 but the cumulative GPA is not above 2.00, or has received a term GPA between 0.00 and 0.99 after being in “Good” standing.

Suspension Warning
A student has received a term GPA less than 2.00 for the past two terms. One more term with a GPA less than 2.00 will result in suspension.

Suspension
Students will be required to sit out one term on their first suspension and one year on their second suspension. Third suspensions will be handled on an appeal basis only.

* These academic actions appear on the student’s transcript.

All students in either College Probation, University Probation, or Suspension Warning status remain in some form of probationary status until both their most recent semester GPA and their cumulative GPA are above 2.0.
Alphabetic List of Programs

A
Accountancy (Professional) - M
Accounting - BS option in Business; minor
Adult & Higher Education - option in MEd; option in EdD
Aerospace - minor
Agribusiness Management - concentration
Agricultural Business - BS; minor
Agricultural Education - BS; MS
Agricultural Education Broadfield - teaching option
Agricultural Relations - BS option in Agricultural Education
Agroecology - BS option in Sustainable Food and Bioenergy Systems
American Studies - BA; MA; PhD
Animal & Range Sciences - MS; PhD
Animal Science - BS; minor
Animal Systems - BS option in Biotechnology
Anthropology - BS; minor
Applied Economics - MS
Applied Mathematics - BS option in Mathematics
Applied Mechanics - PhD option in Engineering
Applied Psychology - BS option in Psychology; MS
Architecture - BA option in Environmental Design; MArch
Art - BA; BFA; MFA: teaching option; teaching minor, Art History minor
Art History - BA option in Art; minor

B
Bioresources Engineering - BS option in Civil Engineering
Biochemistry - BS option in Chemistry; MS; PhD; minor
Bioengineering - BS
Biological Sciences - BS; MS; PhD
Biology - teaching option; teaching minor
Biomedical Sciences - BS option in Cell Biology and Neuroscience
Biotechnology - BS
Botany - refer to Organismal Biology
Business - BS
Business Administration - minor

C
Cell Biology and Neuroscience - BS; option in Cell Biology and Neuroscience
Chemical Engineering - BS; MS; PhD option in Engineering
Chemistry - BS: professional option; teaching option; teaching minor; MS; PhD
Child Services - minor
Civil Engineering - BS; MS; PhD option in Engineering
Clinical Nurse Specialist - Adults with Complex Acute and Chronic Health Problems
Coaching - minor
Commerce - BA option in Modern Languages & Literatures
Community Health - BS
Computer Engineering - BS, MS: minor
Computer Science - BS; MS; PhD; minor
Construction Engineering Management - MS
Construction Engineering Technology - BS
Counseling - MS option in Health & Human Development
Crop Science - BS option in Plant Science
Curriculum & Instruction - option in MEd; option in EdS; option in EdD

D
Dietetics - BS option in Food and Nutrition

E
Early Childhood Education - BS option in Elementary Education
Early Childhood Education and Child Services - BS
Earth Sciences - BS; MS; PhD: teaching minor
Ecology & Environmental Sciences - PhD
Ecological & Environmental Statistics - MS
Ecology & Evolution - option for BS in Biological Sciences
Economics - BS; teaching minor; minor
Economics (Applied) - MS
Education - MEd with options in Adult and Higher Education, Curriculum and Instruction, Educational Leadership, and School Counseling; EdD with options in Adult and Higher Education, Curriculum and Instruction, and Education Administration
Education Leadership - option in MEd; option in EdD; option in EdS
Elementary Specialist - EdS with options in Education Administration
Electrical & Computer Engineering - PhD option in Engineering
Electrical Engineering - BS; MS; minor
Elementary Education - BS
Engineering - PhD with options in Applied Mechanics, Chemical Engineering, Civil Engineering, Electrical & Computer Engineering, Environmental Engineering, Industrial Engineering, Mechanical Engineering
English - BA; MA; literature option; teaching option; teaching minor
English Literature - minor
English Writing - minor
Entrepreneurship & Small Business Management - minor
Entomology - MS; minor
Environmental Biology - BS option in Environmental Sciences
Environmental Design - BA
Environmental Engineering - MS; PhD option in Engineering
Environmental Health - BS option in Microbiology
Environmental Horticulture - BS
Environmental Sciences - BS
Environmental Studies - BA option in Liberal Studies
Equine Science - BS option in Animal Science
Exercise Science - BS option in Health & Human Performance

F
Family & Consumer Sciences - BS teaching or non-teaching option; MS option in Health & Human Development

G
General Science - BS option in Secondary Education
Genetics - non-teaching minor
Geography - BS option in Earth Sciences
Geographic Information Science (GIS)/Planning - option
Geographic Information Science (GIS) - minor
Geology - BS option in Earth Sciences
Geospatial and Environmental Analysis - BS
German - BA option in Modern Languages & Literatures; teaching option; teaching minor; minor
Global/Multicultural Studies - BA option in Liberal Studies
Government - teaching minor
Graphic Design - option in BFA Art

H
Health & Human Development - MS with options in Counseling, Family and Consumer Sciences, Family Financial Planning, Exercise and Nutrition Sciences, and Health Promotion and Education
Health and Human Performance - BS option in Exercise Science; Kinesiology
Health Enhancement K-12 (Health and Physical Education) - BS
Health Promotion and Education - MS option in Health & Human Development
History - BA; MA; PhD: teaching option; teaching minor; minor
Honors - courses

I
Industrial Engineering - BS; PhD option in Engineering
Industrial & Management Engineering - MS
Industrial Technology - BS option in Technology Education
Interdisciplinary Studies - BA; BS
International Business - minor
International Relations - BS option in Political Science

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

Undergraduate Degrees, Majors, and Options
MSU-Bozeman offers a wide range of programs through its eight academic colleges. Specific degrees, majors, and options are listed under each college. By your junior year, earlier if possible, you will need to select a major in your main area of academic interest. The choice should be based on your current interests and your plans for the future. Careful consideration should also be given to the courses offered in the major and the requirements for completing the program of study.

College of Agriculture

- Bachelor of Science in Agricultural Business
  - Agribusiness Management Concentration
  - Farm and Ranch Management Concentration

- Bachelor of Science in Agricultural Education
  - Agricultural Education Broadfield Teaching Option
  - Agricultural Relations Option

- Bachelor of Science in Animal Science
  - Equine Science Option
  - Livestock Management and Industry Option
  - Science Option

- Bachelor of Science in Biotechnology
  - Animal Systems Option
  - Plant Systems Option
  - Microbial Systems Option

- Bachelor of Science in Environmental Horticulture
  - Environmental Horticulture Option
  - Landscape Design Option

- Bachelor of Science in Environmental Sciences
  - Environmental Biology Option
  - Soil and Water Sciences Option

- Bachelor of Science in Geospatial and Environmental Analysis

- Bachelor of Science in Land Rehabilitation

- Bachelor of Science in Natural Resources and Rangeland Ecology
  - Rangeland Ecology and Management Option
  - Wildlife Habitat Ecology and Management Option
• Bachelor of Science in Plant Science
  · Crop Science Option
  · Plant Biology Option
• Bachelor of Science in Sustainable Food & Bioenergy Systems
  · Agroecology Option
  · Sustainable Crop Production Option
• Non-degree program
  · Preveterinary Medicine Program

College of Arts and Architecture
• Bachelor of Arts in Art
  · Art Education K-12 Broadfield Option
  · Art History Option
  · Liberal Arts Studio Option
• Bachelor of Arts in Environmental Design
• Bachelor of Arts in Film and Photography
  · Motion Picture/Video/Theatre Option
  · Photography Option
• Bachelor of Fine Arts in Art
  · Graphic Design Option
  · Studio Arts Option
• Bachelor of Arts in Music
• Bachelor of Music Education
• Bachelor of Arts in Music Technology

College of Business
• Bachelor of Science in Business
  · Accounting Option
  · Finance Option
  · Management Option
  · Marketing Option

College of Education, Health and Human Development
• Bachelor of Science in Community Health
• Bachelor of Science in Early Childhood Education and Child Services
• Bachelor of Science in Elementary Education K-8
  · Early Childhood Education Option
  · Mathematics Option
  · Science Education Option
  · Special Education Option
• Bachelor of Science in Family and Consumer Sciences
  · Nonteaching Option
  · Teaching Option

College of Engineering
• Bachelor of Science in Bioengineering
• Bachelor of Science in Chemical Engineering
• Bachelor of Science in Civil Engineering
  · Bio-Resources Engineering Option
  · Civil Engineering Option
• Bachelor of Science in Computer Engineering
• Bachelor of Science in Computer Science
  · Interdisciplinary Option
  · Professional Option
• Bachelor of Science in Construction Engineering Technology
• Bachelor of Science in Electrical Engineering
• Bachelor of Science in Industrial Engineering
• Bachelor of Science in Mechanical Engineering
• Bachelor of Science in Mechanical Engineering Technology
  · Non-degree programs
    · Military Aerospace Studies - Air Force ROTC
    · Military Science - Army ROTC

College of Letters and Science
• Bachelor of Science in Anthropology
• Bachelor of Science in Biological Sciences - (Ecology)
  · Biology Teaching Option
  · Ecology and Evolution Option
  · Fish and Wildlife Management Option
  · Organismal Biology Option
• Bachelor of Science in Cell Biology and Neuroscience
  · Biomedical Sciences Option
    (includes Premedicine, Predentistry, Preoptometry)
  · Cell Biology & Neuroscience Option
• Bachelor of Science in Chemistry
  · Biochemistry Option
  · Chemistry Professional Option
  · Chemistry Teaching Option
• Bachelor of Science in Earth Sciences
  · Geography Option
  · Geohydrology Option
  · Geology Option
  · GIS/Planning Option
  · Paleontology Option
  · Snow Science Option
• Bachelor of Science in Economics
• Bachelor of Arts in English
  · English Teaching Option
  · Literature Option
  · Bachelor of Arts in History
  · History Option
  · History Teaching Option
  · Japan Studies Option
  · Religious Studies Option
  · Science, the Environment, Technology, and Society (SETS) Option
• Bachelor of Science in Mathematics
  · Applied Mathematics Option
  · Mathematics Option
  · Mathematics Teaching Option
  · Statistics Option
• Bachelor of Science in Microbiology
  · Environmental Health Option
  · Medical Laboratory Science Option
  · Microbiology Option
• Bachelor of Arts in Modern Languages and Literatures
  · Commerce Option
  · French Teaching Option
  · French & Francophone Studies Option
  · German Teaching Option
  · German Studies Option
  · Hispanic Studies Option
  · Spanish Teaching Option
• Bachelor of Arts in Philosophy
  • Philosophy Option
  • Philosophy and Religion Option
• Bachelor of Science in Physics
  • Professional Option
  • Physics Teaching Option
  • Interdisciplinary Option
• Bachelor of Arts in Political Science
  • International Relations Option
  • Analysis and Policy Option
  • Political Institution Option
  • Political Theory Option
• Bachelor of Science in Psychology
  • Applied Psychology Option
  • Psychological Science Option
• Bachelor of Science in Sociology
• Non-degree program
  • Pre-Medical/Pre-Health Professions

College of Nursing
• Bachelor of Science in Nursing

University College
• Bachelor of Arts in American Studies
• Bachelor of Arts in Liberal Studies
  • Environmental Studies Option
  • Global/Multicultural Studies Option
  • Quaternity Option
• Bachelor of Arts in Directed Interdisciplinary Studies
• Bachelor of Science in Directed Interdisciplinary Studies

University Honors

A program which provides academically motivated students with unique opportunities to undertake interdisciplinary coursework and undergraduate research leading to a university honors degree.

MSU-Bozeman reserves the right to add or withdraw programs at any time subject to the concurrence of the Board of Regents of Higher Education.

Undergraduate Minors

Teaching Minors
  A number of teaching minors are available for students majoring in Secondary Education or Elementary Education.
  • Art K-12
  • Biology
  • Chemistry
  • Earth Science
  • Economics
  • English
  • Family and Consumer Sciences
  • Government
  • History
  • Mathematics
  • French K-12
  • German K-12
  • Spanish K-12
  • Physics
  • Psychology
  • Sociology
  • Technology Education

Non-teaching Minors
  In addition to a major field of study, many students are now declaring a non-teaching minor. This is a secondary area of academic specialization. Some students use minors to expand their career opportunities, while others pursue minors in education. Students must submit an Application for a Minor to the Registrar’s Office two semesters prior to graduation. Below is a list of non-teaching minors currently available.
  • Accounting
  • Aerospace
  • Agricultural Business
  • Animal Science
  • Anthropology
  • Art History
  • Astrobiology
  • Women’s Studies
  • Biochemistry
  • Business Administration
  • Chemistry
  • Child Services
  • Coaching
  • Computer Engineering
  • Computer Science
  • Economics
  • Electrical Engineering
  • English Literature
  • English Writing
  • Entrepreneurship and Small Business Management
  • Entomology
  • French
  • Genetics
  • Geographic Information Science (GIS)
  • German
  • Global Studies
  • History
  • Environmental Horticulture
  • International Business
  • Japan Studies
  • Latin American and Latino Studies
  • Management of Information Technology
  • Mathematics
  • Microbiology
  • Military Studies
  • Museum Studies
  • Music
  • Native American Studies
  • Natural Resources and Rangeland Ecology
  • Philosophy
  • Photography
  • Physics
  • Political Science
  • Psychology
  • Religious Studies
  • Sociology
  • Soil Science
  • Spanish
  • Spatial Analysis/GIS
  • Statistics
  • Water Resources
  • Women’s Studies

MSU-Bozeman reserves the right to add or withdraw programs at any time subject to the concurrence of the Board of Regents of Higher Education.

Graduate Degrees and Options

MSU-Bozeman offers forty master’s degrees and fourteen doctoral degrees through its seven academic colleges. Specific majors and options are listed under each college. Further information on these programs is also available through the College of Graduate Studies.

College of Agriculture

• Master of Science in Agricultural Education
• Master of Science in Animal and Range Sciences
• Master of Science in Entomology
• Master of Science in Land Resources and Environmental Sciences
• Master of Science in Land Rehabilitation
• Master of Science in Plant Pathology
• Master of Science in Plant Science
• Master of Science in Veterinary Molecular Biology
• Doctor of Philosophy in Animal and Range Sciences
• Doctor of Philosophy in Ecology and Environmental Sciences
• Doctor of Philosophy in Plant Science
  - Plant Genetics Option
  - Plant Pathology Option
• Doctor of Philosophy in Veterinary Molecular Biology

College of Arts and Architecture
• Master of Architecture (M.Arch.)
• Master of Fine Arts in Art (M.F.A.)
• Master of Fine Arts in Science and Natural History Filmmaking (M.F.A.)
• Master of Art in Art History

College of Business
• Master of Professional Accountancy (M.P.A.c.)

College of Education, Health and Human Development
• Master of Education in Curriculum and Instruction
  - Professional Educator option
  - Educational Research option
  - Technology Education option
• Master of Education in Education (M.Ed.)
  - Adult and Higher Education Option
  - Educational Leadership Option
  - School Counseling Option
• Master of Science in Health and Human Development
  - Counseling Option
  - Exercise & Nutrition Sciences
  - Family and Consumer Sciences Option
  - Family Financial Planning Option
  - Health Promotion & Education Option
• Education Specialist (Ed.S.)
  - Educational Leadership Option
• Doctor of Education in Education(Ed.D.)
  - Adult and Higher Education Option
  - Curriculum and Instruction Option
  - Educational Leadership Option

College of Engineering
• Master of Construction Engineering Management (M.C.E.M.)
• Master of Science in Chemical Engineering
• Master of Science in Civil Engineering
• Master of Science in Computer Science
• Master of Science in Electrical Engineering
• Master of Science in Environmental Engineering
• Master of Science in Industrial and Management Engineering
• Master of Science in Mechanical Engineering
• Doctor of Philosophy in Computer Science
  - Applied Mechanics Option
  - Chemical Engineering Option
  - Civil Engineering Option
  - Electrical & Computer Engineering Option
  - Environmental Engineering Option
  - Industrial Engineering Option
  - Mechanical Engineering Option

College of Letters and Science
• Master of Science in Applied Economics
• Master of Arts in English
• Master of Arts in History
• Master of Arts in Native American Studies
• Master of Public Administration (M.P.A.)
• Master of Science in Biochemistry
• Master of Science in Biological Sciences
• Master of Science in Chemistry
• Master of Science in Earth Sciences
• Master of Science in Ecological and Environmental Statistics
• Master of Science in Fish and Wildlife Management

Intercollege
• Master of Science in Science Education
• Doctor of Philosophy in Ecology and Environmental Sciences

MSU-Bozeman reserves the right to add or withdraw programs at any time subject to the concurrence of the Board of Regents of Higher Education.
Undergraduate Programs Available:

- B.S. in Agricultural Business
- B.S. in Agricultural Education
- B.S. in Animal Science
- Biological Sciences at MSU
- B.S. in Biotechnology
- B.S. in Environmental Horticulture
- B.S. in Environmental Sciences
- B.S. in Land Rehabilitation
- B.S. in Geospatial & Environmental Analysis
- B.S. in Natural Resources & Rangeland Ecology
- B.S. in Plant Science
- Preveterinary Medicine Program
- B.S. in Sustainable Food & Bioenergy Systems

The College of Agriculture offers the Bachelor of Science degree in agricultural business, agricultural education, animal science, biotechnology, environmental horticulture, environmental sciences, land rehabilitation, land resource sciences, natural resources and rangeland ecology, plant science, and sustainable food & bioenergy systems. In addition a pre-veterinary program is available for students wishing to prepare for professional training in veterinary medicine.

Minors

Undergraduate minors are offered in agricultural business, agricultural education extension, animal science, entomology, natural resources and rangeland ecology, and soil science. The minor in animal science is designed to give students outside of agriculture a broad overview of the livestock industry. The agricultural education-extension minor is designed to give students a general agriculture and agricultural education background in preparation for extension work. The entomology minor provides focused training in entomology for students majoring in agricultural and natural resource disciplines. A natural resources and rangeland ecology minor provides students with the basics of managing rangeland ecosystems for wildlife habitat, livestock production, and soil and water conservation. The soil science minor is designed to provide non-majors with fundamental soils courses in preparation for natural resource careers.

Agricultural Business

Department of Agricultural Economics & Economics
http://www.montana.edu/econ/

Agribusiness is a dynamic industry with a high degree of global and technological sophistication. The agribusiness sector includes companies that are on the cutting edge in the use of biotechnology, strategy, information systems, risk management, logistics and international trade. The study of agricultural business involves the application of business and economic principles to farming and ranching and related sectors of the general economy. Training in agricultural business includes courses in agricultural firm management, marketing farm products, farm credit and finance, agricultural prices and outlook, agricultural policy, management science, agricultural law, technical agriculture and the business aspects of industries serving agriculture. Surveys indicate that employers seek out graduates with expertise in communication, critical thinking, business management and quantitative analyses. Our program specifically develops each of these skills.

Many employment possibilities are open to students with training in agricultural business. Positions are available with businesses which process and market agricultural products, and with the large number of businesses that sell products and services to farmers and ranchers, such as fertilizer companies, farm machinery companies, banks, and farm credit institutions. Also, opportunities exist to operate and manage farms and ranches. In addition, federal and state governments employ persons with training in agricultural business. Many of our graduates work for regional, national, and even international agribusiness firms that market, process, and transport agricultural products. Other graduates work for companies that service agriculture by supplying inputs to producers. Agricultural credit institutions employ many of our graduates. Some of our graduates continue their education by pursuing graduate degrees or attending law school.

Agribusiness Management Concentration

The agribusiness sector of the economy, which produces and sells goods and services to farmers and ranchers on one hand, and processes and markets agricultural commodities on the other, is growing rapidly. In the United States, for every job in agricultural production, there are approximately three jobs in agriculture-related businesses. The MSU agribusiness management curriculum has established an excellent reputation with employers and is specifically designed for management training with emphasis on finance, accounting, and managerial economics in agriculture-related businesses and industries.

Farm and Ranch Management Concentration

For a student who expects to work in agricultural production and eventually own and operate a farm or ranch, the farm and ranch management option provides a vital set of management skills for success in undertaking the investment and complicated business aspects of farming and ranching. The future farm or ranch manager needs to be familiar with marketing, finance, business management, and the global agribusiness system in which production agriculture operates. Farm and ranch management is a strong academic program designed to provide marketing, management, and finance skills. This curriculum is supplemented with courses that emphasize technical agricultural issues.
**Curricula in Agricultural Business**

**AGribusiness Management Concentration**

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ARNR 100-Intro Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101BS-Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 302-Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>PSPP 102C-Sci,Res,&amp; Envir</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>CHMY 121IN-Intro Gen Chemistry</td>
<td>4</td>
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<tr>
<td>BIOL 101IN-Organismal Biology</td>
<td>4</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>M 161Q-Survey of Calculus</td>
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<tr>
<td>M 171Q-Calculus I</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>AGED 251US-Leadership Dev for Agr</td>
<td>3</td>
</tr>
<tr>
<td>COM 110US-Public Communication</td>
<td>3</td>
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<td>University Core and Electives</td>
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**Sophomore Year**

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>ECNS 202BS-Microeconomics</td>
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</tr>
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<td>3</td>
</tr>
<tr>
<td>AGEC 337-Agricultural Law</td>
<td></td>
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<tr>
<td>ACTG 201-Principles of Financial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 292-Principles of Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q-Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>LRES 201N-Soil Resource</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
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<tr>
<td>BUS 201-Managerial Communication</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201-College Writing II</td>
<td>3</td>
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<tr>
<td>WRIT 221-Intermediate Tech Writing</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>AGED 105-Microcomputers in Agri</td>
<td>3</td>
</tr>
<tr>
<td>CS 120-Introduction to Computers</td>
<td>3</td>
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**Junior and Senior Year**

<table>
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</tr>
<tr>
<td>AGEC 345-Ag Fin &amp; Credit Analysis</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 41BS-Econ of Ag Policy</td>
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<td>ECNS 301-Intermediate Micro with Calculus</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 303-Intermediate Macro with Calculus</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 341-Farm and Ranch Management</td>
<td>3</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>BUS 301-Management &amp; Organization</td>
<td>3</td>
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<tr>
<td>BUS 311-Information Systems</td>
<td>3</td>
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<tr>
<td>BUS 341-Marketing</td>
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<tr>
<td>I&amp;M/E 313-Work Design &amp; Analysis</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;M/E 325-Engineering Economy</td>
<td>3</td>
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<tr>
<td>I&amp;M/E 375-Production Inventory Cost Analysis</td>
<td>3</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>AGEC 421-Advanced Agricult Mktg</td>
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<td>AGEC 445-Agribusiness Management</td>
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</tbody>
</table>

*ECNS 251HS(Honors Economics, 4 credits) may be substituted for the 3 course sequence ECNS 101BS, ECNS 202, and ECNS 204HS.

**Electives Must Include:**
- One course in Ag, Cs, or I&M/E
- Social Sciences (excluding AGEC/ECNS) 3

**Graduation Requirements:**
- Agribusiness students must receive a grade of C or better in ECNS 101BS, ECNS 202, ECNS 204HS, ECNS 301, ECNS 303, and M 161Q or M 171Q (or their equivalents) to meet departmental graduation requirements. All other ECNS/AGEC elective courses counting toward departmental graduation requirements must be graded C- or better.

Agribusiness students seeking a second major in Economics must complete an additional 15 credits at the 300 level or above in ECNS/AGEC electives over and above all requirements for graduation with a major in Agribusiness.

A minimum of 120 credits is required for graduation; 42 of these credits must be numbered 300 or above.

**FARM AND RANCH MANAGEMENT CONCENTRATION**

**Freshman Year**

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<tr>
<td>Take 4 credits from the supporting area courses. Take:</td>
<td></td>
</tr>
<tr>
<td>ARNR 101-Prm of Rgnld Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 102-Prm of Rgnld Mgmt Lab</td>
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<tr>
<td>PSPP 242-Crop Identification</td>
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**MINOR IN AGRICULTURAL BUSINESS (NON-TEACHING)**

A student must receive a grade of C or better in all Agricultural Economics and Economics courses required for the minor.

**Departmental Course Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 101BS-Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202-Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204BS-Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 301-Intermediate Micro with Calculus</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 321-Econ of Ag Mkgt</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 341-Farm &amp; Ranch Management</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 343-Ag Fin &amp; Cred Acl</td>
<td>3</td>
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<tr>
<td>Plus six upper division AGEC/ECNS elective</td>
<td>6</td>
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</table>

**Supporting Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201-Principles of Financial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>M 161Q-Survey of Calculus</td>
<td>3</td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q-Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>ACTG 216Q-Intro to Ag Econ</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 337-Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;M/E 313-Work Design &amp; Analysis</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;M/E 325-Engineering Economy</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;M/E 375-Production Inventory Cost Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
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</tr>
<tr>
<td>AGEC 421-Adv Agriculture Mkgt</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 445-Agribusiness Management</td>
<td>4</td>
</tr>
<tr>
<td>Take 4 credits from the supporting area courses. Take:</td>
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<tr>
<td>ARNR 101-Prm of Rgnld Mgmt</td>
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<tr>
<td>ARNR 102-Prm of Rgnld Mgmt Lab</td>
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<tr>
<td>PSPP 242-Crop Identification</td>
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<tr>
<td>Univ Core and Electives</td>
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</table>

**Total**

40

*ECNS 251HS(Honors Economics, 4 credits) may be substituted for the three-course sequence: ECNS 101BS, ECNS 202, and ECNS 204HS.

**Students cannot use either AGEC 337 or BUS 361 to meet the requirements of the minor.

**"P" grades may be accepted at the discretion of the department only for courses transferred from outside the Montana University System.
Agricultural Education
Division of Agricultural Education
http://ageducation.montana.edu/

Agricultural Education majors may choose from two options: Teaching or Relations. Agricultural education graduates are employed by high schools, area vocational schools, community colleges, public agriculture sector, Extension Service, Natural Resource Conservation Service, and other federal and state and government agencies.

The agricultural education curriculum is designed to provide professional preparation for extension agents, middle school and secondary agricultural education teachers and persons in agriculture service areas where content knowledge, pedagogical and andragogical skills, and presentation experience are desirable attributes. Our graduates are prepared for a wide variety of jobs because they have a broad base of knowledge combined with excellent people skills.

Students in agricultural education gain leadership experiences through the Collegiate 4-H, Collegiate FFA, and other College of Agriculture student organizations.

Teaching Option

The teaching option permits a student to choose a balanced program among agricultural economics, agricultural mechanics, animal & range sciences, and plant & soil sciences, while also gaining teaching and presentation skills. Students preparing to teach spend 10-12 weeks in an approved high school agriculture department as student teachers. Graduates are eligible to receive a Montana Class Two (standard) teaching license which permits them to teach in middle and high schools. This licensure is recognized in most other states throughout the U.S.

Students may pursue a teaching minor in a variety of disciplines that provides them with additional employment opportunities.

Relations Option

The relations option is designed specifically to prepare students for entry-level employment in the Extension Service, other federal or state agencies or the public agriculture sector. It provides broad-based education that emphasizes six subject matter areas: animal science, plant science, agricultural economics, education, communications and agricultural technology. An approved internship in a local Extension office or an approved internship program with an agricultural agency is required.

Curricula in Agricultural Education

AGRICULTURAL EDUCATION

AGRICULTURAL EDUCATION TEACHING OPTION

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>F</th>
<th>S</th>
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<tbody>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
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<tr>
<td>CHMY 121IN-Intro to General Chemistry</td>
<td>4</td>
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<tr>
<td>AGED 251US-Leadership Dev for Agr</td>
<td>3</td>
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<tr>
<td>M 145Q-Math for Liberal Arts</td>
<td>3</td>
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<td>ARNR 101-Nat Res Conservation</td>
<td>3</td>
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<tr>
<td>ARNR 102-Montana Range Plants Lab</td>
<td>3</td>
<td></td>
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<tr>
<td>PSPP 108S-Plant Sci., &amp; Envr</td>
<td>3</td>
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</tr>
<tr>
<td>BIOR 102-Molecular and Cellular Biology</td>
<td>3</td>
<td></td>
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<tr>
<td>HDCF 150S-Lifespan Human Devlpmnt</td>
<td>3</td>
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<tr>
<td>EDCI 102-In School Experience</td>
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<tr>
<td>ARNR 100-Intro Animal Science</td>
<td>3</td>
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<tr>
<td>AGED 105-Microcomputers in Agri</td>
<td>3</td>
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<tr>
<td><strong>Total</strong></td>
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Sophomore Year

<table>
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<tr>
<th>Freshman Year</th>
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<tbody>
<tr>
<td>EUNSS101S-Econ Way of Think</td>
<td>3</td>
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<tr>
<td>EDCI 209-Ed Psy &amp; Adolescent Dev</td>
<td>3</td>
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<tr>
<td>VTMB 271-Funct Anatomy Dom Anal</td>
<td>4</td>
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<tr>
<td>TE 207-Materials and Processes</td>
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<td>LRES 201N-Soil Resource</td>
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<td>WRIT 221-Intermediate Tech Writing</td>
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<td>EDCI 240D-Multicultural Education</td>
<td>3</td>
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<td>EDCI 320-Found of Instr Compute</td>
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<tr>
<td>MET 315-Welding Tech I</td>
<td>3</td>
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<tr>
<td>ARNR 230-Range Livestock Production</td>
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<tr>
<td>AGED 255-Agr Ed in Pub Schools</td>
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Junior Year

<table>
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<tr>
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<tbody>
<tr>
<td>Take one of the following:</td>
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<tr>
<td>PSPP 318-Biometry</td>
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<tr>
<td>STAT 216Q-Introduction to Statistics</td>
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<tr>
<td>EDCI 360-Bases of Assessment</td>
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<td>ARNR 320-Animal Nutrition</td>
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<td>AGED 314-Power Syst Oper Control</td>
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<tr>
<td>HDCF 256-Exceptional Needs</td>
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<tr>
<td>AGED 210B-Economics of Ag Business</td>
<td>3</td>
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<td>AGED 301-Agric Electrification</td>
<td>3</td>
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<td>AGED 400-Seminar</td>
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<td>PSPP 245-Plant Propagation</td>
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<td>University Core</td>
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Senior Year

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<thead>
<tr>
<th>Freshman Year</th>
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<tbody>
<tr>
<td>EDSD 452-Methods Teach AG &amp; TE</td>
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<td>TE 406-Curr &amp; Facilities Plan</td>
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<td>AGED 335-Const Tech</td>
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<tr>
<td>AGED 355-Teaching Practices</td>
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<td>EDS 413C-Professional Issues</td>
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<td>EDSD 410-Student Teaching</td>
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A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

AGRICULTURAL EDUCATION RELATIONS OPTION

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>F</th>
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<tbody>
<tr>
<td>WRIT 101W-College Writing I</td>
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<tr>
<td>ECNS 101H-Econ Way of Think</td>
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<td>AGED 251US-Leadership Dev for Agr</td>
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<tr>
<td>M 145Q-Math for Liberal Arts</td>
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<tr>
<td>ARNR 101-Prin of Rnglnd Mgmt</td>
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<tr>
<td>ARNR 102-Prin of Rnglnd Mgmt Lab</td>
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<tr>
<td>CHMY 121IN-Intro to General Chemistry</td>
<td>3</td>
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<tr>
<td>PSPP 108S-Plant Sci., &amp; Envr</td>
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<td>HDCF 150S-Lifespan Human Devlpmnt</td>
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<td>ARNR 100-Intro Animal Science</td>
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<td>AGED 105-Microcomputers in Agri</td>
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Sophomore Year

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>F</th>
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<tbody>
<tr>
<td>BIOL 102-Molecular and Cellular Biology</td>
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<tr>
<td>WRIT 201-College Writing II</td>
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<td>EDS 269-Ed Psy Hum DevpAdol</td>
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<td>LRES 201N-Soil Resource</td>
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<tr>
<td>AGED 400-Seminar</td>
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<td></td>
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<tr>
<td>ECNS 204S-Intro Micro Theory</td>
<td>3</td>
<td></td>
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<tr>
<td>AGEC 210B-Economics of Ag Business</td>
<td>3</td>
<td></td>
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<tr>
<td>Ag Relations Curriculum Electives</td>
<td>3</td>
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<tr>
<td>University Core</td>
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Junior Year

<table>
<thead>
<tr>
<th>Freshman Year</th>
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<tbody>
<tr>
<td>VTMB 271-Funct Anatomy Dom Anal</td>
<td>4</td>
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<tr>
<td>BIOL 294-Insect Biology</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>PSPP 318-Biometry</td>
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<tr>
<td>AGED 301-Rural Electrification</td>
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<tr>
<td>AGED 399-Phil &amp; Prag in Ext</td>
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<tr>
<td>HDCF 356-Exceptional Needs</td>
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<td>Ag Relations Curriculum Electives</td>
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Senior Year

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<tr>
<th>Freshman Year</th>
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<tbody>
<tr>
<td>AGED 482-Non Frml Teaching Methods</td>
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<tr>
<td>AGEC 321-Econ of Ag Mkgt</td>
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<tr>
<td>AGED 462-International Extension Systems</td>
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<tr>
<td>AGED 512-Communicating Agriculture</td>
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<tr>
<td>AGED 476-Communicating Agriculture</td>
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<td>Ag Relations Curriculum Electives</td>
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<tr>
<td><strong>Total</strong></td>
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</table>

* A minimum of 25 Ag Relations Curriculum Electives must be taken with advisor approval, 12 of which must come from the College of Agriculture. A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.
Animal Science  
Department of Animal and Range Sciences  
http://animalrange.montana.edu/

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options go to page 84.

The animal science curricula are administered by the Department of Animal and Range Sciences. The curricula in animal science provide students with a firm foundation in the biological and natural sciences, animal breeding, reproductive physiology, nutrition and livestock production and management. Applications to production environments of the western United States are emphasized, including the close relationships among livestock, rangeland and natural resources. Three options are offered leading to a B.S. in Animal Science. Proper use of restricted electives allows students to tailor curricula to meet their individual needs.

Equine Science Option

The Equine Science Option emphasizes science and technology combined with practical aspects of management, horsemanship and training. Graduates of this program will have a firm foundation to meet the growing needs of the equine industry. This program is designed to prepare students for employment in breeding, nutrition, and management of facilities and land, as well as in the allied industries such as sales, feed, tack, and equipment. Students can tailor their program for more emphasis in biotechnology, business, or range management.

Livestock Management & Industry Option

The Livestock Management & Industry Option stresses the application of science to livestock production, incorporating courses in agricultural economics and business. Emphasis is placed on the application of the principles of economics, range science, genetics, physiology and nutrition in sustainable livestock production systems and business and management skills as they relate to livestock enterprises and service industries closely allied to livestock production. It is designed to allow flexible course work choices to prepare graduates to manage livestock enterprises or for employment with companies producing and marketing livestock, animal feeds and health products, as well as employment with a variety of communication and service organizations such as breed associations, commodity groups, livestock publications and government agencies.

Science Option

The Science Option emphasizes greater depth in the basic sciences and is designed for highly motivated students who have a strong interest in graduate training or professional school. Individual curricula can be tailored to provide excellent preparation for veterinary school, medical school, or graduate studies in animal biotechnology, physiology, nutrition or genetics.

Curricula in Animal Science

EQUINE SCIENCE OPTION

<table>
<thead>
<tr>
<th>Freshman Year</th>
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<tbody>
<tr>
<td>ARNR 100–Intro Animal Science</td>
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<tr>
<td>ARNR 101–Natural Resource Cons</td>
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<tr>
<td>ARNR 102–Montana Range Plans Lab</td>
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<tr>
<td>BIOL 102–Molec &amp; Cellular Biol</td>
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<td>CHMY 121IN–Intro to General Chemistry</td>
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<tr>
<td>ECNS 101IS–Economic Way of Thinking</td>
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<tbody>
<tr>
<td>ARNR 230–Range Livestock Production</td>
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<td>ARNR 236–Small Pasture Management</td>
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<td>CHMY 123–Intro to Organic and Biochem</td>
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<td>VTM 271–Funct Anatomy Dom Anim</td>
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<tr>
<td>BUS 201–Managerial Communication</td>
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<tr>
<td>WRIT 221–Intermediate Tech Writing</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>ECNS 202–Principles of Macroeconomics</td>
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<td>ECNS 294IS-Microeconomics</td>
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<td>Take one of the following:</td>
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<tr>
<td>PSPP 318–Biometry</td>
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<td>STAT 216Q–Introduction to Statistics</td>
<td>3</td>
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<tr>
<td>Econ &amp; Business Elective</td>
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<tr>
<td>Applied Courses</td>
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<tr>
<th>Junior Year</th>
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<tbody>
<tr>
<td>ARNR 320–Animal Nutrition</td>
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<tr>
<td>ARNR 321–Physiology of Repro</td>
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<tr>
<td>ARNR 322–Prin of Animal Breed/Genetics</td>
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<tr>
<td>ARNR 327–Equine Lameness</td>
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<tr>
<td>ARNR 337–Diseases of Dom Livst</td>
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<td>ARNR 347–Equine Form to Function</td>
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<td>ARNR 476–Equine Internship (min. 3 cr)</td>
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<td>Econ &amp; Business Elective</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Applied Courses</td>
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<td>2</td>
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<tr>
<td>Total</td>
<td>16</td>
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<table>
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<tr>
<th>Senior Year</th>
<th>F</th>
<th>S</th>
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<tbody>
<tr>
<td>ARNR 415–Equine Reproduction</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
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</tr>
<tr>
<td>ARNR 422–Topics in Beef</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>ARNR 423–Equine Nutrition</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>ARNR 430–Horse Management</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Econ and Business Elective</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Mgmt &amp; Industry Electives</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>13 16</td>
<td></td>
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</tbody>
</table>

Applied Courses (Select 5 Credits)

| ARNR 110–Western Equitation | 2 |
| ARNR 114–English Equitation | 2 |
| ARNR 207–Intermediate English Equit | 2 |
| ARNR 208–Intermediate Western Equit | 2 |
| ARNR 211–Colt Breaking & Training | 2 |
| ARNR 215–Specialized Horse Training | 2 |
| ARNR 233–Livestock Mgmt-Horse | 1 |
| ARNR 235–Range and Pasture Monitoring | 1 |
| ARNR 314–Equestrian Instruction | 2 |

Econ & Business Electives

<table>
<thead>
<tr>
<th>Select 9 Credits</th>
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<tbody>
<tr>
<td>BUS 221–Prop Accounting</td>
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<tr>
<td>BUS 222–Managerial Accounting</td>
</tr>
<tr>
<td>BUS 301–Mgmt &amp; Organization</td>
</tr>
<tr>
<td>BUS 313–Marketing</td>
</tr>
<tr>
<td>BUS 361–Intro to Law</td>
</tr>
<tr>
<td>ECNS 314–International Economics</td>
</tr>
<tr>
<td>MKTG 292D–Intro Global Markets</td>
</tr>
<tr>
<td>MKTG 343–Consumer Behavior</td>
</tr>
<tr>
<td>MKTG 345–Professional Selling</td>
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Management & Industry Electives

<table>
<thead>
<tr>
<th>Select 12 Credits</th>
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<tbody>
<tr>
<td>ARNR 202–Livestock Mgmt-Sheep</td>
</tr>
<tr>
<td>ARNR 234–Livestock Mgmt-Bee</td>
</tr>
<tr>
<td>ARNR 240–Natural Resource Ecology</td>
</tr>
<tr>
<td>ARNR 345–Riparian Ecol &amp; Mgmt</td>
</tr>
<tr>
<td>ARNR 353–Grazing Ecology &amp; Mgmt</td>
</tr>
<tr>
<td>ARNR 410–Veterinary Entomolgy</td>
</tr>
<tr>
<td>ARNR 432–Sheep Management</td>
</tr>
<tr>
<td>ARNR 434–Bee Cattle Management</td>
</tr>
<tr>
<td>ARNR 435–Habitat Inventory &amp; Analysis</td>
</tr>
<tr>
<td>LRES 292–Soil Resource</td>
</tr>
<tr>
<td>PSPP 314–Field Crop Production</td>
</tr>
<tr>
<td>PSPP 342–Forages</td>
</tr>
</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. University core requirements must be completed.
**LIVESTOCK MANAGEMENT & INDUSTRY OPTION**

**Freshman Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARNR 100</td>
<td>Intro Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 101</td>
<td>Natural Resource Cons</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 102</td>
<td>Montana Range Plants Lab</td>
<td></td>
</tr>
<tr>
<td>CHMY 125</td>
<td>Intro to Organic &amp; Biochem</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 102</td>
<td>Molec &amp; Cellular Biol</td>
<td></td>
</tr>
<tr>
<td>CHMY 121IN</td>
<td>Intro to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 1018</td>
<td>Economic Way of Thinking</td>
<td>3</td>
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<tr>
<td>University Core and Electives</td>
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<td>6</td>
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<tr>
<td>Total</td>
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**Sophomore Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ARNR 230</td>
<td>Range Livestock Production</td>
<td>3</td>
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<tr>
<td>Take two of the following:</td>
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<tr>
<td>ARNR 205</td>
<td>Intro Meat Eval (or)</td>
<td>2</td>
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<tr>
<td>ARNR 309</td>
<td>Livestock Mgmt-Swine</td>
<td>1</td>
</tr>
<tr>
<td>ARNR 223</td>
<td>Livestock Mgmt-Sheep</td>
<td>1</td>
</tr>
<tr>
<td>ARNR 234</td>
<td>Livestock Mgmt-Reef</td>
<td>1</td>
</tr>
<tr>
<td>ARNR 235</td>
<td>Range/Pr畜 Monitoring</td>
<td></td>
</tr>
<tr>
<td>ARNR 240</td>
<td>Natural Resource Ecology</td>
<td>6</td>
</tr>
<tr>
<td>AGEC 2108</td>
<td>Econ of Ag Business</td>
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<tr>
<td>Take one of the following:</td>
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</tr>
<tr>
<td>BUS 201</td>
<td>Managerial Communication</td>
<td></td>
</tr>
<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
<td></td>
</tr>
<tr>
<td>STAT 210Q</td>
<td>Intro to Statistics</td>
<td></td>
</tr>
<tr>
<td>VTM 271</td>
<td>Funct Anatomy Dom Animal</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
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<td>4</td>
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<tr>
<td>ECON &amp; Business Elective</td>
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<td>Total</td>
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**Junior Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARNR 316</td>
<td>Meat Science</td>
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</tr>
<tr>
<td>ARNR 320</td>
<td>Animal Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>ARNR 322</td>
<td>Prin of Animal Breed/Genetic</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 337</td>
<td>Diseases of Dom Livsk</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 476</td>
<td>Internship (minimum 3 credits)</td>
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<tr>
<td>Econ &amp; Business Elective</td>
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<td>University Core and Electives</td>
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<td>Total</td>
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**Senior Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARNR Livestock Management Electives</td>
<td></td>
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<tr>
<td>ARNR 351</td>
<td>Swine Production</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 410</td>
<td>Meat Processing</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 430</td>
<td>Horse Management</td>
<td>4</td>
</tr>
<tr>
<td>ARNR 432</td>
<td>Sheep Management</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 434</td>
<td>Beef Cattle Mgmt</td>
<td>4</td>
</tr>
<tr>
<td>ECON &amp; Business Electives</td>
<td></td>
<td></td>
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<tr>
<td>AGEC 321</td>
<td>Econ Ag Marketing</td>
<td>3</td>
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<tr>
<td>AGEC 337</td>
<td>Ag Law</td>
<td>3</td>
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<tr>
<td>AGEC 341</td>
<td>Farm &amp; Ranch Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 345</td>
<td>Ag Finance Cred Analys</td>
<td>3</td>
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<tr>
<td>AGEC 401</td>
<td>Ag Marketing</td>
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</tr>
<tr>
<td>AGED 355</td>
<td>Coop Bus Pr</td>
<td>3</td>
</tr>
<tr>
<td>BUS 221</td>
<td>Prin Accounting</td>
<td>3</td>
</tr>
<tr>
<td>BUS 222</td>
<td>Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>BUS 301</td>
<td>Mgmt &amp; Organization</td>
<td>3</td>
</tr>
<tr>
<td>BUS 341</td>
<td>Marketing</td>
<td>3</td>
</tr>
<tr>
<td>BUS 361</td>
<td>Intro to Law</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 314</td>
<td>International Economics</td>
<td>3</td>
</tr>
<tr>
<td>MKTG 242D</td>
<td>Intro Global Mkts</td>
<td>3</td>
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<tr>
<td>MKTG 343</td>
<td>Consumer Behavior</td>
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<td>MKTG 345</td>
<td>Professional Selling</td>
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**Management & Industry Electives** (Select 12 credits)  
<table>
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<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>ARNR 327</td>
<td>Equine Lameness</td>
<td>3</td>
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<tr>
<td>ARNR 345-1</td>
<td>Rip Ecol &amp; Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 355</td>
<td>Grazing Ecology &amp; Mgmt</td>
<td>3</td>
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<tr>
<td>ARNR 410</td>
<td>Veterinary Entomology</td>
<td>2</td>
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<td>ARNR 421</td>
<td>Assist Repro Tech</td>
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<td>ARNR 422</td>
<td>Topics Beef Cattle Nut</td>
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<tr>
<td>ARNR 425</td>
<td>Equine Nutrition</td>
<td>2</td>
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<tr>
<td>ARNR 455</td>
<td>Habitat Inventory &amp; Anal</td>
<td>3</td>
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<tr>
<td>LRES 201IN</td>
<td>Seal Resource</td>
<td>3</td>
</tr>
<tr>
<td>PSEP 341</td>
<td>Field Crop Production</td>
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<tr>
<td>PSEP 342</td>
<td>Forages</td>
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</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. University core requirements must be completed.

**SCIENCE OPTION**

**Freshman Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARNR 100</td>
<td>Intro Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 101</td>
<td>Natural Resource Cons</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 102</td>
<td>Montana Range Plants Lab</td>
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<tr>
<td>BIOL 101IN</td>
<td>Organismal Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 102</td>
<td>Molec &amp; Cellular Biology</td>
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<tr>
<td>CHMY 141</td>
<td>Coop Bus Pr</td>
<td>3</td>
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<td>CHMY 145</td>
<td>College Chemistry II</td>
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**Sophomore Year**  
<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARNR 230</td>
<td>Range Livestock Production</td>
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<td>ARNR 240</td>
<td>Natural Resource Ecology</td>
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<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
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<tr>
<td>M 161Q</td>
<td>Survey of Calculus</td>
<td>4</td>
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<tr>
<td>Take one of the following:</td>
<td></td>
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</tr>
<tr>
<td>BUS 201</td>
<td>Managerial Communication</td>
<td></td>
</tr>
<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
<td></td>
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<tr>
<td>STAT 210Q</td>
<td>Intro to Statistics</td>
<td></td>
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<tr>
<td>VTM 271</td>
<td>Funct Anatomy Dom Animal</td>
<td></td>
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<td>University Core and Electives</td>
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<td>Total</td>
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**Junior Year**  
<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARNR 320</td>
<td>Animal Nutrition</td>
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<tr>
<td>ARNR 321</td>
<td>Physiology of Repro</td>
<td>4</td>
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<tr>
<td>ARNR 322</td>
<td>Prin of Animal Breed/Genetics</td>
<td>3</td>
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<tr>
<td>BCHM 340</td>
<td>General Biochemistry</td>
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<tr>
<td>Select 12 credits from the following:</td>
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<tr>
<td>ARNR 357</td>
<td>Diseases of Dom Livsk</td>
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<tr>
<td>ARNR 410</td>
<td>Veterinary Entomology</td>
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</tr>
<tr>
<td>BIOL 301</td>
<td>Principles of Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 310</td>
<td>Vertebrate Anat</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 311</td>
<td>Vertebrate Embryology</td>
<td>3</td>
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<tr>
<td>BIOL 312</td>
<td>Histology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 411</td>
<td>Animal Physiology</td>
<td>3</td>
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<tr>
<td>MB 301</td>
<td>Gen Microbiology</td>
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<tr>
<td>PHYS 205</td>
<td>College Physics I</td>
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<tr>
<td>PHYS 206</td>
<td>College Physics II</td>
<td>4</td>
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<td>University Core and Electives</td>
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<tr>
<td>Total</td>
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<td>15</td>
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**Senior Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>F S</td>
<td>Take one of the following:</td>
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<tr>
<td>ARNR 476</td>
<td>Internship</td>
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<tr>
<td>ARNR 498R</td>
<td>498R-UG Resrch/</td>
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<td>Creative Activity Instr</td>
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<tr>
<td>ARNR 409</td>
<td>Seminar</td>
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<td>Must take at least 2 of the following:</td>
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<tr>
<td>ARNR 311</td>
<td>Swine Production</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 430</td>
<td>Horse Management</td>
<td>4</td>
</tr>
<tr>
<td>ARNR 432</td>
<td>Sheep Management</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 454R</td>
<td>Beef Cattle Management</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
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</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. University core requirements must be completed.

**ANIMAL SCIENCE MINOR**  

**(NON-TEACHING)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARNR 100</td>
<td>Intro Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 101</td>
<td>Natural Resource Cons</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 230</td>
<td>Range Livestock Production</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 321</td>
<td>Physiology of Repro</td>
<td>4</td>
</tr>
<tr>
<td>ARNR 322</td>
<td>Prin of Animal Breed/Genetics</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARNR 316</td>
<td>Meat Science</td>
<td>4</td>
</tr>
<tr>
<td>ARNR 351</td>
<td>Swine Production</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 430</td>
<td>Horse Management</td>
<td>4</td>
</tr>
<tr>
<td>ARNR 432</td>
<td>Sheep Management</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 454R</td>
<td>Beef Cattle Management</td>
<td>4</td>
</tr>
</tbody>
</table>

All students are responsible for meeting prerequisites for upper division ARNR courses.

**Biotechnology**

**Department of Biotechnology**

[http://vmb.montana.edu/](http://vmb.montana.edu/)

*Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.*

Modern research in cellular and molecular biology and its resultant technology offers unparalleled opportunities to provide solutions to our society’s most urgent problems in human and animal health, agriculture, and environmental quality. The emerging biotechnology industries are involved in developing products to maintain biodiversity, restore soil and water quality, develop new pharmaceuticals to combat disease, decrease our dependence on nonrenewable resources, and improve food and fiber production. Students interested in microbiology,
animal or plant science, biochemistry, and animal or human medicine will find challenging careers in the diverse areas of biotechnology in either an academic or industrial setting. Students successfully completing a biotechnology curriculum will also be prepared to enter graduate or medical professional schools for further study.

The Bachelor of Science in Biotechnology is an interdisciplinary degree offered by the College of Agriculture. Students will pursue a basic science curriculum the first two years and then choose an area of emphasis in plant, animal or microbial systems for the junior/senior years. Depending on the option chosen, students will be advised by participating faculty in the Colleges of Agriculture and Letters and Science.

Curricula in Biotechnology

ALL BIOTECHNOLOGY OPTIONS

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOL 101N-Biology of Organisms</td>
</tr>
<tr>
<td>OR BIOL 213 -Intro Bio Cells to Organisms</td>
</tr>
<tr>
<td>BIOL 192-Molec &amp; Cellular Biol</td>
</tr>
<tr>
<td>CHMY 141-College Chemistry I</td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
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</tbody>
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Take the following M group:

| M 161Q-Survey of Calculus |
| AND one of the following:
| PSPP 318-Biometry |
| STAT 216Q-Introduction to Statistics |

OR take the following two courses:

| M 161Q-Calculus for Technology I |
| M 166Q-Calculus for Technology II |
| VTM 101CS/PSPP101CS/MB 110CS-Intro to Biotech |
| University Core and Electives |

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 301-Principles of Genetics</td>
</tr>
</tbody>
</table>

Take the following:

| CHMY 211-Elements of Organic Chemistry |
| CHMY 321-Organic Chemistry I and II |
| ECNS 101N-Economic Way of Thinking |

Take one of the following:

| AGED 105-Microcomp in Ag |
| CS 120-Introduction to Computers |
| University Core and Electives |

ANIMAL SYSTEMS OPTION

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTM 406-Infected Diseases</td>
</tr>
<tr>
<td>CHBM 540-General Biochemistry</td>
</tr>
<tr>
<td>VTM 411-Hybridomas</td>
</tr>
<tr>
<td>VTM 412-Adv Immunol</td>
</tr>
<tr>
<td>VTM 413-Flow Cytometry</td>
</tr>
<tr>
<td>VTM 414-Adv Microscopy</td>
</tr>
<tr>
<td>VTM 420-Series Anim Cell Meth-Molec</td>
</tr>
<tr>
<td>VTM 421-Genome Science</td>
</tr>
<tr>
<td>VTM 422-Funct Gene Express</td>
</tr>
</tbody>
</table>

Take one of the following:

| VTM 271-Funct Anim Dom Anim |
| BIOL 297-Anatomy & Physiol I |
| BIOL 298-Anatomy & Physiol II |

University Core and Electives

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSPP 360-College Physics I</td>
</tr>
<tr>
<td>CS 220-Introduction to Computers</td>
</tr>
<tr>
<td>VTM 424-Ethic Pract of Science</td>
</tr>
<tr>
<td>VTM 475-Biotechnology Internship</td>
</tr>
<tr>
<td>VTM 477-Biotech Capstone Sem</td>
</tr>
</tbody>
</table>

University Core and Electives

Recommended Electives

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARNR 321-Physiology of Reprod</td>
</tr>
<tr>
<td>ARNR 421-Assisted Reproductive Tech</td>
</tr>
<tr>
<td>BCHM 441-Biochem of Macromol</td>
</tr>
<tr>
<td>BCHM 442-Metabolic Regulation</td>
</tr>
<tr>
<td>BCHM 444-Biochem Mols Molec Biol</td>
</tr>
<tr>
<td>BIOL 492-Adv Cell &amp; Molec Biology</td>
</tr>
<tr>
<td>MB 401-Immunology</td>
</tr>
<tr>
<td>MB 402-Immunology Laboratory</td>
</tr>
<tr>
<td>MB 420-Micro Physiology</td>
</tr>
<tr>
<td>VTM 451-Virology</td>
</tr>
</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

"CHMY 211 “Elements of Organic Chemistry” serves as the prerequisite for additional Chemistry courses, which are required in the Biotechnology Degree, Animal Systems Option. Graduate departments at some universities require that students have one year of organic Chemistry. Therefore, students potentially interested in graduate school can take the CHMY 321/323 series of organic Chemistry during their sophomore year.

PLANT SYSTEMS OPTION

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 540-General Biochemistry</td>
</tr>
<tr>
<td>PSPP 426-Plant Biotechnology</td>
</tr>
<tr>
<td>PSPP 447-Advanced Plant Propagation</td>
</tr>
<tr>
<td>PSPP 450-Plant Physiology</td>
</tr>
<tr>
<td>PSPP 205-College Physics I</td>
</tr>
<tr>
<td>PSPP 206-College Physics II</td>
</tr>
<tr>
<td>University Core and Electives</td>
</tr>
</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSPP 421-Concepts in Plant Pathology</td>
</tr>
<tr>
<td>PSPP 429-Plant Biotech CapStone Seminar</td>
</tr>
<tr>
<td>PSPP 460-Plant Metabolism</td>
</tr>
<tr>
<td>PSPP 476-Internship</td>
</tr>
<tr>
<td>University Core and Electives</td>
</tr>
</tbody>
</table>

Restricted Electives

Choose Four Of The Following Courses:

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 441-Biochem of Macromolecules</td>
</tr>
<tr>
<td>BCHM 442-Metabolic Regulation</td>
</tr>
<tr>
<td>BIOL 492-Adv Cell &amp; Molec Biology</td>
</tr>
<tr>
<td>BIOL 466-Gene Construction</td>
</tr>
<tr>
<td>MB 420-Micro Physiology</td>
</tr>
<tr>
<td>MB 435-Applied &amp; Env Microbiology</td>
</tr>
<tr>
<td>MB 449-Microbial Genetics</td>
</tr>
<tr>
<td>PSPP 341-Crop Production</td>
</tr>
<tr>
<td>PSPP 422-Plant Disease Control</td>
</tr>
<tr>
<td>PSPP 423-Mycology</td>
</tr>
<tr>
<td>PSPP 441-Crop Breeding</td>
</tr>
<tr>
<td>PSPP 449-Population Genetics</td>
</tr>
</tbody>
</table>

Choose one of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>BCHM 444-Biochem Mols Molec Biol</td>
</tr>
<tr>
<td>MB 450-Resrch Meth in Microbiol</td>
</tr>
</tbody>
</table>

MICROBIAL SYSTEMS OPTION

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 540-General Biochemistry</td>
</tr>
<tr>
<td>BCHM 442-Metabolic Regulation</td>
</tr>
<tr>
<td>PSPP 205-College Physics I</td>
</tr>
<tr>
<td>PSPP 206-College Physics II</td>
</tr>
<tr>
<td>MB 401-Immunology</td>
</tr>
<tr>
<td>MB 402-Immunology Laboratory</td>
</tr>
<tr>
<td>University Core and Electives</td>
</tr>
</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 420-Micro Physiology</td>
</tr>
<tr>
<td>MB 435-Applied and Env Microbiology</td>
</tr>
<tr>
<td>Take one of the following two courses:</td>
</tr>
<tr>
<td>LRES 452-Soil &amp; Envir Micro (or)</td>
</tr>
<tr>
<td>MB 415-Microbial Divers, Ecol &amp; Evol</td>
</tr>
<tr>
<td>MB 449-Microbial Genetics</td>
</tr>
<tr>
<td>MB 490-Seminar, Capstone</td>
</tr>
<tr>
<td>MB 489/490-UWG Research/</td>
</tr>
<tr>
<td>Creative Activity</td>
</tr>
<tr>
<td>University Core and Electives</td>
</tr>
</tbody>
</table>

Take at least three of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 441-Biochem of Macromol</td>
</tr>
<tr>
<td>BCHM 444-Biochem Mols Molec Biol</td>
</tr>
<tr>
<td>BIOL 298-Anatomy &amp; Physiology</td>
</tr>
<tr>
<td>ENV 444-Hazardous Waste Management</td>
</tr>
<tr>
<td>MB 405-Virology</td>
</tr>
<tr>
<td>MB 405-Hematology</td>
</tr>
<tr>
<td>and MB 406-Hematology Lab</td>
</tr>
<tr>
<td>MB 430-Med Bacteriology</td>
</tr>
<tr>
<td>and MB 431-Med Bac Lab</td>
</tr>
<tr>
<td>LRES 355-Environ Chemistry</td>
</tr>
<tr>
<td>LRES 453-Soil &amp; Envir Physics</td>
</tr>
<tr>
<td>CHBE 215-Materials Science</td>
</tr>
<tr>
<td>CHBE 438-BioProcess Engineering</td>
</tr>
</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.
Environmental Horticulture
Department of Plant Sciences
and Plant Pathology
http://plantsciences.montana.edu/

Note: MSU's programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.

The curriculum in Environmental Horticulture is administered by the Department of Plant Sciences and Plant Pathology. Options are available in Environmental Horticulture Science, and Landscape Design.

Faculty members who advise students and teach courses are also active researchers in their disciplines. Students learn current knowledge and technology through formal coursework and gain valuable first-hand experience in departmental laboratories, greenhouses, and at field research farms. Students are encouraged to seek additional learning experiences outside the classroom by working in summer jobs and internship with private industry and government agencies.

Each student works closely with a faculty advisor to formulate a program of study which is appropriate with the student’s career goals and also fits into one of the following options.

Environmental Horticulture Science Option

Horticulture is the science and art of growing and maintaining plants for food and for the enjoyment and improvement of the human environment. Its application through research has led to improved varieties of plants to benefit our daily lives. Students studying horticulture take fundamental courses in biology and chemistry prior to taking specialized courses such as plant materials, plant physiology, commercial plant production, plant propagation, turfgrass management and horticulture capstone, and landscape management.

Graduates of this program are prepared for careers in such area as nursery crop production; landscape nurseries; greenhouse businesses; botanic gardens; golf courses; grounds maintenance; cooperative extension service; and research with private companies, public agencies or institutions of higher learning.

Landscape Design Option

The Landscape Design option will prepare students to solve aesthetic and functional landscape problems. Students learn written, oral and graphic communication skills which are necessary to convey creative solutions for landscape planning. This blend of art and science which utilizes both technical and creative studies leads to problem-solving skills for beautiful, functional and efficient landscape design solutions. Emphasis is placed on utilization of plant materials to solve specific site problems. Graduates are employed by landscape nurseries, landscape contractors, and planning agencies; others become self-employed as landscape designers and contractors.

Many students have chosen to continue advanced studies in programs of landscape architecture.

Curricula in Environmental Horticulture

ENVIRONMENTAL HORTICULTURE SCIENCE OPTION

Freshman Year Credits
BIOL 101N-Biology of Organisms 4
BIOL 102-Molec & Cell Biology 4
PSPP 102CS-Plant Sci Resource & Env 3
PSPP 105-Miracle Growing 3
CHMY 121N-Intro to General Chemistry 4
WRIT 101W-College Writing I 3
M 145-Q-Math for Liberal Arts 3
University Core and Electives 5
30

Sophomore Year Credits
CHMY 123-Intro to Organic Biochem 4
BIOL 201-Insect Biology 3
LRES 201N-Soil Resource 3
PSPP 251-Woody Ornamentals 3
PSPP 252-Herb Ornamentals 3
PSPP 245-Plant Propagation 3
BIOL 251-Botany 4
Take two of the following:
BUS 201-Managerial Communication 3
CAPP 120-Intro to Computers 3
WRIT 201-College Writing II 3
WRIT 221-Intermediate Tech Writing 3
SPNS 101-Elementary Spanish I 4
University Core and Electives 4-5
30

Junior Year Credits
LRES 351-Nutrient Cycling 3
PSPP 305-Practical Genetics 3
PSPP 310-Turfgrass Management 3
PSPP 443-Comm Plant Production 3
PSPP 451-Tough Plants in Tough Places 3
Take one of the following:
ACTG 220-Principles of Mang Acct 3
BUS 201-Management & Organztn 3
BUS 341-Marketing 3
MKTG 241-Sales 3
University Core and Electives 12
30

Senior Year Credits
PSPP 421-Concepts of Plant Pathology 3
PSPP 447-Adv Plant Propagation 3
PSPP 425R-Horticulture Capstone I 1
CHMY 212N-Intro to General Chemistry 4
PSPP 450-Plant Physiology 3
PSPP 476-Internship 3
Take one of the following:
MB 301-General Microbiology 3
PSPP 318-Biometry 3
PSPP 422-Plant Disease Control 3
PSPP 426-Plant Biotechnology 3
PSPP 357-Vegetable Production 3
PSPP 345-Organic Market Gardening 3
University Core & Elective 11-12
30

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

LANDSCAPE DESIGN OPTION

Freshman Year Credits
ARCH 151-Design Fundamentals I 4
BIOL 101N-Biology of Organisms 4
CHMY 212N-Intro to General Chemistry 4
WRIT 101W-College Writing I 3
M 145-Math for Liberal Arts 3
PSPP 102CS-Plant Sci,Res,&Env 3
PSPP 151-Landscape Hist/Theory 3
PSPP 105-Miracle Growing 3
University Core and Electives 7
30

Sophomore Year Credits
LRES 201N-Soil Resource 3
PSPP 251-Woody Ornamentals 3
PSPP 252-Herb Ornamentals 3
ME 116-Engr Design Graph Lab 1
PSPP 225-Landscape Graphics 3
PSPP 226-Computer Graphics 3
Take two of the following:
BUS 201-Manage Communication 3
CAPP 120-Intro to Computers 3
WRIT 201-College Writing II 3
WRIT 221-Intermediate Tech Writing 3
SPNS 101-Spanish I 4
University Core & Electives 6-7
30

Senior Year Credits
LRES 301-Landscape Management 3
PSPP 443-Comm Plant Production 3
PSPP 451-Tough Plants in Tough Places 3
Take one of the following:
ACTG 220-Principles of Mang Acct 3
BUS 201-Management & Organztn 3
BUS 341-Marketing 3
MKTG 241-Sales 3
University Core and Electives 12
30

Note: MSU's programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.
Environmental Sciences

Department of Land Resources & Environmental Sciences

http://landresources.montana.edu/

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.

Effective management of land and water resources requires a solid fundamental understanding of the processes and relationships in land and natural resources systems, combined with applications of environmental science and applied ecology. The Environmental Sciences curricula are designed to provide this classroom, laboratory, and field training. Graduates of these degree programs will: (i) possess a broad knowledge of biological, physical, and chemical processes important across landscapes; (ii) receive training in applied ecology, soil and water science, and land resources analysis; (iii) be capable of critical analysis of land resource problems; and (iv) be experienced with teamwork required to develop and implement effective land management strategies. They will be the scientists most capable of making significant advances and contributions in the 21st century!

The Environmental Sciences degree programs are administered by the Department of Land Resources and Environmental Sciences.

Environmental Biology Option

This option is intended to train students who are interested in understanding the ecology of organisms in natural environments, and/or in understanding how organisms may be used to clean up environments that have been disturbed by human activities. The curriculum launches from a base in environmental science which includes a broad knowledge of organisms (including plants, animals, and microorganisms) and the physical and chemical characteristics of natural environments. A special feature of this option is that it emphasizes cross-training between the traditional disciplines of Biology and Microbiology. Students trained in Biology or Microbiology normally focus on either large or small organisms or on human biology and disease. But, even biologists trained as ecologists have a poor understanding of microorganisms, despite the fact that they appreciate the great importance of microorganisms in most natural environments. Similarly, most microbiologists do not understand the diversity of large organisms and are never exposed to natural principles of ecology and evolution. In the LRES Environmental Biology curriculum, students will develop a knowledge of the diversity of organisms and their interrelated functions in complex environments. In later stages of the curriculum, students may select from a wide array of upper division courses in environmental microbiology, natural ecosystems, applied ecology, and policy and planning that enable them to specialize in areas best-suited to their own career vision.

Career opportunities: Environmental industries and consulting firms that address problems associated with disturbed environments. Biotechnology companies that attempt to exploit biological diversity for the benefit of humans. Government jobs in environmental management and policy making. Graduate training that leads to independent research in basic and applied ecology, environmental biology, and environmental microbiology.

Soil and Water Science Option

The Soil and Water Science Option provides students with fundamental training in basic biological, chemical, and physical sciences and advanced training in soil and water sciences. Students are encouraged through choice elective blocks to emphasize specific course sequences to help them understand the underlying processes central to managed and natural landscapes, as well as to develop practical skills and abilities relevant to applying this knowledge in land resource management and the environmental sciences.

Water is perhaps the most unique substance on earth, having a multitude of seemingly anomalous properties, and literally forms the basis for life as we know it. Soils form the precious ‘skin’ of the Earth, the critical interface between atmospheric and geologic/groundwater systems. The multitude of physical, chemical, and biological
processes that occur in the three-phase soil system (solids, water, and air) are critical to sustainability of natural and managed ecosystems. Soils and water will be among the most critical limiting resources in coming decades. The LRES Soil and Water Science Option provides students with advanced training in the chemical, physical, and biological sciences, and integration of these fundamentals in applications related to soil science, hydrology, water-shed management, pollution treatment and prevention, land rehabilitation, agricultural and natural resources management, and bioremediation. Students develop relevant skills in written and oral communication, and gain experience in modern measurement, monitoring and analysis techniques used in land and water sciences and management.

Career opportunities: Environmental industries and consulting firms that work on problems associated with soils, water, contaminant transport, fate of chemicals in the environment, and water resource management. Local, state, or federal government positions in natural resources and environmental sciences management and policy. Advanced graduate training to prepare for research and management positions in soil sciences, hydrology, water resources, land reclamation, and related areas.

Curricula in Environmental Sciences

ENVIRONMENTAL BIOLOGY OPTION

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRES 110--Land Resources &amp; Env Sci</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 213--Intro Biol: Cells-Organisms</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141--College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 145--College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>WRIT 101W--College Writing I</td>
<td></td>
</tr>
</tbody>
</table>

Take one of the following:

- M 161Q--Survey of Calculus            | 4       |
- M 160Q--Calculus for Technology I     | 4       |
- M 171Q--Calculus I                    | 4       |
- M 172Q--Calculus II                   | 4       |
- BIOL 101N--Biological Organisms       | 4       |
- CHMY 211--Elements of Organic Chemistry| 5       |
- PSPP 216Q--Introduction to Statistics | 3       |

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRES 201N--Survey of Calculus</td>
<td>3</td>
</tr>
<tr>
<td>LRES 244C--Intro Water Resources</td>
<td>3</td>
</tr>
</tbody>
</table>

Take one of the following:

- ARNR 240--Principles Nat Res Eco      | 3       |
- BIOL 303--Principles of Eco          | 3       |
- University Core and Electives        | 6       |

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 340--General Biochem</td>
<td>5</td>
</tr>
<tr>
<td>BIOL 301--Principles of Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 405--Evolution</td>
<td>3</td>
</tr>
<tr>
<td>LRES 310--Professional Preparation</td>
<td>1</td>
</tr>
<tr>
<td>LRES 351--Nutrient Cycling</td>
<td>3</td>
</tr>
<tr>
<td>LRES 415--Microbial Diversity, Eco</td>
<td>3</td>
</tr>
<tr>
<td>LRES 411--Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>LRES 415--Ichthyology</td>
<td>3</td>
</tr>
<tr>
<td>LRES 418--Mammalogy</td>
<td>3</td>
</tr>
<tr>
<td>LRES 419--Ornithology</td>
<td>3</td>
</tr>
<tr>
<td>LRES 450--Plant Physiology</td>
<td>3</td>
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</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRES 355--Soil &amp; Env Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>LRES 428R--Capstone 2 Field Apples in LRES</td>
<td>3</td>
</tr>
<tr>
<td>LRES 452--Soil &amp; Env Microbiol</td>
<td>3</td>
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</tbody>
</table>

Take a minimum of 15 credits from the following:

Environmental Microbiology:
- MB 420--Microbial Physiology          | 5       |
- MB 433--Applied & Env Micro           | 5       |
- MB 449--Microbial Genetics            | 3       |
- MB 450--Research Meth in Micro        | 4       |
- PSPP 423--Myology                    | 3       |

Environmental Microbiology:
- BIOL 405--Advanced Animal Ecology    | 3       |
- BIOL 411--Animal Physiology          | 3       |
- BIOL 415--Ichthyology                | 3       |
- BIOL 418--Mammalogy                  | 3       |
- BIOL 419--Ornithology                | 3       |
- BIOL 450--Plant Physiology           | 3       |

Natural Ecosystems:
- LRES 444--Watershed Hydrology        | 3       |
- LRES 445--Watershed Analysis         | 3       |
- BIOL 406--Rocky Mountain Vegetation  | 2       |
- BIOL 424--Freshwater Ecology         | 3       |

Applied Ecology:
- LRES 334--Water Quality              | 3       |
- LRES 401--Integrated Pest Mgmt       | 3       |
- LRES 420--Remote Sensing             | 3       |
- LRES 435--Weed Ecol Mgmt             | 3       |
- LRES 438--Stream Restoration Ecology | 3       |
- LRES 461--Restoration Ecology        | 3       |
- ARNR 438--Wildlife Habitat Ecology   | 3       |
- ARNR 453--Habitat Inventory & Analysis| 3     |
- F&WL 301--Principles Fish/Wildlife Mgmt| 3     |

Policy and Planning:
- LRES 421--Holistic Thought & Mgmt    | 4       |
- LRES 430--Natural Resource Law        | 3       |
- ECNS 332--Econ of Natural Resources  | 3       |
- University Core and Electives        | 6       |

Because some of our courses are offered during alternate years, the proposed scheduling of courses in junior and senior years may need to be modified. Work with your advisor for your individual schedule.

A minimum of 120 credits is required for graduation; at least 42 of these credits must be in courses numbered 300 and above.

SOIL AND WATER SCIENCE OPTION

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRES 110--Land Resources &amp; Env Sci</td>
<td>3</td>
</tr>
</tbody>
</table>

Take one of the following two semester Math Sequences:
- M 160Q--Calculus Technology I         | 3       |
- M 166--Calculus Technology II         | 3       |

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 501--Gen Microbiology</td>
<td>5</td>
</tr>
</tbody>
</table>

Take one of the following:

- PSPP 423--Environmental Microbiology | 3       |
- STAT 216Q--Introduction to Statistics| 3       |

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MB 501--Gen Microbiology</td>
<td>5</td>
</tr>
</tbody>
</table>

Take one of the following:

- ARNR 240--Principles Nat Res Ecology | 3       |
- BIOL 303--Principles of Ecology      | 3       |
- LRES 310--Professional Preparation   | 1       |
- LRES 344--Water Quality              | 3       |
- LRES 351--Nutrient Cycling           | 3       |
- LRES 355--Soil & Env Chemistry       | 3       |
- LRES 411--Animal Physiology          | 3       |
- LRES 444--Watershed Hydrology        | 3       |
- LRES 452--Soil & Env Microbiol       | 3       |

Take one of the following:

- University Core and Electives        | 5       |

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRES 110--Land Resources &amp; Env Sci</td>
<td>3</td>
</tr>
<tr>
<td>LRES 201N--Survey of Calculus</td>
<td>3</td>
</tr>
</tbody>
</table>

Take one of the following:

- ARNR 240--Principles Nat Res Ecology | 3       |
- BIOL 101N--Biological Organisms      | 4       |
- CHMY 211--Elements of Organic Chemistry| 5       |
- GPHY 101C--Intro to Physical Geography| 4       |
- PSPP 216Q--Introduction to Statistics| 3       |

Take one of the following:

- University Core and Electives        | 5       |

Takes some of the following:
- LRES 428R--Surface Water Resources   | 3       |

Take a minimum of 10 credits from the following:

- LRES 357--GPS Fund and Applications  | 3       |
- LRES 415--Microbial Diversity, Eco, & Evol | 3       |
- LRES 426--Remote Sensing & Digital Image | 3       |
- LRES 460--Soil Remediation           | 3       |
- LRES 461--Restoration Ecology        | 3       |
- BIOL 424--Freshwater Ecology         | 3       |
- BIOL 435--Wildlife Habitat Ecology   | 3       |
- BREN 411--Natural Treatment Systems  | 3       |
- CHMY 311--Analytical Chem-Quant Analysis| 3       |
- ERTH 397--Principles of Geomorphology| 4       |
- GPHY 294--Intro GIS Science & Cartog | 3       |
- GEOG 490--Intro Geographic Info Systems| 3       |
- GPHY 494R--Applied GIS & Spatial Analysis| 3     |

Take one of the following:

- LRES 421--Holistic Thought & Mgmt    | 4       |
- LRES 430--Natural Resource Law        | 3       |
- PSC 362--Natural Resource Policy      | 3       |
- University Core and Electives        | 6       |
Because some of our courses are offered during alternate years, the proposed scheduling of courses in junior and senior years may need to be modified. Work with your advisor for your individual schedule.

A minimum of 120 credits is required for graduation; at least 42 of these credits must be in courses numbered 300 and above.

**SOIL SCIENCE MINOR (NON-TEACHING)**

A total of 21 credits, including at least 15 credits from the following list:

- LRES 201IN--Soil Resource ........................................3
- LRES 351--Nutrient Cycling .......................................3
- LRES 355--Soil & Env Chem .......................................3
- LRES 452--Soil & Env Microbiol ..................................3
- LRES 453--Soil & Environ Microbiol .............................3
- LRES 454--Landscape Pedology ..................................3
- LRES 460--Soil Remediation .......................................3
- LRES 461--Restoration Ecology ...................................3

**Land Rehabilitation**

**Department of Land Resources & Environmental Sciences**

http://landresources.montana.edu/

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.

The Land Rehabilitation curriculum provides training in site remediation and restoration ecology, including soil remediation, revegetation, fluvial and riparian restoration, investigation of impacted geologic resources, amelioration of contaminated soils and water, integrated management of invasive species, and remediation of sites impacted by industrial, recreational, and land management activities. Emphasis is placed on developing a broad understanding of hydrologic, soil, and plant processes, from both a basic and an applied science approach. Coursework in the chemical, biological, and environmental sciences provides a foundation of knowledge. During the junior and senior years, students take courses in soil, water and plant sciences that range from molecular to landscapes in scale. Students will acquire skills in plant identification and landscape inventory including geographic information systems. Additionally, students select coursework from one of three focal areas: microbial/bioremediation science, soil and water science, and plant/vegetation science. Land rehabilitation is critically important to Montana, the surrounding region, and the United States. Graduates possess a broad knowledge of land rehabilitation processes, are able to critically analyze and solve problems, and can work in teams to develop and implement effective land management strategies. Studies in Land Rehabilitation will infuse students with critical knowledge and skills needed to analyze and manage lands requiring rehabilitation. Students will also receive foundation skills in writing, communication, arts, humanities and social sciences. Graduates in Land Rehabilitation will be very capable of making significant advances during the 21st century.

The Land Rehabilitation degree program is administered by the Department of Land Resources and Environmental Sciences.

Career Opportunities: Worker and manager for local, state, and federal agencies responsible for land rehabilitation and remediation, ecological restoration, invasive species management, and land resources management. Land reclamation managers for environmental consulting, mining, and highway construction companies. Stepping stone to Graduate School for independent research and advanced coursework in restoration ecology, soil sciences, geology, hydrology, ecology, and the plant sciences. Environmental consulting and non-profit organization related to restoration and conservation.

**Curriculum in Land Rehabilitation**

**LAND REHABILITATION**

**Freshman Year**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>LRES 110--Land Resources &amp; Env Sci.....................3</td>
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<tr>
<td>BIOL 101IN--Biology of Organisms .....................4</td>
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<td>BIOL 102--Molec &amp; Cellular Biol ..........................4</td>
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<tr>
<td>CHMY 141--College Chemistry I ..........................4</td>
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<td>CHMY 145--College Chemistry II ..........................4</td>
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<td>WRIT 101W--College Writing I ...........................3</td>
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<tr>
<td>GPHY 111CS--Intro to Physical Geography .............4</td>
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**Sophomore Year**

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<th>Course Code</th>
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<tr>
<td>LRES 441--Capstone 1--Field Apps in LRES .............3</td>
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<tr>
<td>ERTH 440--Hydrogeology ..................................3</td>
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<td>ERTH 432--Surface Water Resources ....................3</td>
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<tr>
<td>LRES 443--Capstone 1-Field Apps in LRES ..............3</td>
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<tr>
<td>LRES 443--Weed Ecology &amp; Management ..................3</td>
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<td>University Core and Electives ..........................1</td>
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**Junior Year**

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<tr>
<td>LRES 421--Holistic Thought &amp; Mgmt ..........................4</td>
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<tr>
<td>LRES 357--GPS Fund/Applic Map .............................3</td>
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<tr>
<td>LRES 421--Holistic Thought &amp; Mgmt .........................4</td>
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<tr>
<td>LRES 430--Natural Resource Law ............................3</td>
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<tr>
<td>ARNR 451--Biomass West Wldlands .........................2</td>
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<tr>
<td>GPHY 384--Arb GIS &amp; Spatial Analysis ....................3</td>
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<tr>
<td>GPHY 484--Applied GIS &amp; Spatial Analysis ...............3</td>
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**Senior Year**

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>LRES 452--Soil &amp; Environ Microbiol .....................3</td>
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<tr>
<td>LRES 453--Soil &amp; Env Phys ..................................3</td>
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<td>LRES 454--Landscape Pedology ............................3</td>
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<td>LRES 460--Soil Remediation ................................3</td>
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<td>LRES 461--Restoration Ecology ...........................3</td>
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<td>LRES 460--Soil Remediation ................................3</td>
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<td>LRES 461--Restoration Ecology ...........................3</td>
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<td>University Core and Electives ..........................1</td>
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**Take 15 credits from the following electives:**

**Microbial/Bioremediation Focus**

These 15 credits plus 2 from either soil/water focus, plant/revegetation focus or additional courses list.

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>M 161Q--Survey of Calculus ..................................4</td>
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<tr>
<td>M 165Q--Calculus for Technology I .......................3</td>
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<tr>
<td>M 171Q--Calculus I ...........................................4</td>
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<tr>
<td>BIOL 201--Ident of Seed Plants .............................4</td>
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<tr>
<td>LRES 201IN--Soil Resource ...................................3</td>
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<tr>
<td>LRES 24HC--Intro to Water Resources .....................3</td>
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<tr>
<td>PSPP 318--Biometry ..........................................3</td>
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<tr>
<td>WRIT 201--College Writing II .............................3</td>
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<tr>
<td>ARNR 240--Natural Res Ecology ............................3</td>
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<tr>
<td>BIOL 305--Principles of Ecology ............................3</td>
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<td>University Core and Electives ..........................3</td>
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**Soil & Water Science Focus**

These 12 credits plus 3 from either microbial/bioremediation focus, plant/revegetation focus, or additional courses list.

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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>LRES 351--Nutrient Cycling ..................................3</td>
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<tr>
<td>LRES 435--Water Quality .......................................3</td>
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<tr>
<td>LRES 443--Capstone 1-Field Apps in LRES ..............3</td>
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<td>LRES 443--Weed Ecology &amp; Management ..................3</td>
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**Plant/Revegetation Focus**

These 9 credits plus 6 from either microbial/bioremediation focus, soil/water focus, or additional courses list.

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<th>Course Code</th>
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<tbody>
<tr>
<td>LRES 344--Water Quality .......................................3</td>
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<tr>
<td>LRES 351--Nutrient Cycling ...................................3</td>
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<tr>
<td>LRES 445--Watershed Analysis .............................3</td>
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<tr>
<td>LRES 448--Stream Restoration Ecology ..................3</td>
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**Additional Courses**

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<td>LRES 357--GPS Fund/Applic Map .............................3</td>
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<tr>
<td>LRES 421--Holistic Thought &amp; Mgmt .........................4</td>
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<td>LRES 430--Natural Resource Law ............................3</td>
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<td>ARNR 451--Biomass West Wldlands .........................2</td>
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The Geospatial & Environmental Analysis degree program is administered by the Department of Land Resources and Environmental Sciences.

Geospatial & Environmental Analysis

This degree is for students interested in land resources and their management at landscape scales. All human activities depend on the world’s land and water resource base. The air we breathe, the water we drink, and the food we eat all depend upon activities occurring and interacting across broad extents of the Earth’s land surface. This curriculum is based on the philosophy that our well being requires knowledge-based decision making involving land and natural resources across these large areas. Students build on knowledge of the basic natural sciences with course work in geology, biology, geography, soils, and ecology. Then, courses in remote sensing, geographic information systems, global positioning and statistics provide tools for gathering, processing, analyzing, and displaying information about land resources across large areas. Finally, students learn how to integrate land resource information with social and financial realities to support balanced management decisions. Throughout the program, students are encouraged to gain hands-on experience with land, people and information through field trips, internships, and the capstone field course. The knowledge and skills of land resource analysis and management are needed wherever there are land resources. Graduates in the Geospatial & Environmental Analysis major can be the environmental scientists and managers most capable of providing information for sound management of the land resource base.

Career Opportunities: Careers in natural resource management, environmental consulting, precision agriculture, watershed management, and land mapping, requiring professionals who can work outdoors on the land and indoors with data and computer applications dealing with geographic information systems and remote sensing. Employment with federal government land management agencies, such as the Forest Service, Bureau of Land Management, Natural Resources Conservation Service, and Bureau of Reclamation; state agencies, such as departments of natural resources; local and regional planning organizations; private organizations which own and manage land (timber companies, ranches, farms, recreation areas); consulting firms; conservation organizations such as land trusts; and Congressional staffs. Graduate training leading to independent research in remote sensing, ecological processes, and soil and water science.

Curricula in Geospatial & Environmental Analysis

**GEOSPATIAL & ENVIRONMENTAL ANALYSIS**

**Freshman Year**

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>LRES 101</td>
<td>Soil Resource</td>
<td>3</td>
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<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
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<tr>
<td>BIOL 101IN</td>
<td>Biology of Organisms</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
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**Sophomore Year**

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<th>Course Code</th>
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<tbody>
<tr>
<td>LRES 201IN</td>
<td>Soil Resource</td>
<td>3</td>
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<tr>
<td>GEO 101IN</td>
<td>Intro to Physical Geology</td>
<td>4</td>
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<tr>
<td>BIOL 102</td>
<td>Molec &amp; Cellular Biol</td>
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<tr>
<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog</td>
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**University Core and Electives**

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**Junior Year**

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<tr>
<td>LRES 351</td>
<td>Nutrient Cycling</td>
<td>3</td>
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<tr>
<td>LRES 444</td>
<td>Watershed Hydrology</td>
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<tr>
<td>LRES 452</td>
<td>Soil &amp; Env Microbiol</td>
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**Senior Year**

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<tr>
<td>LRES 445</td>
<td>Watershed Analysis</td>
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<td>LRES 444</td>
<td>Watershed Hydrology</td>
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<tr>
<td>LRES 452</td>
<td>Soil &amp; Env Microbiol</td>
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**University Core and Electives**

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Effective management of agricultural and other managed land resources requires individuals to have sound fundamental understanding of the processes and relationships in land systems, combined with excellent skills in modern land inventory and analysis techniques including geographic information systems (GIS), global positioning systems (GPS), remote sensing, and an appreciation for the intricacies of land resources and land use practices. The Land Resource Sciences curricula are designed to provide classroom, laboratory, and field training. Graduates of this program will: (i) possess a broad knowledge of land processes, (ii) be able to critically analyze and solve land resource problems, and (iii) work in teams to develop and implement effective land management strategies. They will be the premier land resource users and managers in the 21st century.
Junior and Senior Electives
Complete a minimum of 20 credits of listed electives below, meeting the following requirements:
1. No more than four (4) credits from Human System electives count toward the 20 credit requirement.
2. Up to three (3) elective credits may be received for advisor approved LRES 470 or LRES 490.
3. At least fourteen (14) credits at the 300 level or above.

Ecology Electives: (at least 2 courses)
- LRES 415-Micro Diversity, Ecol & Ecol
- LRES 428-Cropping Systems
- LRES 435-Weed Ecol & Mgmt
- LRES 448-Stream Restoration Ecology
- LRES 461-Restoration Ecology
- LRES 460-Soil Remediation
- LRES 421-Holistic Thought & Mgt
- BIOL 406-Rocky Mt Vegetation
- BIOL 407-Alpine Ecology
- BIOL 424-Freshwater Ecology

Soil and Water Electives: (at least 2 courses)
- LRES 351-Nutrient Cycling
- LRES 355-Soil & Environ Chem
- LRES 352-Soil & Environ Microbiol
- LRES 355-Soil & Environ Physics
- LRES 454-Landscape Pedology
- LRES 460-Soil Remediation
- EART 397-Principles of Geomorphology
- EART 392-Surface Water Resources
- EART 340-Hydrogeology

Technical Electives:
- CE 201-Intro to Surveying
- CE 453-Photogrammetry
- STAT 410-Methods for Data Analysis

Human Systems Electives: (no more than 6 credits)
- LRES 421-Holistic Thought & Mgt
- ECNS 332-Econ of Natural Resources
- GPHY 121D-Human Geography
- SOCI 470-Environmental Sociology

Other Electives:
- BIOL 303-Principles of Ecology
- LRES 470-Sustainable Agriculture
- LRES 201IN-Soil Resource
- LRES 454-Landscape Pedology

Because some of our courses are offered during alternate years, the proposed scheduling of courses in junior and senior years may need to be modified. Work with your advisor for your individual schedule.

A minimum of 120 credits is required for graduation; at least 42 of these credits must be in courses numbered 300 and above.

SOIL SCIENCE MINOR (NON-TEACHING)

LRES 201IN-Soil Resource
LRES 351-Nutrient Cycling
LRES 355-Soil & Environ Chem
LRES 452-Soil & Environ Microbiol
LRES 455-Soil & Environ Physics
LRES 454-Landscape Pedology
LRES 461-Restoration Ecology

5 or 6 credits from the following:
LRES 444-Watershed Hydrology
LRES 469-Soil Remediation
LRES 461-Restoration Ecology

Natural Resources
And Rangeland Ecology

Department of Animal and Range Sciences
http://animalrange.montana.edu/

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.

Students who complete the requirements for a B.S. degree in Natural Resources and Rangeland Ecology in the Department of Animal and Range Sciences will be eligible for a variety of natural resource jobs with state and federal agencies or private industries, or pursue a Master of Science degree. The two options available within this degree offer students an opportunity to study the interaction of livestock and wildlife and their rangeland habitats. Emphasis is placed on soil, water and vegetation attributes which influence habitat ecology and management for livestock and wildlife. The curriculum in both these options has been designed to allow students to score at the highest level for employment with federal agencies.

Rangeland Ecology and Management Option

This option is designed to emphasize management of rangeland environments. Courses in resource inventory, watershed, rangeland restoration and vegetation ecology are required to give the student a background in ecological principles used to manage rangelands in the western United States. Students in this option can select courses which focus on production agriculture or other natural resource areas. This option is designed to train students for employment with state or federal land management agencies, as well as private industry or graduate school.

Wildlife Habitat Ecology and Management Option

This option provides students with a broad based background in wildlife habitat, rangeland ecology, and wildlife-livestock interactions common in the western United States. The focus will be on wildlife habitat, major vegetation types, rangeland livestock production, soils, and water within the framework of total resource management. Habitat management under a variety of uses and goals will be discussed. Courses specifically designed for this option include classes in wildlife habitat ecology, habitat restoration, wildlife-livestock habitat issues and wildlife-livestock nutrition. Students who graduate with a degree in this option will be eligible for employment in private industry, state and federal land agencies, or pursue a Master of Science degree.

Curricula in Natural Resources and Rangeland Ecology

RANGELAND ECOLOGY AND MANAGEMENT OPTION

Freshman Year
- F  S
  ARNR 100-Intro Animal Science
  ARNR 101-Natural Resource Cons.
  ARNR 102-Montana Range Plants Lab
  BIOL 101IN-Organismal Biology
  BIOL 102-Molecular/Cellular Biol
  CHMY 121IN-Intro to General Chemistry
  ECNS 101IS-Economic Way of Thinking
  University Core

Sophomore Year
- F  S
  ARNR 230-Rangeland Production
  ARNR 235-Range and Pasture Monitoring I
  ARNR 240-Natural Resource Ecology
  ARNR 342-Forages
  CHMY 123-Inro to Organic & Biochem
  BIOL 250-Ident of Seed Plants
  LRES 251IN-Soil Resource
  Take one of the following:
    BUS 201-Managerial Communication
    WRIT 201-College Writing II
    WRIT 211-Intermediate Tech Writing
  Take one of the following:
    PSPP 318-Biometry
    STAT 216Q-Introduction to Statistics

Junior Year
- F  S
  ARNR 325-Wildlife Lvstk Range Nutr
  ARNR 350-Veg of Western Wildlands
  ARNR 351-Biomes of West Wildlands
  ARNR 353-Grazing Ecology & Mgmt
  ARNR 354-Fire Ecology & Mgmt
  F&WL 301-Principles of F&WL Mgmt
  GPHY 284-Inro to GIS Science
  LRES 461-Restoration Ecology
  Take one of the following:
    PSPP 454-Agrostology
    PSPP 456-Plant Systematics
  Take one of the following:
    University Core and Electives

Senior Year
- F  S
  ARNR 345-Riparian Ecology & Mgmt
  ARNR 438-Wildlife Habitat Ecology
  ARNR 453-Habitat Inventory & Analysis
  BIOL 363-Principles of Ecology
  PSPP 450-Plant Physiology
  LRES 454-Pedology
  University Core and Electives
**PROGRAMS OF INSTRUCTION – AGRICULTURE**

**Restricted Electives**
(Select 6 Credits)
- AGEC 2105-S-Economics of Ag Business 3
- ARNR 292-Appl Tech Livstck Mgmt-Beef 1
- ARNR 324-Appl Tech Livstck Mgmt-Beef 1
- ARNR 320-Animal Nutrition 4
- ARNR 337-Diseases Domestic Livst 3
- ARNR 410-Veterinary Entomology 2
- ARNR 422-Sheep Management 1
- ARNR 345-Natural Resource Ecology 3
- BIOL 349-Stream Ecology 3
- GEO 101N-Intro to Physical Geology 4
- LRES 414-Watershed Hydrology 4
- LRES 444-Watershed Hydrology 4
- PSPP 456-Plant Systematics 3

**WILDLIFE HABITAT ECOSYSTEM AND MANAGEMENT OPTION**

**Freshman Year**

<table>
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**Junior Year**

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<td>ARNR 350</td>
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<td>ARNR 354</td>
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**Senior Year**

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<td>ARNR 455</td>
<td>Habitat Inventory &amp; Analysis</td>
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<td>BIOL 303</td>
<td>Principles of Ecology</td>
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<td>LRES 454</td>
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<td>PSPP 456</td>
<td>Plant Physiology</td>
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**Restricted Electives**
(Select 6 Credits)
- ARNR 480-Yellowstone Range Ecology 3
- ARNR 482-Wildlife & Evol Ecol 3
- BIOL 416-Mammalogy 3
- BIOL 414-Ornithology 3
- BIOL 419-Stream Ecology 3
- GPHY 411-Biogeochemistry 3
- LRES 444-Watershed Hydrology 4
- MGMT 473-Modern Mgmt of Western Res 3
- VTMB 271-Functional Anat Dom Animals 4

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. University core requirements must be completed.

**Natural Resources and Rangeland Ecology Minor (Non-Teaching)**

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<tr>
<td>ARNR 240</td>
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<td>ARNR 355</td>
<td>Grazing Ecology &amp; Mgmt</td>
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<tr>
<td>ARNR 455</td>
<td>Habitat Inventory &amp; Analysis</td>
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Take a minimum of 12 credits from:
- ARNR 230-Rangelivestock Production 3
- ARNR 325-Wildestry Livst Range Nutrition 3
- ARNR 345-Riparian Ecology & Mgmt 3
- ARNR 350-Veg of Western Wildlands 3
- ARNR 355-Wildestry Livst Habitat Restor 3
- ARNR 354-Wildestry Ecology & Mgmt 3
- ARNR 488-Wildestry Habitat Ecology 3

**Biological Sciences at MSU**

**Animal Science**

Animal and Range Sciences Department; College of Agriculture

*Equine Science*: emphasizes science and technology combined with practical aspects of management, horsemanship and training.

*Livestock Management and Industry*: stresses the application of science to livestock production, incorporating courses in agriculture economics and business. This program focuses on sustainable livestock systems, business, and management skills as they relate to livestock enterprises and production service industries.

*Science Option*: emphasizes greater depth in the basic sciences and is designed for highly motivated students who have a strong interest in graduate training or professional school.

**Biological Sciences**

Ecology Department; College of Letters and Science

- **Ecology and Evolution**: combines (1) a basic sequence of courses in ecology, (2) a broad background in the sciences and Mathematics, and (3) a flexible curriculum of upper-division courses in biology and related disciplines.

- **Fish and Wildlife Management**: provides a professional degree program for those students who have an interest in employment in these fields. Study leading toward a bachelor’s degree emphasizes basic principles of animal ecology, with considerable work in related fields.

- **Organismal Biology**: provides a rigorous program of study in plant and animal biology at the whole-organism, species, population, and community levels, while allowing students flexibility in selecting those biology courses that best meet their interests and objectives.

- **Biology Teaching**: certifies graduates to be qualified to teach secondary school biology and provides a solid education in biology and basic sciences with professional preparation courses required for state teacher certification.

**Biotechnology**

Veterinary Molecular Biology Dept; Microbiology Dept; Plant Sciences and Plant Pathology Department

Modern research in cellular and molecular biology and its resultant technology offers unparalleled opportunities to provide solutions to our society’s most urgent problems in human and animal health, agriculture, and environmental quality.

- Animal Systems
- Plant Systems
- Microbial Systems

**Cell Biology and Neurosciences**

Cell Biology and Neurosciences Department; College of Letters and Science

- **Biomedical Sciences**: The biomedical sciences options curriculum provides a strong background for students who are (1) interested in biomedical sciences career in research or teaching, or (2) plan on a career in medicine or other health professions.

- **Cell Biology and Neuroscience**: The curriculum in the cell biology and neuroscience option provides a strong background for students who are interested
in a career in research or teaching in cell biology, molecular biology, developmental biology, or neuroscience.

Chemistry; Biochemistry option
Chemistry and Biochemistry Department; College of Letters and Science.

This course of study includes a core of Chemistry, Biochemistry, and biology courses for the student interested in the molecular nature of biological materials and life processes.

Environmental Horticulture
Plant Sciences and Plant Pathology Department; College of Agriculture

Environmental Horticulture Science: the science and art of growing and maintaining plants for food and the enjoyment and improvement of the human environment. Its application through research has led to improved varieties of plants to benefit our daily lives.

Landscape design: prepares students to solve aesthetic and functional landscape problems.

Environmental Sciences
Land Resources and Environmental Sciences Department; College of Agriculture

Environmental Biology: intended to train students who are interested in understanding the ecology of organisms in natural environments, and/or in understanding how organisms may be used to clean up environments that have been disturbed by human activities.

Soil and Water Sciences: provides students with fundamental training in biological, chemical, and physical sciences and advanced training in soil and water sciences.

Land Rehabilitation
Land Resources and Environmental Sciences Department; College of Agriculture

This course of study provides training in site revegetation, soil remediation, riparian zone restoration, stream channel restoration, investigation of impacted geologic resources, restoration ecology, and remediation of sites contaminated by industrial activities.

Geospatial and Environmental Analysis
Land Resources and Environmental Sciences; College of Agriculture

This program is for students interested in land resources and their management at landscape scales.

Microbiology
Microbiology Department; College of Letters and Science

Environmental Health: provides a program for attaining a broad understanding of the physical, chemical, and biological factors in our environment, and their interactions that relate to health.

Medical Laboratory Science: designed to prepare students for careers in Clinical Laboratory Science.

Microbiology: In this option, students obtain a thorough education in the fields of medical, ecological, physiological and environmental microbiology, immunology, virology, and molecular biology.

Natural Resources and Rangeland Ecology
Animal and Range Sciences Department; College of Agriculture

Rangeland Ecology and Management: provides training in soils, vegetation, water, riparian areas, and livestock production on rangelands.

Wildlife Habitat Ecology and Management: the science and art of managing wildland habitats for wildlife.

Plant Sciences
Plant Sciences and Plant Pathology Department; College of Agriculture

Crop Science: The challenge for crop scientists is to implement crop and soil management schemes that maintain and/or increase production, but at the same time conserve our soil and water resources and preserve the delicate balance in the agroecosystem.

Plant Biology: Plant biology provides a broad education in the plant sciences.

Plant Science
Department of Plant Sciences and Plant Pathology
http://plantsciences.montana.edu/

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.

Plant Science involves a thorough background in the liberal arts and a comprehensive understanding of the scientific principles underlying plant sciences. Plant systems are the fundamental basis for life on earth and are also a major contributor to the economy. Modern plant science encompasses many areas, impacting such diverse interests as agriculture, biotechnology, and recreational land management.

Faculty members who advise students and teach courses are also active researchers in their respective disciplines. Students learn current knowledge and technology through formal course work and gain valuable first hand experience in departmental laboratories, greenhouses, and field research farms. Students are encouraged to gain additional learning experiences outside the classroom by working as research assistants in faculty programs, summer jobs, and internships with private industry and government agencies.

Each student works closely with a faculty advisor to formulate a program of study that is appropriate with the student’s career goals and also fits into either the Crop Science or Plant Biology options.

Crop Science Option

Continued increases in food and fiber crop production are essential for the future of humankind. Yet increased production places increased pressure on our soil, water, and other finite resources. The challenge for crop scientists is to implement crop and soil management schemes that maintain and/or increase production, but at the same time conserve our soil and water resources and preserve the delicate balance in the agroecosystem.

Course requirements in the Crop Science option are designed to
acquaint students with the principles underlying crop and soil management. Thus soil fertility, plant physiology, crop production, crop breeding, and pest management, along with courses in the biological and physical sciences are included in this area of study.

Graduates from this option find careers in farming and ranching; as crop production specialists; in pest management; in seed, fertilizer, and chemical industries; with banks and other lending institutions; Cooperative Extension Service and with a government agency such as the Natural Resource Conservation Service.

**Plant Biology Option**

Plant biology provides a broad education in the plant sciences. The expertise of the Plant Sciences faculty provides an opportunity to focus at the cellular and molecular level, but opportunities also exist for emphasis in plant ecology and systematics. Course requirements include beginning and advanced courses in biology, microbiology, biochemistry, physiology, genetics, plant development, ecology, and systematics.

Graduates are prepared for postgraduate school, and academic and professional careers.

**Curricula in Plant Science**

**CROP SCIENCE OPTION**

**Freshman Year**

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<td>BIOL 102</td>
<td>Molecular &amp; Cellular Biology</td>
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<td>M 145Q</td>
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**Junior Year**

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<td>LRES 351</td>
<td>Soil Plant Nutrient Cycles</td>
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<td>LRES 445</td>
<td>Weed Ecology &amp; Management</td>
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**Senior Year**

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A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**PLANT BIOLOGY OPTION**

**Freshman Year**

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<td>OR CLS 101</td>
<td>University Seminar</td>
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<td>WRIT 10W</td>
<td>College Writing I</td>
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<td>M 161</td>
<td>Survey of Calculus</td>
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**Sophomore Year**

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**Junior Year**

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<tr>
<td>University Core and Electives</td>
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</table>

**Additional Requirements:**

A minimum of 20 credits of advice-approved plant biology electives must be taken, at least 15 of which must be upper division. Up to 7 total credits may be included from PSPP 470, PSPP 476, PSPP 480, and PSPP 490 courses. Electives could come from any plant biology courses in the Plant Sciences and Plant Pathology Department (e.g., PSPP 454-Agrobiology, PSPP 456-Plant Systematics, PSPP 457-Plant Development, PSPP 458-Plant Cell Physiology), other plant courses in the Plant Sciences and Plant Pathology Department (e.g., PSPP 421-Concepts of Plant Pathology, PSPP 425-Mycology, etc.), and selected courses in the departments of Animal & Range Sciences, Land Resources & Environmental Sciences, Ecology, Microbiology, Cell Biology & Neuroscience, Earth Sciences, Membran Sciences, and Computer Science.

**Preveterninary Program**

Department of Veterinary Molecular Biology
http://vmb.montana.edu/

The preveterinary program prepares students for professional veterinary school leading to a Doctorate in Veterinary Medicine (DVM). Although Montana does not have a college of veterinary medicine, Montana residents may obtain supplemental funding for their professional program through the Western Interstate Commission for Higher Education (WICHE) Program. This program enables students to attend veterinary schools out-of-state, yet pay in-state rates for tuition. There is a separate WICHE application.

The preveterinary program will prepare students for acceptance to all veterinary schools in the WICHE program through both didactic coursework and internships. Application to other veterinary schools may vary in requirements. Acceptance to veterinary medical college is highly competitive and course requirements can change from year to year. Students are encouraged to meet with their advisor on a regular basis to keep abreast of any changes in requirements and suggested courses.

Students must choose and declare an undergraduate major after 3 semesters in the preveterinary curriculum. Students are encouraged to choose an undergraduate major as early as possible.
Preveterinary coursework can be applied toward a bachelor of science in any major including animal science, biotechnology, biology and microbiology. High school students are encouraged to take a significant number of science courses including chemistry, biology, Mathematics and physics. Students unable to obtain adequate preparatory science courses in high school should begin the preveterinary curriculum with more basic courses than suggested below.

Preveterinary Curriculum

**Freshman Year**
- BIOL 101N—Biology of Organisms .............................. 4
- BIOL 102-Molec & Cellular Biol ................................. 4
- CHMY 141-College Chemistry I .................................. 4
- CHMY 145-College Chemistry II .................................. 4
- COM 110US—Public Communication ............................ 3
- WRIT 101W-College Writing I .................................... 3
- University Core and Electives ................................. 4....6
  (Math Placement Exam or M 161) .............................. 4

**Sophomore Year**
- BIOL 310—Comp Vertebrate Anatomy ......................... 4
- BIOL 312—Histology ................................................... 3
- CHMY 211—College Chemistry II ................................. 4
- PHYS 206-College Physics II ...................................... 4
- STAT 216Q—Introduction to Statistics .......................... 3
- University Core and Electives ................................. 4....6

**Junior Year**
- Take one of the following:
  - BIOL 301—Principles of Genetics .............................. 3
  - ARNR 322—Breeding and Genetics ............................. 3
  - BIOL 411—Animal Physiology ................................... 3
- Take one of the following:
  - ARNR 320—Animal Nutrition .............................. 4
  - On-Line Animal Nutrition

OSU requires an upper division science class and a course in animal nutrition.

**Recommended But Not Required Credits**

- ARNR 321—Physiology of Reproduction ....................... 4
- ARNR 357—Disease of Domestic Livestock .................... 3
- BIOL 310—Vertebrate Anatomy .................................. 4
- BIOL 312—Histology ................................................... 3
- MB 301—General Microbiology I ................................ 4
- MB 401—Immunology ................................................... 3
- VTMB 271—Funct Anatomy Dom Animals ....................... 4
- VTMB 406—Infectious Diseases .................................. 3
- VTMB 475—Preveterinary Internship ............................ 2

**Sustainable Food & Bioenergy Systems**

**Interdisciplinary Curriculum**

This program is a unique interdisciplinary curriculum designed for students interested in the interconnected processes of crop production, processing, distribution, and utilization for food and bioenergy uses. The degree focuses on ecologically sound, socially just, and economically viable farming methods, food and health, and other food and bioenergy system-related issues. Students work closely with faculty to gain hands-on experience in practical applications, and in specific, self-selected focus areas through internships with Montana industries. The degree plan is intended to encompass a wide range of food- and bioenergy-related areas in order to prepare students for career opportunities in agricultural business, public health and community food security, natural resource conservation, bioenergy production industries, marketing, distribution, and local food systems. Graduates will be capable of addressing interdisciplinary food and farming system problems such as food safety, agricultural biosecurity, rural economic decline and poverty, obesity, loss of indigenous foods, and bioenergy-related issues.

**Agroecology Option**

Agroecology explores how crops and pest organisms interact with their environment, and the application of technology to efficiently and sustainably produce crops. Agroecology focuses on application of principles of population and community ecology, as well as environmental science, to cropland ecosystems. The curriculum is based on the philosophy that to be able to successfully predict management outcomes and thus make informed recommendations, one must understand fundamental principles of evolution, ecology, soil science, agronomy, and pest management.

The curriculum originates from a base in biological science which includes a broad knowledge of organisms (including plants, animals and microorganisms) and the physical and chemical characteristics of environments. In the Agroecology curriculum, students will develop a knowledge of the diversity of organisms and how they interact in natural and managed ecosystems. Furthermore, the curriculum will build on this knowledge in courses that demonstrate the application of ecology and environmental science principles. Students will also learn how new technologies like remote sensing and geographic information systems are modernizing agriculture. In later stages of the curriculum, students may select from an array of upper division courses in natural ecosystems, cropping systems, pest management, applied ecology, and policy and planning that enable them to specialize in food or bioenergy-related areas best suited to their own career vision.
Career Opportunities: Graduates from this option find careers in environmental industries and consulting firms that solve problems associated with agroecosystems or agricultural practices; government jobs in environmental management and policy making; agricultural industry positions associated with precision agriculture, pest management, general agronomy, and information services. Students will be prepared for graduate training that leads to independent research in basic and applied ecology, environmental biology, cropping systems, precision agriculture, ecologically-based pest management, or weed science.

Sustainable Crop Production Option
Where does our food come from? Are there ways to sustainably maintain production levels and yet protect our natural resources? Is it possible to improve the quality and nutrition of our food supply? Are local food systems a viable alternative to corporate agricultural production? Can crops grown for bioenergy production reduce our use of fossil fuels and lessen carbon dioxide emissions? The answers to these questions and many more are discovered by students in the Sustainable Crop Production Option. The curriculum is designed to acquaint students with a broad range of principles and issues in sustainable crop production, including soil fertility, plant physiology, greenhouse production, pest management, and small business management. Both large- and small-scale food and bioenergy production systems are examined.

Career Opportunities: Graduates from this option are prepared for careers in community nutrition, community food security, public health, Extension education, food and nutrition policy and education, food enterprise, culinary arts and management, community supported agriculture, food processing, food marketing, retailing and distribution.

Curricula in Sustainable Food and Bioenergy Systems

SUSTAINABLE FOOD SYSTEMS OPTION

Health and Human Development (HHD)

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HDFN 146--Intro SFBS Seminar</td>
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<tr>
<td>BOL 101N--Organism Function</td>
<td>4</td>
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<tr>
<td>ECNS 1018S--Econ Way Thinking</td>
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<tr>
<td>PSPS 102CS--Plant Sci, Res Environ</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>CHMY 121IN--Intro to General Chemistry</td>
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<tr>
<td>CHMY 111--College Chemistry</td>
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<tr>
<td>M 121--College Algebra</td>
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<tr>
<td>M 145Q--Mathematics for Liberal Arts</td>
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<tr>
<td>SOCI 101S--Intro to Sociology</td>
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<td>HHD 276--Internship</td>
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Sustainable Food Systems Option

Sophomore Year

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<tr>
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<tr>
<td>CHBE 205--Energy &amp; Sustainability</td>
</tr>
<tr>
<td>HDFN 211C--Human Nutrition</td>
</tr>
<tr>
<td>HDFN 226--Culinary Fund</td>
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<tr>
<td>HDFN 227--Culinary Fund Lab</td>
</tr>
<tr>
<td>LRES 110--Land Res Environ Sci</td>
</tr>
<tr>
<td>MB 101IN--Microbial Today's World</td>
</tr>
<tr>
<td>PSPS 341--Field Crop Production</td>
</tr>
<tr>
<td>Take one of the following:</td>
</tr>
<tr>
<td>PSPS 318--Biometry</td>
</tr>
<tr>
<td>STAT 216Q--Introduction to Statistics</td>
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<tr>
<td>Take one of the following:</td>
</tr>
<tr>
<td>NAS 210D--Am Indians Montana</td>
</tr>
<tr>
<td>HDFN 221C--Human Nutrition</td>
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Junior Year

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<th>Credits</th>
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<tr>
<td>CHBE 305--Energy &amp; Sustainability</td>
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<tr>
<td>HDFN 371--Res Methods</td>
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<tr>
<td>HDFN 322--Culinary Skills Mgmt</td>
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<td>HDFN 325--Culinary Mgmt Practicum</td>
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<tr>
<td>HDFN 351--Nutrition &amp; Society</td>
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<tr>
<td>LRES 201IN--Soil Resource</td>
</tr>
<tr>
<td>LRES 466-Crop Sys Sust Agriculture</td>
</tr>
<tr>
<td>Take two of the following:</td>
</tr>
<tr>
<td>AGEC 315--Ag in Global Context</td>
</tr>
<tr>
<td>PSPS 345--Organic Market Gardening</td>
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<tr>
<td>HDFN 445R--Culinary Mgmt Farm to Table</td>
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<td>University Core and Electives</td>
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Senior Year

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<tr>
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</tr>
<tr>
<td>HDFC 429--Small Bus Ops</td>
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<tr>
<td>MGMT 469--Com Soc Entrepreneurship</td>
</tr>
<tr>
<td>HDFN 321--Nutrition in the Lifecycle</td>
</tr>
<tr>
<td>HDFN 451R--Sustainable Food Systems</td>
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<tr>
<td>HDFN 499--Capstone</td>
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<tr>
<td>HHD 476--Internship</td>
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<td>Take one of the following:</td>
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<td>NAS 415--Native American Food Systems</td>
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<td>PSCE 456--Politics of Food &amp; Hunger</td>
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<td>Take two of the following:</td>
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<tr>
<td>PSPS 337--Veget Production</td>
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<td>LRES 421--Holistic Thought</td>
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<tr>
<td>PSPS 491--Special Topics</td>
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Land Resources and Environmental Sciences (LRES)

AGROECOLOGY OPTION

Land Resources and Environmental Sciences (LRES)

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<tr>
<td>LRES 146--Intro SFBS Seminar</td>
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<tr>
<td>BOL 101N--Organism Function</td>
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<tr>
<td>BOL 102--Molecular &amp; Cellular Biology</td>
</tr>
<tr>
<td>PSPS 102CS--Plant Sci, Res Environ</td>
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<tr>
<td>CHMY 141--College Chemistry I</td>
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<tr>
<td>CHMY 143--College Chemistry II</td>
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<tr>
<td>LRES 110--Land Res Environ Sci</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>M 121--College Algebra</td>
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<tr>
<td>M 145Q--Mathematics for Liberal Arts</td>
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Sophomore Year

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<tr>
<td>ECNS 1018S--Econ Way of Thinking</td>
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<tr>
<td>HDFN 211C--Human Nutrition</td>
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<td>Take one of the following:</td>
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<tr>
<td>BCHM 108IN--Biochem of Health</td>
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<tr>
<td>CHMY 125--Intro to Organic &amp; Biochem</td>
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<tr>
<td>LRES 201IN--Soil Resource</td>
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<tr>
<td>LRES 299s--Internship</td>
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<td>Take one of the following:</td>
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<tr>
<td>PSPS 318--Biometry</td>
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<tr>
<td>STAT 216Q--Introduction to Statistics</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>NAS 210D--Am Indians Montana</td>
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<td>PSCE 250DS--Intro to International Rel</td>
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<td>Take two of the following:</td>
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<tr>
<td>AGEC 210S--Econ Ag Business</td>
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<tr>
<td>MB 301--General Microbiology</td>
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<td>ECNS 2519IN--Microeconomics</td>
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<td>HDFN 322--Culinary Skills Mgmt</td>
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<td>HDFN 352--Culinary Mgmt Practicum</td>
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Junior Year

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<td>CHBE 205--Energy &amp; Sustainability</td>
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<td>Take two of the following:</td>
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<td>AGEC 315--Ag in Global Context</td>
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<td>PSPS 345--Organic Market Gardening</td>
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<td>HDFN 445R--Culinary Mgmt Farm to Table</td>
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Senior Year

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<tr>
<td>HDFC 429--Small Bus Ops</td>
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<td>MGMT 469--Com Soc Entrepreneurship</td>
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<td>HDFN 451--Sustainable Food Systems</td>
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<td>LRES 499--Internship</td>
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<td>LRES 499--Capstone</td>
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<td>LRES 425--Culinary Mgmt Farm to Table</td>
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University Core and Electives

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<td>Take one of the following:</td>
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<td>HDFC 429--Small Bus Ops</td>
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<td>MGMT 469--Com Soc Entrepreneurship</td>
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<td>HDFN 451--Sustainable Food Systems</td>
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<td>LRES 499--Internship</td>
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<td>LRES 499--Capstone</td>
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<td>LRES 425--Culinary Mgmt Farm to Table</td>
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### SUSTAINABLE CROP PRODUCTION OPTION

**Plant Sciences and Plant Pathology (PSPP)**

<table>
<thead>
<tr>
<th>Class Year</th>
<th>Courses</th>
<th>Credits</th>
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<td>Freshman Year</td>
<td>PSPP 126-Intro SFBS Seminar ..................................................</td>
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<td>BIOL 101IN-Organism Function</td>
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<td>ECNS 101BS-Econ Way Thinking</td>
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<td>PSPP 102S-Plant Sci, Res Environ</td>
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<td>LRES 110-Land Res Env Sci</td>
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<td>LRES 201IN-Soil Resources</td>
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<td>PSPP 211-Contemporary Plant Path Production..........................</td>
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<td>MB 101IN-Microbial Today's World</td>
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<td>PSPP 105-Miracle Growing-Intro to Hort</td>
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<td>NAS 201D-Am Indians Montana</td>
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<td>PSCI 230D-Intro to International Relations</td>
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<td>PSPP 318-Biometry</td>
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<td>AGEC 210ES-Econ Ag Business</td>
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<td>ECNS 234S-Microeconomics</td>
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<td>Junior Year</td>
<td>CHBE 205-Energy &amp; Sustainability</td>
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<td>BIOL 303-Prin of Ecology</td>
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<td>AGEC 315-Ag in Global Context</td>
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<td>PSPP 345-Organic Market Gardening</td>
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<td>PSPP 357-Vegetable Production</td>
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<td>LRES 421-Holistic Thought</td>
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<td>HDFN 455R-Culinary Mkgt Farm to Table</td>
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<td></td>
<td>HDFN 429-Small Bus Ops</td>
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<td>MGMT 469-Com Soc Entrepreneurship</td>
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<td>HDFN 431B-Sustainable Food Systems</td>
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<td>PSPP 498-Internship</td>
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<td>PSPP 499-Capstone</td>
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<td></td>
<td>NAS 415-Native American Food Systems</td>
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<td>PSCI 456-Politics of Food &amp; Hunger</td>
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<td>Take four of the following:</td>
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<td>LRES 401-Integrat Pest Mgmt</td>
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<td>PSPP 245-Plant Propagation</td>
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<td>PSPP 342-Forages</td>
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<td></td>
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</tbody>
</table>

### COLLEGE OF ARTS AND ARCHITECTURE

**Susan Agre-Kippenhan, Dean**  
Heather Bentz, Assistant Dean

**Undergraduate Programs Available:**
- B.A. and B.F.A. in Art
- B.A. in Environmental Design
- B.A. in Film (formerly Motion Picture/Video/Theatre) and Photography
- B.A. in Music
- B.A. in Music Technology
- Bachelor of Music Education

The College of Arts and Architecture includes the School of Architecture, the School of Art, the School of Film and Photography, and the Department of Music. KSUM, Montana Public Broadcasting System (PBS) - MSU’s public television station and Shakespeare in the Parks, a theatre outreach performance company, are also affiliated with the College. The curriculum provides for baccalaureate degree programs with majors in Architecture (Environmental Design), Art (Ceramics, Jewelry and Metalsmithing, Painting and Drawing, Printmaking, and Sculpture), Graphic Design, Art History, Art Education K-12 Broadfield Option, Film, Photography, Music, Music Technology and Music Education.

A Master of Architecture, Master of Arts in Art history, Master of Fine Arts in Art and Master of Fine Arts in Science and Natural History Filmmaking degrees are offered at the graduate level.

All College of Arts and Architecture students take a broad spectrum of humanities and science core courses to provide depth and substance to their artistic explorations.

**Art**

**School of Art**  
http://www.montana.edu/art/

The School of Art is committed to making available the best possible facility, curriculum, facilities, and experiences for a professional education in the studio arts, graphic design and art history. On both the undergraduate and graduate levels, the School seeks to prepare students for careers in the visual arts and to enrich the cultural lives of all University students. Additionally, the School recognizes its responsibility to serve as a cultural resource for the community, state, and nation.

The School of Art, fully accredited by the National Association of Schools of Arts and Design, was established in 1893 and its first graduate degree was conferred in 1932. As an academic department of the University, the School of Art is a subdivision of the College of Arts and Architecture and is allied with the School of Architecture, the Department of Media and Theatre Arts, and the Department of Music.

The School’s faculty is composed of practicing artists, designers, and scholars, each teaching in the particular discipline of his or her professional involvement. The regular faculty is augmented by graduate teaching assistants and by visiting artists/scholars who are part of an active program of lectures, workshops, and critiques supported by the National Endowment for the Arts, the Montana Arts Council, the Associated Students of Montana State University, and the MONTS Speakers Program. The Helen E. Copeland Gallery located in Haynes Hall, and the Waller-Yahonsky Gallery located in the Melvin Graduate Art Studios, displays continuous exhibitions covering all aspects of the visual arts.
The curriculum is divided into seven areas of study: art history, ceramics, graphic design, jewelry and metalsmithing, painting and drawing, printmaking, and sculpture. Curricula within these areas lead to the Bachelor of Fine Arts (BFA) in Graphic Design and Studio Arts; and the Bachelor of Arts (BA) in Art History, Art Education K-12, Broadfield, and Liberal Arts Studio. Minors are also available in Art History (non-teaching) and Art Education K-12. The graduate degrees offered are the Master of Fine Arts in studio art (MFA) and the Master of Arts in Art History (MA). For information on the Master of Fine Arts and Master of Arts degrees, consult the graduate section of this bulletin.

Admission to Art Programs
During the spring semester of the first year in the School of Art, students are required to apply for admission to the remaining three-year curriculum leading to the Bachelor of Arts in Studio Arts, the Bachelor of Arts in Art Education, the Bachelor of Fine Arts in Studio Arts and the Bachelor of Fine Arts in Graphic Design. All applications for admission are subject to the approval of the School of Art Admissions Committee. Total enrollment in the program shall be limited by the teaching resources and space capacities of the School of Art. Spaces available each year will be awarded to those applicants with the greatest creative promise and highest scholastic achievement. The School of Art does not accept Advanced Placement Studio Art credits to fulfill Art requirements. AP Art credits may be used as university electives.

Admission of transfer students is selective and highly competitive; only those students whose past academic performance and portfolio submission indicate a probability of success are admitted. Students transferring from other academic departments within the university will be required to take ART 110 & ART 111 regardless of prior coursework. Portfolio review for transfer students will take place only during spring semester and at the end of summer session. Contact the School of Art for details and deadlines.

BFA Admission to Studio Arts and Graphic Design
In the Studio Arts Option-BFA and Graphic Design Option-BFA a portfolio review is required for all students before admittance to 300 level courses. Prospective students who are transferring from similar programs at other institutions must submit portfolios. Contact the School of Art for details and deadlines.

The curriculum for art majors is composed of both required and elective courses within the School, and supporting courses from the other schools and departments of the College of Arts and Architecture and the University. Students may be limited to two studio courses per semester based on space availability and teaching resources. Required courses outside of the School of Art have either specific application to the student’s particular concentration or general application to a liberal arts education. The purpose of the curriculum is to develop perceptual and technical skills and to establish a foundation of ideas which gives meaning and direction to this training. The many and varied departments within the University offer the art student a rich source of technical, philosophical, and scientific information.

Semester In Italy Program
Each spring the School of Art offers a semester of study in Italy. This program provides upper-level students with an enriching opportunity to participate in an intensive studio and art history experience by immersing participants in the art and culture of Italy. Course offerings vary from year to year.

Internship Program
It is possible for students to earn academic credit while working outside of the University, employed by businesses, individual artists, craftspersons, designers, or other agencies through the School of Art’s Art and Design Internship Program. To be eligible, students must be art majors and be of junior standing. Further, they must have the recommendation of their academic adviser and approval by the Director of the School of Art. Accepted students enroll for internship credits under ART 476 and GDSN 498.

Computer Notebook Requirement
Laptop Computers are required for all upper level graphic design courses. Contact the School of Art for specifications.

GPA Requirement
Art majors must maintain a cumulative GPA of 2.5 or higher to remain in the curriculum.

Program Fee
Because of the unique nature of equipment and materials used in the School of Art, all majors are assessed an additional fee. Students in some courses will also be required to purchase additional materials on their own. Please inquire at the School of Art office for specific fees.

Curricula in Art

GRAFIC DESIGN OPTION - B.F.A.

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>F</th>
<th>S</th>
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<tbody>
<tr>
<td>ART 110RA-2D Art Fundamentals ..........</td>
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</tr>
<tr>
<td>ART 111RA-3D Art Fundamentals ...........</td>
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<tr>
<td>ART 112RA-Drawing Fundamentals ..........</td>
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<tr>
<td>ART/CS 145RA-Web Design ..................</td>
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<td>ART 202IA-Ancient - Medieval Art .........</td>
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<td>ART 203IA-Renaissance-Modern Art .........</td>
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<td>Total ..................</td>
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Portfolio Review is required before admittance to 300 level studios.

Sophomore Year

F | S
ART 238RA-Representational Draw.......... | 4 |
MTA 103RA-Understanding Photo ............. | 3 |
GDSN 225-Design Principles .............. | 4 |
GDSN 224-Form and Content ................ | 4 |
Art Studio Beginning (must include one 2D & one 3D) |
Take one of the following: ......... | 4 |
ART 205-Painting |
ART 206-Metalsmithing |
ART 207-Sculpture |
ART 208RA-Ceramics |
ART 209-Printmaking |

Art History Elective
Take one of the following: .......... | 3 |
ART 302IA-Asian Art |
ART 308-Hist of Printmaking |
ART 312-Hist of Decorative Arts |
ART 340-Survey of Ancient Art |
ART 402-Greek Art & Architecture |
ART 406-Roman Art & Architecture |
ART 418A-Beginnings of Modern Art |
ART 419-20th Century Art |
ART 425-Field Studies |
ART 435-Art & Architecture of Egypt |
ART 436-Late Gothic Painting |
ART 440-Art & Revolution 1750-1800 |
ART 442IA-Medieval Art |
ART 446-Early Renaissance Art |
ART 449-High Renaissance & Mannerism |
ART 450-Contemporary Art |
ART 436-Late Gothic Painting
ART 442IA-Medieval Art
ART 446-Early Renaissance Art
ART 448-High Renaissance & Mannerism
ART 450-Contemporary Art
ART 457-Baroque Art in Italy
ART 459-Baroque Art in N Europe
ART 465-19th Century Art
University Core and Electives ..........................2.....5

All Graphic Design courses must be taken in sequence. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

STUDIO ARTS OPTION - B.F.A.

Freshman Year
F S
ART 110IA-2D Art Fundamentals ...............4
ART 111RA-3D Art Fundamentals ...............4
ART 112RA-Drawing Fundamentals ...............3
ART 202IA-Ancient - Medieval Art ...............4
ART 203IA-Renaissance - Modern Art ............4
University Core and Electives .......................7.....4

Sophomore Year
F S
ART 235RA-Representational Draw ...............4
MTA 103RA-Understanding Photo .................3

Junior Year
F S
ART 206-History of Printmaking ..................4
ART 207-Sculpture ..................................4
ART 209--Printmaking ................................4

Major Medium
Take two of the following: .....................5.....5
ART 315-Ceramics II
ART 325-Metalsmithing II
ART 327-Printmaking-Lithography
ART 333-Sculpture II
ART 336-Advanced Drawing
ART 341-Advanced Relief Printmaking
ART 344-Printmaking-Serigraphy
ART 345-Advanced Intaglio Printmaking

Senior Year
F S
ART 308-History of Printmaking ..................4
ART 312-History of Decorative Arts ...............4
ART 347-Medieval Art ................................4
ART 348-Contemporary Art ..........................4
ART 419-20th Century Art ............................4
ART 425-Field Studies ................................4
ART 415--Art & Architecture of Egypt ............4

Portfolio Review is required before admittance to the BFA major medium. Students who fail portfolio review may continue in the BA option or may reapply to the BFA program the following year.

STUDIO ARTS OPTION - B.F.A.

Freshman Year
F S
ART 110IA-2D Art Fundamentals ...............4
ART 111RA-3D Art Fundamentals ...............4
ART 112RA-Drawing Fundamentals ...............3
ART 202IA-Ancient - Medieval Art ...............4
ART 203IA-Renaissance - Modern Art ............4
University Core and Electives .......................7.....4

Sophomore Year
F S
ART 235RA-Representational Draw ...............4
MTA 103RA-Understanding Photo .................3

Junior Year
F S
ART 206-History of Printmaking ..................4
ART 207-Sculpture ..................................4
ART 209--Printmaking ................................4

Major Medium
Take two of the following: .....................5.....5
ART 315-Ceramics II
ART 325-Metalsmithing II
ART 327-Printmaking-Lithography
ART 333-Sculpture II
ART 336-Advanced Drawing
ART 341-Advanced Relief Printmaking
ART 344-Printmaking-Serigraphy
ART 345-Advanced Intaglio Printmaking

Senior Year
F S
ART 308-History of Printmaking ..................4
ART 312-History of Decorative Arts ...............4
ART 347-Medieval Art ................................4
ART 348-Contemporary Art ..........................4
ART 419-20th Century Art ............................4
ART 425-Field Studies ................................4
ART 415--Art & Architecture of Egypt ............4

Portfolio Review is required before admittance to the BFA major medium. Students who fail portfolio review may continue in the BA option or may reapply to the BFA program the following year.
### ART HISTORY OPTION - B.A.

#### Freshman Year

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ART 1101A-2/D Art Fundamentals</td>
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<tr>
<td>ART 1111A-3/D Art Fundamentals</td>
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<td>ART 1221A-Drawing Fundamentals</td>
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<td>ART 2021A-Art History 300 Phase</td>
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<td>ART 2031A-Renaissance/Modern Art</td>
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<td>EDJD 102-Arts in School</td>
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#### Sophomore Year

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<td>ART 2311A-Ceramics</td>
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<td>ART 3021A-Art History</td>
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<td>EDJD 203-Arts in Education</td>
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#### Junior Year

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<td>ART 2121A-Art History</td>
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<td>ART 2131A-Modern Art</td>
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<td>ART 2141A-History of Art</td>
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<td>ART 2151A-Modern Art</td>
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#### Senior Year

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<td>ART 3111A-Ceramics</td>
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<td>ART 3021A-Advanced Studio</td>
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A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.
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**LIBERAL ARTS STUDIO OPTION - B.A.**

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ART 110A-A-2D Art Fundamentals</td>
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<td>ART 111A-A-3D Art Fundamentals</td>
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<td>ART 115RA-Drawing Fundamentals</td>
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<td>ART 202A-Ancient - Medieval Art</td>
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<td>ART 203A-Renaissance-Modern Art</td>
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<tr>
<td>University Core and Electives</td>
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Portfolio Review is required before admission to 200 level studios.

**Sophomore Year**

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<tr>
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<tr>
<td>ART 238RA-Representational Drawing</td>
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<tr>
<td>MTA 103RA-Understanding Photo</td>
<td>3</td>
</tr>
<tr>
<td>ART 205-Painting</td>
<td>4</td>
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<td>ART 206-Metamorphing</td>
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<tr>
<td>ART 207-Graphic Design I</td>
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<td>Art History Elective</td>
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Take one of the following: 9

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ART 302AIA-Asian Art</td>
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<tr>
<td>ART 308-Hist of Printmaking</td>
<td>3</td>
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<tr>
<td>ART 312-Hist of Decorative Art</td>
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<tr>
<td>ART 340-Survey of Ancient Art</td>
<td>3</td>
</tr>
<tr>
<td>ART 406-Greek Art &amp; Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ART 406-Roman Art &amp; Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ART 446-Modern Art &amp; Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ART 448-Medieval Art</td>
<td>3</td>
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<tr>
<td>ART 446-Early Renaissance Art</td>
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<tr>
<td>ART 448-High Renaissance &amp; Mannerism</td>
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<td>ART 457-Baroque Art in Italy</td>
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<tr>
<td>ART 459-Baroque Art in N Europe</td>
<td>3</td>
</tr>
<tr>
<td>ART 463-19th Century Art</td>
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<td>University Core and Electives</td>
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Junior Year

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ART 470-Individual Problems</td>
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Take six of the following, at least one from each group:

**Group I - Ancient Medieval**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ART 540-Ancient Art</td>
<td>3</td>
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<tr>
<td>ART 402-Greek Art &amp; Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ART 406-Roman Art &amp; Architecture</td>
<td>3</td>
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<tr>
<td>ART 435-Art &amp; Arch of Egypt</td>
<td>3</td>
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<tr>
<td>ART 446-Early Renaissance Art</td>
<td>3</td>
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<tr>
<td>ART 457-Baroque Art in Italy</td>
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<tr>
<td>ART 459-Baroque Art in N Europe</td>
<td>3</td>
</tr>
<tr>
<td>ART 463-19th Century Art</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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Senior Year

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ART 202AIA-Renaissance-Modern Art</td>
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<td>ART 470-Individual Problems</td>
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Take two of the following: 5

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>ART 315-Ceramics II</td>
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<tr>
<td>ART 325-Metamorphing</td>
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<tr>
<td>ART 327-Printmaking-Lithography</td>
<td>3</td>
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<tr>
<td>ART 333-Sculpture II</td>
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**Advanced Studies**

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ART 341-Ancient History</td>
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<td>ART 406-Roman Art &amp; Architecture</td>
<td>3</td>
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<td>ART 446-Early Renaissance Art</td>
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</tr>
<tr>
<td>ART 457-Baroque Art in Italy</td>
<td>3</td>
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<tr>
<td>ART 463-19th Century Art</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**ART HISTORY MINOR (NON-TEACHING)***

**Course**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ART 202AIA-Renaissance-Modern Art</td>
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<tr>
<td>ART 470-Individual Problems</td>
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Take six of the following, at least one from each group:

**Group I - Ancient Medieval**

<table>
<thead>
<tr>
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<td>ART 402-Greek Art &amp; Architecture</td>
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<td>ART 406-Roman Art &amp; Architecture</td>
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<td>ART 435-Art &amp; Arch of Egypt</td>
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</table>

**Group II - Renaissance & Baroque**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ART 435-Art &amp; Architecture of Egypt</td>
<td>3</td>
</tr>
<tr>
<td>ART 446-Early Renaissance Art</td>
<td>3</td>
</tr>
<tr>
<td>ART 457-Baroque Art in Italy</td>
<td>3</td>
</tr>
<tr>
<td>ART 459-Baroque Art in N Europe</td>
<td>3</td>
</tr>
<tr>
<td>ART 463-19th Century Art</td>
<td>3</td>
</tr>
</tbody>
</table>

**Group III - Modern & Contemporary**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ART 436-Late Gothic Painting</td>
<td>3</td>
</tr>
<tr>
<td>ART 440-Art &amp; Revolution 1750-1800</td>
<td>3</td>
</tr>
<tr>
<td>ART 448-High Renaissance &amp; Mannerism</td>
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**Group IV - Non-Western, Diversity, Theory**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ART 302AIA-Survey of Asian Art</td>
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</tr>
<tr>
<td>ART 408-Hist of Printmaking</td>
<td>3</td>
</tr>
<tr>
<td>ART 512-Decorative Arts &amp; Environment</td>
<td>3</td>
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</tbody>
</table>
ART EDUCATION K-12 MINOR

Course                        Credits
ART 110RA-2D Art Fundamentals........4
ART 111RA-3D Art Fundamentals........4
ART 112RA-Drawing Fundamentals........3
ART 202A-Ancient-Medieval Art.........4
ART 203A-Renaissance-Modern Art.......4
Take one class from the following:.....4
ART 205-Painting
ART 206-Metalsmithing
ART 207-Sculpture
ART 208RA-Ceramics
ART 230RA-Representational Drawing
Take one class from the following:.....5
ART 315-Ceramics II
ART 327-Printmaking-Lithography
ART 335-Sculpture II
ART 336-Advanced Drawing
ART 341-Adv Relief Printmaking
ART 344-Printmaking-Serigraphy
ART 348-Adv Intaglio Printmaking
ART 350-Painting II
EDEL 332--Teaching Art..................(3)
EDSL 435-Methods of Teaching Art........(3)

Environmental Design
School of Architecture
http://arch.montana.edu/

The School of Architecture offers a four year Bachelor of Arts in Environmental Design undergraduate program which combined with our three-semester graduate program leads to a fully accredited Master of Architecture degree. The Master of Architecture degree is a first-professional degree.

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 US 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 six-year, three-year, or two-year term of accreditation, depending on the extent of its conformance with established educational standards.

Doctor of Architecture and Master of Architecture 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.

Montana State University, College of Arts and Architecture, School of Architecture offers the following NAAB-accredited degree program:

- **Master of Architecture**
  (Pre-professional degree + 42 graduate credits)

The next accreditation visit for this degree program will take place in 2014.

The School of Architecture seeks to prepare students for a lifelong critical engagement in the arts and science of architecture. Located in “the last best place” of the Northern Rockies we are in an extraordinary position to engage questions regarding the relationship between the natural and built environment. To that end, we teach and practice a moral, ethical and aesthetic responsibility to society and the natural world in the design of the built environment. It is in our design studios, that this philosophy is most clearly demonstrated. Each studio is conceived to build upon the previous studio in a manner that develops a student’s mastery of the science of architecture while at the same time exposing the student to the rich diversity of our faculty’s philosophical beliefs. Within a structured sequence of increasingly complex problems emphasis is placed on teaching both an iterative design process and the visualization skills necessary to demonstrate the resultant design proposals. The science of architecture is continuously evolving and will do so over the life of every architect. We are committed to preparing our students to enter the profession with both the contemporary scientific knowledge and emerging technical expertise to further this evolution while at the same time ensuring that our graduates are grounded in the fundamental processes, composition and drawing skills that have been central to architecture throughout its history. In addition to the science of architecture we are equally committed to ensuring that our graduates acquire a critical philosophy with which they can engage the design of the built environment.

Knowing how to build is a matter of science and technology but knowing what to build is a question of morality, ethics, and aesthetic responsibility. In this regard the faculty shares a commitment to the stewardship of our environment. This is particularly important in the Northern Rockies where our historic fabric of cities, rural communities and the natural landscape coexist in a tenuous balance. Focusing on the broad principles of creating a sustainable social, cultural, economic and physical environment we utilize the region, from its major cities to its national parks, as the canvas for our teaching, research and creative activities.

**Architecture**

Briefly defined, architecture is the art and science of designing buildings that provide appropriate accommodation for human activities. Professional practice requires a person with the unique combination of creative ability, technical knowledge, human understanding, and administrative skill. The undergraduate Environmental Design curriculum, which leads to the Bachelor of Arts in Environmental Design degree, prepares students to enter the graduate program in Architecture at MSU or serves as a basis for application to other graduate programs or for employment as a non-architect in environmental design fields. However, the Bachelor of Arts in Environmental Design degree by itself does not qualify students to become registered architects. Students wishing to become registered architects must complete the graduate program of study and receive the accredited Master of Architecture degree. A Bachelor of Architecture degree is no longer offered at MSU.

Once admitted to the Environmental Design program, and after completing their fourth year design studios, students with an acceptable academic record may apply to the Master of Architecture professional program. Specific dates for graduate applications can be obtained from the main office of the School of Architecture. The program offers a professional education as well as exposure to other academic disciplines, and provides the foundation for an internship with a practicing architect, required after graduation.

In most states, a graduate with a professional degree in architecture needs the equivalent of three additional years.
of varied experience in an architectural office to qualify for the examination for a professional license. A person is not authorized to practice architecture until the architectural licensing examination is passed and a license is issued. Other areas of employment open to the architecture graduate include construction, government service, industry, and education.

In addition to the college preparatory curriculum, high school students planning on enrolling in architecture are especially encouraged to take art courses such as basic design and drawing.

Students must begin the undergraduate program in the fall semester because the first course of the design studio sequence is offered fall semester only. Students that have completed their university core requirements or have completed a previous degree may enroll in an accelerated first year design sequence offered in the summer semester.

Admission of transfer students is selective and highly competitive; only those students whose past academic performance and portfolio submission indicate a probability of success are admitted.

**Admission to the Environmental Design Program**

1. Admission to the first year, the Pre-Environmental Design Program, is open. During the spring semester of the first year of the Pre-Environmental Design Program, students are invited to apply for admission to the remaining three-year curriculum leading to the Bachelor of Arts in Environmental Design degree. All applications for admission are subject to the approval of the Second Year Admissions Committee. Total enrollment in the program shall be limited by the teaching resources and space capacities of the School of Architecture. An enrollment quota will be established prior to each admissions cycle.

2. To be considered for admission to the second year of the program, applicants must:
   a. Be in good scholastic standing with a cumulative GPA of 3.0 or higher.
   b. Have satisfactorily completed all required course work of the first year of the Environmental Design Program.
   c. Be enrolled full time during the fall and spring semesters of the year of application. This is a demanding program and students must demonstrate their ability to succeed while maintaining a full-time course schedule.
   d. Have a design portfolio that indicates creative potential. Transfer students from other architecture or environmental design programs must have, prior to acceptance and advanced design year placement, an overall grade-point average of 3.0 or above and a high quality, creative portfolio. Transfer students planning to attend the fall semester must submit their application and portfolio to the Environmental Design Program by May 1. Applications received after that date will be considered on a space-available basis only.

3. Application procedures for admission to the Environmental Design Program:
   a. An application for admission, including portfolio requirements, may be obtained from the School of Architecture after March 1st. The completed application form, plus portfolio of design and graphic work, are to be submitted to the School of Architecture by May 1.
   b. Applicants are required to submit a portfolio including examples of their design and graphic work.
   c. An applicant who has applied previously for admission and has not been accepted or who fails to enroll in the environmental design program after acceptance or who fails to complete ARCH 253 must re-apply in the regular manner.

Spaces available each year will be awarded to those applicants with the highest scholastic achievement and who show the greatest creative and professional promise. The Second Year Admissions Committee reserves the right to leave available spaces unfilled if it determines that the remaining applicants have not performed at an acceptable level in the first year of the Environmental Design Program.

Applicants who are not selected have the right to meet with the Second Year Admissions Committee for a review of their application materials.

Students not admitted to, or not enrolled in, the Environmental Design Program may not take courses in the curriculum without permission of the director. Former students who have withdrawn after being admitted to the program must be in good scholastic standing for re-admission and will be readmitted on a space available basis only. Former students must contact the School in writing, stating their intent to return, at least two months prior to their return so that a decision can be made regarding space availability.

**Architecture Internship Program**

This is an optional enrichment program for students who, for a short period in their education, would benefit at least as much from professional experience as academic experience. The goals of the program are those of the required architecture courses plus those which can be sought only in the office context, such as familiarization with the relationship of all aspects of professional practice.

Students must obtain their own employment in an architecture firm for a continuous period of not less than 24 weeks.

Students must apply in writing to the coordinator of the program by the fifth week of the semester prior to the internship during the student’s fourth year in Environmental Design. The faculty reviews all applications and makes the decision concerning acceptance into the program. A student meeting the criteria listed below may still be denied acceptance if the faculty determines that the student would benefit more from a formal design studio. The criteria for admission are:

1. A minimum 3.0 overall cumulative grade point average and a minimum 3.0 in all architecture courses.
2. Completion of all required courses as tabulated through the third year.
Foreign Study Program

This is an optional enrichment program which allows qualified students to participate in an intensive semester of foreign study. Students pay the additional costs of travel, lodging, and administration related to this program in addition to normal tuition and fees. The program is typically offered both fall and spring semesters, subject to funding constraints, and is organized and directed by a faculty member(s) from the School of Architecture.

The criteria for acceptance into the Foreign Study Program are as follows:
1. A high degree of self motivation and self discipline as demonstrated by performance in required course work.
2. A minimum 3.0 overall cumulative grade point average and a minimum 3.0 in all architecture courses.
3. Completion of ARCH 121IA, ARCH 322IA and ARCH 323IA.
4. Completion of all required courses as tabulated through the third year.

Admission to the program requires submission of a request in writing to the coordinator of the program by the fifth week of the semester prior to the program. A cash deposit may be required at this time. Requests will be reviewed by the faculty for approval.

Standard of Work in Architecture Courses

Any student receiving two consecutive grades of C- or lower in any design sequence course will be required to repeat the last course in which a C- or lower was received.

Financial

Costs for an architectural education are similar to, though somewhat higher than, other programs in the university. An academic exposure to both rural and urban settings through class field trips, the integration of computer technology, networking, printing as well as other program enhancements are an important part of an architect’s education. In order to meet this need and help defer costs of the field trips, computer integration, lecture series and program enhancements, a Program Fee is assessed to each student in the pre-environmental design, environmental design and architectural programs that reflects the student’s degree status in the program. For current Program Fee costs, students may contact the School of Architecture. Students are required to purchase their own personal notebook computer, which meets the specifications of the School of Architecture, during the second year of the Environmental Design undergraduate program. The computer will be an essential tool for use throughout the Professional Program.

Beyond normal tuition, fees, room, board, and supplies, an architectural student requires drawing equipment and materials for drawing and models during the school year. This can be expected to add at least another $600 per year to the cost. Inquiries for financial aid or assistance should be sent directly to the Office of Financial Aid Services at Montana State University.

Curriculum in Environmental Design

ENVIRONMENTAL DESIGN

First Year

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ARCH 121IA--Intro to Design</td>
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<tr>
<td>ARCH 151RA--Design Fundamentals I</td>
<td>4</td>
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<td>ARCH 152--Design Fundamentals II</td>
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<tr>
<td>Take one of the following: M 151Q--Precalculus</td>
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<td>or M 171Q--Calculus I</td>
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<td>PHYS 205--College Physics I</td>
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<td>University Core</td>
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Second Year

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<tr>
<td>ARCH 241--Architectural Structures I</td>
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<tr>
<td>ARCH 244--Architectural Structures II</td>
<td>4</td>
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<td>ARCH 253--Architectural Design I</td>
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<td>ARCH 261--Architectural Graphics I</td>
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<td></td>
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<tr>
<td>ARCH 262--Arch Graphics II</td>
<td>3</td>
<td></td>
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<tr>
<td>ARCH 322IA--World Architecture I</td>
<td>3</td>
<td></td>
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<tr>
<td>ARCH 323IA--World Architecture II</td>
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<td></td>
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<tr>
<td>University Core</td>
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Third Year

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<td>ARCH 241--Building Construction I</td>
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<td>ARCH 313--Professional Practice</td>
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<td>ARCH 331--Environmental Ctrl I</td>
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<tr>
<td>ARCH 392--Environmental Ctrl II</td>
<td>4</td>
<td></td>
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<tr>
<td>ARCH 340--Building Construction II</td>
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<td>ARCH 354--Architectural Design II</td>
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<td>ARCH 355--Arch Design III</td>
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<td>ARCH 383--Arch Graphics III</td>
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Fourth Year

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<td>ARCH 456--Arch Design IV</td>
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</table>
| Take one of the following:
  |       |
| ARCH 450--Community Design Center | 5 |
| Electives | 7 |
| or ARCH 476--Internship | 12 |
| or ARCH 414--Arch Study Abroad | 9 |
| ARCH 428--Foreign Study History | 3 |
| or ARCH 458--Arch Design VI | 5 |
| Electives | 7 |
| University Core | 5 |
| Non-Architecture Electives | 7 |
|                | 15 |
|                | 12 |

ARCH 414, 428, 450 and 476 are offered both fall and spring semesters in Fourth Year to provide diverse options.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

The School of Architecture reserves the right to retain student work for exhibition and instructional purposes.

Additional Professional Program Requirements (M.Arch)

For students interested in obtaining a Bachelor of Arts in Environmental Design degree leading to a Master of Architecture degree, one graduate level design studio must be taken during a summer semester to complete the Master of Architecture program. For additional advising information please contact the School of Architecture at 160 Cheever Hall, 994-4255.

Additional Professional Program Requirements (M.Arch)

Students interested in obtaining a Bachelor of Arts in Environmental Design degree and considering entry into the Master of Construction Engineering Management Program will be required to take additional Math, English, Natural Science, Business and Engineering courses from those listed above. Students interested in this Construction Engineering Management focus should contact the Department of Civil Engineering, 3900 Cobleigh Hall, 994-2111 to obtain the specific course requirements.

Film and Photography

The School of Film and Photography (SFP) offers two distinct options leading to the Bachelor of Arts degree either in Film or Photography.

Both the Film and Photography option are in heavy demand. Therefore in order to preserve the integrity of student education, GPA-based “gates” are in place, allowing only a certain number of students to continue in
each program beyond the first year. For more information about the gate requirements in each program see the individual program descriptions below.

For both the Film and the Photography options, there are specific classes that are offered only in sequence. Any prospective transfer student should send a list of courses that he/she has completed elsewhere or is in the process of completing, for evaluation by the School of Film and Photography well in advance of registering at MSU. Students who intend to transfer to SFP should seek prior approval of credit taken elsewhere in order to be certain that these credits will count toward the degree in Film or Photography. In no case may a class completed with a grade below "C" elsewhere be applied toward the departmental requirements for the degree in either Film or Photography. Any class submitted by an entering student in the Film option for transfer toward any of the first-year requirements must be approved by the SFP Director or Advisor on the basis of a review of the syllabus of the course taken elsewhere. A challenge exam may be required for any transfer credit at the discretion of the SFP Director or Advisor. All students enrolled in The School of Film and Photography will be assigned a faculty academic advisor after acceptance to the sophomore year.

Course fees are assessed to all students enrolled in MTA 102 and MTA 103. Students who have declared a major in either option or a double major which includes Film or Photography are charged a program fee per semester (subject to annual increase) beginning their sophomore year.

The Film Option
The Film option curriculum begins with first-year foundation courses emphasizing an understanding and analysis of motion pictures and theatre and introduces students to the actual production process. In the second year, students complete a series of eight skills classes related to film and theatre production. In the third year, qualified students who have attained a minimum 3.0 GPA in their SFP requirements in the first two years, build upon these basics in production process workshops in required of all students in fiction film, non-fiction film and stage production. Additional course work in advanced film studies as well as professional practices courses and internship options complement the upper division requirements. The individual student’s capstone senior project is approved by the entire faculty and developed in consultation with a team of faculty advisors assigned to the project through a workshop process.

Film Option Gate Requirements
• The Film option will accept no more than 48 students into the sophomore year based in part on the students GPA for the required freshman Film courses and for two core courses selected from outside the School, including WRIT 101 College Writing I. (and)
• The students’ choice for satisfying the university seminar (US) core requirements.

Admission to the sophomore year also requires submission of a portfolio. The portfolio will consist of one film selected from the individual projects shot in MTA 102 and a written statement. Candidates must submit a completed application form by April 30th for admission to the sophomore year following fall semester. Portfolios are due on the last day of spring semester finals week. The department will notify students for the following semester on or before May 30th. When any of the five required first-year Film courses have been attempted at MSU, a student’s grade may change only by retaking that specific course in Film (i.e., no transfer credits or other substitutions for the specific course are permitted). In addition, admission to the upper division 300 - and 400 - level courses in Film requires a combined GPA of 3.0 in all departmental classes required at the 100 - and 200 - levels.

The Photography Option
The curriculum in the Photography option offers both artistic and applied approaches to the medium, providing a solid foundation for those entering a professional field and those choosing to pursue postgraduate education. Accredited by the National Association of Schools of Art and Design, the Photography option sets high standards for production and is one of the few comprehensive four-year photography degree programs in a sizable geographical area of the north central and northwest United States. Coursework covers everything from traditional silver-based darkroom techniques to alternative processes as well as emphasis in digital technologies across the curriculum.

Photography Option Gate Requirements
Photography students are required to complete MTA 103RA and MTA 106 with a grade of "B" or higher and pass a portfolio review in order to advance to the second year courses. Those accepted into the program will be required to purchase their own MAC laptop computer that meets the specifications of the department by the fall semester of their sophomore year. Students will be notified of these specifications upon a successful portfolio review outcome in May. To advance to upper division junior courses, students must complete first and second year photography classes with a minimum average GPA of 2.75. The senior year consists of two semesters of weekly seminars for critique and discussion of independent capstone projects. Students are registered for these classes only if they meet the project proposal deadlines and specifications the semester before admittance, and if project proposals are approved by the photography faculty through written and verbal presentations.

Curricula in The School of Film and Photography

FILM OPTION

The following is a recommended course plan for Film majors. Variations may occur in a student’s schedule. The freshman year requirements must be successfully completed before a student may enroll in sophomore year courses. The sophomore year requirements must be successfully completed before a student may enroll in junior year courses.

Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>MTA 101IA</td>
<td>Film in America</td>
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<tr>
<td>MTA 102</td>
<td>Aesthetics of Film Production</td>
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</tr>
<tr>
<td>MTA 103RA</td>
<td>Understanding Photography</td>
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<tr>
<td>MTA 104</td>
<td>Theatre and Mass Media</td>
<td>3</td>
</tr>
<tr>
<td>MTA 215D</td>
<td>International Film &amp; Television</td>
<td>3</td>
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<tr>
<td>University Core and Electives</td>
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<td>6</td>
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</tbody>
</table>
PROGRAMS OF INSTRUCTION – ARTS AND ARCHITECTURE

PHOTOGRAPHY OPTION

Students pursuing the Photography Option will take MTA 103 Understanding Photography, in fall semester; and MTA 106, Intermediate Photography, in spring semester. Students who earn a grade of B or better in MTA 103 and MTA 106 will be eligible for faculty review of their MTA 106 portfolios the end of spring semester. Portfolio submissions will be accepted immediately after the scheduled critique of lab assignments in MTA 106. Following a successful portfolio review, students will be registered for second-year classes. Students will be notified of results of the review in a timely manner as well as computer requirements for fall semester.

Freshman Year
MTA 103A-Understanding Photography........3
MTA 106-Intermediate Photography..............3
Take one of the following:
MTA 101A-Film in America ..................3
MTA 102-Aesthetics of Film Production ..........3
MTA 104H-Theatre and Mass Media ..........3
MTA 203-International Film and Television ....3
MTA 206-Intro to Color Photography ..........3
MTA 264-View Camera ..................4
MTA 301-Investigations into Photography .....3
MTA 303A-Early History of Photography* or 3
MTA 304-Recent History of Photography 3
MTA 320-Intermediate Photography ..........3
MTA 321-Advanced Lighting Practices .......3
MTA 322-Advanced Color Photography .......3
MTA 341-Experimental Photography ..........3
MTA 360-Advanced Color Photography .......3
MTA 361-Photography: Professional Practices 3
MTA 400-Production Seminar ................3
MTA 401-Films Studies Seminar ..............3
MTA 402-Experimental Photography ..........3
MTA 403-Career Internship ..................3
MTA 472-Sr Prod Photo ..................3
MTA 473-Ind Sr Prod Photo ..................3
MTA 474-Production Seminar ..............3
MTA 475-Ind Sr Prod Photo ..................3
MTA 476-Career Internship ..................3
MTA 477-International Film and Television ....3
MTA 478-Intro to Color Photography ..........3
MTA 479-Investigations into Photography ....3
University Core and Electives .............9  9
15 15

Sophomore Year
MTA 206-Intro to Color Photography ..........4
MTA 264-View Camera ..................4
MTA 301-Investigations into Photography .....3
MTA 303A-Early History of Photography* or 3
MTA 304-Recent History of Photography 3
MTA 320-Intermediate Photography ..........3
MTA 321-Advanced Lighting Practices .......3
MTA 322-Advanced Color Photography .......3
MTA 341-Experimental Photography ..........3
MTA 360-Advanced Color Photography .......3
MTA 361-Photography: Professional Practices 3
MTA 400-Production Seminar ................3
MTA 401-Films Studies Seminar ..............3
MTA 402-Experimental Photography ..........3
MTA 403-Career Internship ..................3
MTA 472-Sr Prod Photo ..................3
MTA 473-Ind Sr Prod Photo ..................3
MTA 474-Production Seminar ..............3
MTA 475-Ind Sr Prod Photo ..................3
MTA 476-Career Internship ..................3
MTA 477-International Film and Television ....3
MTA 478-Intro to Color Photography ..........3
MTA 479-Investigations into Photography ....3
University Core and Electives .............9  9
15 15

Junior Year
MTA 303A-Early History of Photography* or 3
MTA 304-Recent History of Photography 3
MTA 320-Intermediate Photography ..........3
MTA 321-Advanced Lighting Practices .......3
MTA 322-Advanced Color Photography .......3
MTA 341-Experimental Photography ..........3
MTA 360-Advanced Color Photography .......3
MTA 361-Photography: Professional Practices 3
MTA 400-Production Seminar ................3
MTA 401-Films Studies Seminar ..............3
MTA 402-Experimental Photography ..........3
MTA 403-Career Internship ..................3
MTA 472-Sr Prod Photo ..................3
MTA 473-Ind Sr Prod Photo ..................3
MTA 474-Production Seminar ..............3
MTA 475-Ind Sr Prod Photo ..................3
MTA 476-Career Internship ..................3
MTA 477-International Film and Television ....3
MTA 478-Intro to Color Photography ..........3
MTA 479-Investigations into Photography ....3
University Core and Electives .............5  5
15 15

Electives
In addition, the department requires that each student take a minimum of 9 elective credits taken from any of the following:

MTA 370-Professional Practices* .............2  4
MTA 401-Films Studies Seminar* .............3
MTA 409-Film Documentary Theory ..........3
MTA 333-Basic Production Operations* ....1 3
MTA 400-Production Seminar* ..............1 4
MTA 470-Individual Problems* ..............1 6
MTA 476-Career Internship* ................2 12
MTA 570, MTA 401, MTA 535, MTA 470 and 476 are repeatable courses.

A minimum of 120 credits is required for graduation, 42 of these credits must be in courses numbered 300 or above.

PHOTOGRAPHY MINOR

(NON-TEACHING)

The School of Film and Photography offers a photography minor on a space-available basis. The minor consists of 29 credits. Due to the sequential nature of the photography classes, a minor will require a minimum of 2 1/2 years to complete. Photography majors/minors will both complete the same sequence of Photography classes their first year. MTA 103 in the fall and MTA 106 in the spring. At the end of spring semester of that year, a portfolio review for acceptance into the program is conducted. All applicants who have maintained a B average in MTA 103 and MTA 106 are welcome to apply. A panel of faculty will assess and rank the student work presented in the portfolios. After the 36 seats are filled in rank order, remaining applicants who still have a successful portfolio review outcome can choose to be wait listed for the immediate fall semester only and notified should vacancies occur. When all vacancies are filled for that fall semester, the wait list will be retired. Accepted majors/minors are required to purchase a MAC laptop of their choosing upon entrance into the fall semester classes of their second year.

Freshman Year
MTA 103A-Understanding Photography ........3
MTA 106-Intermediate Photography ..........3
Take one of the following:
MTA 101A-Film in America ..................3
MTA 102-Aesthetics of Film Production ..........3
MTA 104H-Theatre and Mass Media ..........3
MTA 203-International Film and Television ....3
MTA 206-Intro to Color Photography ..........3
MTA 264-View Camera ..................4
MTA 301-Investigations into Photography .....3
MTA 303A-Early History of Photography* or 3
MTA 304-Recent History of Photography 3
MTA 320-Intermediate Photography ..........3
MTA 321-Advanced Lighting Practices .......3
MTA 322-Advanced Color Photography .......3
MTA 341-Experimental Photography ..........3
MTA 360-Advanced Color Photography .......3
MTA 361-Photography: Professional Practices 3
MTA 400-Production Seminar ................3
MTA 401-Films Studies Seminar ..............3
MTA 402-Experimental Photography ..........3
MTA 403-Career Internship ..................3
MTA 472-Sr Prod Photo ..................3
MTA 473-Ind Sr Prod Photo ..................3
MTA 474-Production Seminar ..............3
MTA 475-Ind Sr Prod Photo ..................3
MTA 476-Career Internship ..................3
University Core and electives ..............7  4
15 15

Sophomore Year
MTA 475-Sr Prod Photo ..................2  2
MTA 476-Sr Prod Photo ..................3  3
University Core and Electives .............10 10
15 15

Junior Year
MTA 475-Sr Prod Photo ..................2  2
MTA 476-Sr Prod Photo ..................3  3
University Core and Electives .............10 10
15 15

*Each student must complete both MTA 303 and MTA 304. Because these courses are offered spring semester only, alternating years it is important to take them immediately.

A minimum of 120 credits is required for graduation. 42 of these credits must be in courses numbered 300 or above.
Music
Department of Music
http://montana.edu/wwwmusic

The Department of Music at Montana State University offers dynamic programs in music, music technology, and music education, preparing our students for various professions in music and music education, along with a life-long musical enhancement.

Inspired by the belief that music is central to human ways of life, the Department affirms the University’s mission to serve the people and communities of Montana by providing a musically enriched environment.

The Department is committed to contributing to the musical world through performance, scholarship, composition and leadership, and nurturing the musical expression, understanding, discovery, and creativity of its faculty and students.

The Department of Music offers classes to all students regardless of major. Some music courses satisfy University core requirements. Interested students may study band and orchestral instruments, voice, piano, and guitar. Membership in Department of Music ensembles is open to all students regardless of major. Some ensembles require an audition. All incoming music majors must demonstrate their level of musicianship through auditions, a theory pre-test, and a keyboard placement exam prior to acceptance in the program.

Curricula in Music

BACHELOR OF ARTS IN MUSIC

The Bachelor of Arts in Music degree emphasizes the study of music within a broad program of general study. A non-teaching minor is offered by the Department of Music.

All music majors must enroll in Applied Music each semester of residency. All students will be placed, by audition, at the appropriate level of applied study. Advancement to the next level will be by performance jury and with the approval of the applied music instructor. A recital, or an appearance in a recital as soloist, must be completed before advancement to MUSI 395. Successful completion of at least one semester of MUSI 395 is required to graduate. All applied music students are expected to participate in the Department’s band, choral, and orchestral ensembles.

Music majors are required to fulfill concert attendance through MUSI 100 every semester in residence.

Students in the BA music major or those seeking a music minor must achieve the grade of "C" or better in all required music courses. Further, a grade of "C-" or better is required in all courses that will be counted toward the 42 upper-division credits required in all degrees. Courses with a passing grade of D-, D, or D+ may only be counted toward the overall 120 credit requirement.

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100--Concert Attendance</td>
<td>0</td>
</tr>
<tr>
<td>MUSI 140--Aural Perception I</td>
<td>1</td>
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<tr>
<td>MUSI 141--Aural Perception II</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 105--Music Theory I</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 106--Music Theory II</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 107--Keyboard Skills I</td>
<td>1</td>
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<tr>
<td>MUSI 108--Keyboard Skills II</td>
<td>1</td>
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<tr>
<td>MUSI 109--Applied Music I</td>
<td>2</td>
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<tr>
<td>Ensemble</td>
<td>2</td>
</tr>
<tr>
<td>University Core and Electives</td>
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Total: 31

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>MUSI 100--Concert Attendance</td>
<td>0</td>
</tr>
<tr>
<td>MUSI 210--Aural Perception III</td>
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<tr>
<td>MUSI 241--Aural Perception IV</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 205--Music Theory III</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 206--Music Theory IV</td>
<td>3</td>
</tr>
<tr>
<td>Take two of the following:</td>
<td></td>
</tr>
<tr>
<td>MUSI 230--Adv Keybd Skills:Repertoire</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 231--Adv Keybd Skills:Accomp</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 232--Adv Keybd Skills:Open Score Read</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 233--Adv Keybd Skills:Choral</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 295--Applied Music II</td>
<td>2</td>
</tr>
<tr>
<td>MUSI 307/TA--World Music</td>
<td>3</td>
</tr>
<tr>
<td>Ensemble</td>
<td>2</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>13</td>
</tr>
</tbody>
</table>

Total: 30

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100--Concert Attendance</td>
<td>0</td>
</tr>
<tr>
<td>Take two of the following:</td>
<td></td>
</tr>
<tr>
<td>MUSI 301--Music History I</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 302--Music History II</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 303--Music History of the 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 295--Applied Music II</td>
<td>2</td>
</tr>
<tr>
<td>Ensemble</td>
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<tr>
<td>Music Electives</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
</tbody>
</table>

Total: 30

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100--Concert Attendance</td>
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<tr>
<td>MUSI 498R--Senior Thesis/Capstone</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 285--Applied Music II</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 385--Applied Music III</td>
<td>1</td>
</tr>
<tr>
<td>Ensemble</td>
<td>2</td>
</tr>
<tr>
<td>Music Electives</td>
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</tr>
<tr>
<td>University Electives</td>
<td>17</td>
</tr>
</tbody>
</table>

Total: 29

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

BACHELOR OF MUSIC EDUCATION

The Bachelor of Music Education (K-12 Broadfield) degree leads to certification to teach music at all levels of the public schools. This degree allows a music major to select instrumental or choral music as a major field. The curriculum provides training in the alternative so graduates are prepared to teach in both disciplines. Emphasis is equally divided among music pedagogy, performance, and historical and theoretical study. All options provide thorough training for graduate school. A selection of courses in music education, music theory, and music history are offered at the graduate level. A Master of Education degree with an emphasis in music is available through the Department of Education. Please see http://www.montana.edu/ehld/educ/curriculumGrad/masters/profedOption/k12music.html for more information.

All music majors must enroll in Applied Music each semester of residency. All students will be placed, by audition, at the appropriate level of applied study. Advancement to the next level will be by performance jury and with the approval of the applied music instructor. A recital, or an appearance in a recital as soloist, must be completed before advancement to MUSI 395. BME students must successfully complete at least one semester of MUSI 395 (Applied Music III) before student teaching. Music majors are required to fulfill concert attendance through MUSI 100 every semester in residence.

Bachelor of Music Education (BME) degree students are classified as either Instrumental or Choral majors. As a portion of the required ensemble courses, choral majors are required to enroll in choir (MUSI 112, MUSI 312, or MUSI 426), complete one term of an instrumental ensemble, and fulfill the chamber music requirement through applied study. In the Instrumental category, string, piano and guitar majors are required to complete one term each of an instrumental, choral, and chamber ensemble. Wind-Percussion majors must enroll in MUSI 155 (Marching Band) for two semesters, and both a choral ensemble and a chamber music ensemble for one semester.
MUSI 302--Music History II .......................................3
MUSI 440--Instrumentation & Arranging ................2
MUSI 100--Concert Attendance ................................0
MUSI 397--Methods:General Music ..........................3
MUSE 131--Techniques:Sax, Oboe, Bassoon ...........1
EDCI 320--Found of Instr Compute .........................2

Junior Year Credits

Freshman Year Credits

COM 110US--Public Communication .................5
EDCI 102-InSchool Experience .........................1
WRT 101W-College Writing I ..........................3
HDCF 128L-Life span Human Despnt ............3
MUSI 100-Concert Attendance .........................0
MUSI 140-Aural Perception I .........................1
MUSI 141-Aural Perception II ......................1
MUSI 105-Music Theory I ..............................1
MUSI 106-Music Theory II ..............................1
MUSI 195--Applied Music I ............................2
MUSE 123--Techniques:Voice
MUSE 134--Tech:Percussion ..............................1
MUSE 130--Tech:Flute & Clarinet ....................1
MUSI 136--Keyboard Skills II .......................1
MUSI 232--Adv Keybd Skills:Open Score Reading..1
(vocal majors only) ........................................ (2)
MUSI 205--Music Theory III ..............................3
MUSI 206--Music Theory IV ..............................3
MUSI 205--Music Theory IV ..............................3
MUSI 241--Aural Perception IV ......................1
MUSI 240--Aural Perception III ......................1
MUSI 241--Aural Perception IV ......................1
MUSI 240--Aural Perception III ......................1
MUSIC 220--Intro to Comp App .......................2
MUSIC 220--Intro to Comp App .......................2
MUSI 281--Diction: Latin, English, Italian
(vocal majors only) ........................................ (2)
MUSI 291--Adv Keybd Skills/Comp Read .........1
MUSI 295--Applied Music II ............................2
MUSI 301--Music History I ..............................3
MUSI 302--Music History II ..............................3
MUSI 303--Music History of the 20th Century.....3
MUSI 335--Instrumental Conducting ..............2
MUSI 336--Choral Conducting .........................2
MUSI 339--Conducting Practicum ....................1
MUSI 395--Applied Music III .........................2
MUSI 397--Methods:General Music ..............3
MUSI 100-Concert Attendance .........................0
MUSI 335--Instrumental Conducting ..............2
MUSIC 473--Instr Field Experience ................1
MUSIC 497--Instr Methods/Lit 5-12 ..............3
MUSI 442--Vocal Pedagogy & Lit .......................2
Ensemble ......................................................2

Sophomore Year Credits

EDCI 208 or 299..............................................3
MUSE 383--Foundations of Assessment ............2
HDHL 106--Drug Health Issues ......................1
MUSI 100-Concert Attendance .........................0
MUSI 192--Tech:Brass .....................................3
MUSI 155--Tech: Strings ..................................1
MUSI 240--Aural Perception III ....................1
MUSI 241--Aural Perception IV ....................1
MUSI 205--Music Theory III .........................3
MUSIC 220--Intro to Comp App .......................2
MUSI 281--Diction: Latin, English, Italian
(vocal majors only) ........................................ (2)
MUSI 291--Adv Keybd Skills/Open Score Reading..1
MUSIC 295--Applied Music II ............................2
MUSI 301--Music History I ..............................3
MUSI 302--Music History II ..............................3
MUSI 303--Music History of the 20th Century.....3
MUSI 335--Instrumental Conducting ..............2
MUSI 336--Choral Conducting .........................2
MUSI 339--Conducting Practicum ....................1
MUSI 395--Applied Music III .........................2
MUSI 397--Methods:General Music ..............3
MUSI 100-Concert Attendance .........................0
MUSI 335--Instrumental Conducting ..............2
MUSIC 473--Instr Field Experience ................1
MUSIC 497--Instr Methods/Lit 5-12 ..............3
MUSI 442--Vocal Pedagogy & Lit .......................2
Ensemble ......................................................2

Junior Year Credits

EDCI 320--Multicultural Education ...................3
EDCI 320--Found of Instr Compute ....................2
MUSE 151--Techniques Sax, Oboe, Bassoon ....1
MUSI 395--Teaching Practicum/General Music ....1
MUSI 397--Methods:General Music ..............3
MUSI 100-Concert Attendance .........................0
MUSI 440--Instrumentation & Arranging ..........2
MUSI 302--Music History II ..............................3

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

BACHELOR OF ARTS IN MUSIC TECHNOLOGY

The Bachelor of Arts in Music Technology offers undergraduate students an integrated experience in composition, sound design, audio technology, and interdisciplinary collaboration, within a broad program of general study. Music Technology courses provide students with the range of skills and experience they need to forge their own pathways in this constantly-changing field.

All Music Technology majors must enroll in Applied Music for a minimum of three semesters. Advancement to the next level will be by performance jury and with the approval of the applied music instructor. Successful completion of one semester at the MUSI 295 level or higher is required for graduation. All students must successfully complete a minimum of two semesters of ensemble performance.

Students without previous experience reading standard musical notation may need to complete MUSI 103 (Fundamentals of Musical Creation) before starting the Music Theory course sequence, as determined individually for each student in consultation with the Director of Music Technology and the Music Faculty.

All students will be placed, by audition, at the appropriate level of performance study. Placement in MUSI 195 will be at the sole determination of the studio professor. Students with less previous experience on their principal instrument are responsible for obtaining preparatory instruction and basic music-reading skills to reach the 195 level. Basic preparatory skills on guitar may be obtained via MUSI 160, MUSI 161, and / or MUSI 260 (Beginning Guitar/Intermediate Guitar), as determined by placement evaluation with the Guitar faculty.

Music majors are required to fulfill concert attendance through MUSI 100 every semester in residence, with the exception of Pre-Music Technology majors who have not yet taken Introduction to Digital Music (MUST 115).

Other requirements for Music Technology majors: Music Technology majors must complete either MUSI 301 or MUSI 302. Music Technology majors must receive the grade of “C” or better in all music content courses. Further, a grade of “C-” or better is required in all courses that will be counted toward the 42 upper-division credits required in all degrees. Courses with a passing grade of D-, D, or D+ may only be counted toward the overall 120 credit requirement. Music Technology majors must complete either MUST 382 (Interdisciplinary Projects 2) or CAA 499R (Collaborative Research/Creative Activity).

The Music Technology major requires each entering student to declare the pre-major and complete an initial course sequence before applying for the major. This gate ensures that students will have sufficient studio time and individual instruction, and that Department of Music resources can meet the needs of the student population. For the Bachelor of Arts in Music Technology, the pre-gate requirements are:

4. MUSI 140 and 141 (Aural Perception I and II)
5. MUSI 105 and 106 (Theory I and II)
6. MUSI 135 and 136 (Keyboard Skills I and II)
7. MUST 115 (Introduction to Digital Music)
8. MUST 125 (MIDI and Electro-Acoustic Composition)
f) Placement into MUSI 195 in one of the applied studios, or placement by audition in MUSI 260 (Intermediate Guitar), or successful completion of MUSI 161 (Beginning Guitar II) with a grade of "C" or better. Music Technology students wishing to study piano as a secondary instrument may be accepted for applied study (MUSI 195) by the following methods:

1. By earning an A- or A in MUSI 135 and MUSI 136.
2. By earning a grade of "C" or better in a minimum of two semesters of Advanced Keyboard Skills (MUSI 230, MUSI 231, MUSI 232, or MUSI 233); or
3. By audition and subsequent permission of the instructor.

Music Technology students wishing to study piano as a secondary instrument may be admitted to MUSI 195 only by fulfilling requirements #2 and #3 of the above.

Each spring, any Music Technology pre-major who has successfully completed all of these requirements may submit an application and portfolio for the gate. Successful completion is defined as a grade of "C" or better, with an average of "C" or better in each of the Theory sequence pairs (MUSI 140 & 141 and MUSI 105 & 106).

Any student who is not admitted past the gate may re-submit one additional time the following spring. When any of the required first-year courses have been attempted at MSU, a student’s grade may change only by retaking that specific course in the Department of Music (i.e., no transfer credits or other course substitutions will count toward re-submission).

Students admitted past the gate may declare the Music Technology Major. Evaluation for the gate is based on three components:
1) GPA in the pre-gate course sequence
2) Composition portfolio submitted with the application
3) Service credits for participation and volunteerism in the pre-gate year.

Undergraduate Music Technology majors are required to be enrolled for a minimum of nine credits each semester, and to make consistent progress toward the degree requirements each semester until graduation. Any exceptions will be at the sole discretion of the Department Head and the Director of Music Technology. (For example, post-baccalaureate students pursuing a second bachelor’s degree in Music Technology may be exempt from the 9-hour requirement.)

Music Technology is a broad field encompassing a wide variety of topics, and Music Technology programs at different institutions vary significantly in emphasis and curriculum order. Therefore, transfer credits for Music Technology courses (MUST 115, 220, 129, 341, 380, 382, 384, plus Music Technology electives) will not generally be awarded. The Director of Music Technology and the Music Department Head reserve the right to award transfer credits in exceptional circumstances, at their sole discretion.

Course fees are assessed to all students enrolled in MUST 115 and MUST 125. Annual program fees (subject to annual increase) are assessed to all Music Technology majors admitted past the gate. Course fees and program fees support emergent equipment needs and maintenance of the computer lab and individual studios. These fees will enable Music Technology students to accomplish their work efficiently and to gain necessary experience with the most up-to-date tools of the trade.

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100-Concert Attendance</td>
<td>0</td>
</tr>
<tr>
<td>MUSI 140-Aural Perception I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 141-Aural Perception II</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 105-Music Theory I</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 106-Music Theory II</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 135-Keyboard Skills I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 136-Keyboard Skills II</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 195-Applied Music I (or)</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 160/161-Guitar in Class I/II*</td>
<td>2</td>
</tr>
<tr>
<td>MUST 115-Introduction to Digital Music</td>
<td>3</td>
</tr>
<tr>
<td>MUST 125-MIDI &amp; Electro-Acoustic Composition 3</td>
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</tr>
<tr>
<td>University Core and Electives</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>MUSI 100-Concert Attendance</td>
<td>0</td>
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<tr>
<td>MUSI 295-Applied Music II (or)</td>
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<tr>
<td>MUSI 260-Intermediate Guitar*</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 195-Applied Music I*</td>
<td>(1)</td>
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<tr>
<td>Ensemble</td>
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<tr>
<td>MUST 220-Recording I</td>
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</tr>
<tr>
<td>MUST 380-Interdisciplinary Projects I</td>
<td></td>
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<tr>
<td>MTA 254-Sound</td>
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</tr>
<tr>
<td>EE 217-Science of Sound (or)</td>
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</tr>
<tr>
<td>MUSI 485-Acoustic Composition</td>
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<tr>
<td>University Core and Electives</td>
<td>18</td>
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<tr>
<td><strong>Total</strong></td>
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### Junior Year

<table>
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<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>MUSI 100-Concert Attendance</td>
<td>0</td>
</tr>
<tr>
<td>MUSI 195/ 295-Applied Music I/II*</td>
<td>(2)</td>
</tr>
<tr>
<td>(if not previously completed)</td>
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<tr>
<td>Ensemble</td>
<td></td>
</tr>
<tr>
<td>MUSI 301-Music History (or)</td>
<td></td>
</tr>
<tr>
<td>MUSI 302-Music History II</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 307A-World Music</td>
<td>3</td>
</tr>
<tr>
<td>MUST 384-Film Scoring</td>
<td>3</td>
</tr>
<tr>
<td>MUST 341-Sound Design and Synthesis</td>
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</tr>
<tr>
<td>MUST 382-Interdisciplinary Projects II (or)</td>
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</tr>
<tr>
<td>CAA 490R-Collaborative Resh./Creative Activity</td>
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</tr>
<tr>
<td>EE 217-Science of Sound (or)</td>
<td></td>
</tr>
<tr>
<td>MUSI 485-Acoustic Composition</td>
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</tr>
<tr>
<td>MUST 305-Orchestration for New Media</td>
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<td>University Core and Electives</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
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### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MUSI 100-Concert Attendance</td>
<td>0</td>
</tr>
<tr>
<td>Music Technology Elective (or)</td>
<td></td>
</tr>
<tr>
<td>MUST 496-Internship</td>
<td>6</td>
</tr>
<tr>
<td>Computer Science or Business Elective</td>
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<tr>
<td>Upper Division Electives</td>
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<td>Electives</td>
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</tr>
<tr>
<td>MUST 305-Music History of the 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>MUST 499-Senior Project/Capstone Experience</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

Of the available elective credits:
- 14 must be in the Humanities, Social Sciences, or Fine Arts except music.
- 3 credits must be in Computer Science or Business.
- 10 credits may be free electives (music or non-music).
- The remaining 6 elective credits must be non-music.

* Guitar principals will be placed in the appropriate level of performance coursework (Beginning Guitar I, Beginning Guitar II, Intermediate Guitar or MUSI 195) by audition upon entry to the pre-major.

### MUSIC MINOR (NON-TEACHING)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 105-Music Theory I</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 106-Music Theory II</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 140-Aural Perception I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 141-Aural Perception II</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 195-Applied Music I</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

One of the following:
- MUSI 101A-Enjoyment of Music                     | 3       |
- MUSI 211A-Master Works in Music                   | 3       |
- MUSI 295-Applied Music II                         | 2       |
- MUSI 307A-World Music                             | 3       |
| Music Ensembles                                    |         |
| Music Electives                                    |         |
| **Total**                                         | **28**  |
COLLEGE OF BUSINESS

Dan Moshavi, Ph.D., Dean
Bruce Raymond, Ph.D., Associate Dean for Administration and Finance
Susan Dana, J.D., Associate Dean for Academic Affairs and Director,
The Bracken Center for Excellence in Undergraduate Business Education
Christine Lamb, Ed.D., Assistant Dean

Undergraduate Programs Available:
• Accounting
• Finance
• Management
• Marketing
• Business Minors

The College of Business at Montana State University is a vibrant and exciting place where the academic and professional success of students comes first. An extraordinary faculty offers both an innovative, nationally recognized curriculum and a unique learning environment for undergraduate students. Distinguishing features of the program include small classes, exceptional faculty members in every classroom (no graduate student instructors), rigorous course work, an interactive, personalized learning environment, and high-performing students. Each student has a faculty advisor who is available to mentor the student on both academic and career choices.

The College is fully accredited by AACSB International—the Association to Advance Collegiate Schools of Business (AACSB), the premier accrediting association for business programs. AACSB has awarded its mark of distinction to only fifteen percent of all business programs worldwide. Not only does this accreditation certify that the College meets AACSB’s rigorous standards for business education, but it also signals to local, regional and national employers that the College’s graduates are well-prepared for careers in business.

The College’s commitment to student-centered learning is articulated in the College’s vision and mission statements:

Vision Statement: The College of Business at Montana State University will provide a locally revered and nationally recognized business education for undergraduate students and in selected areas of graduate study. The programs of study will be distinguished by the personalized attention accorded to students, a diverse and contemporary curriculum, and the dedication of the faculty to create an extraordinary classroom environment and facilitate career opportunities for students.

Mission Statement: The mission of the College of Business is to provide excellence in undergraduate and select graduate business education.

To accomplish this, the College:
• Fosters an integrated and experiential learning environment
• Encourages critical thinking, quantitative reasoning, effective communication, ethical decision making, social responsibility and life-long learning.

The College is committed to the teacher-scholar model in which faculty members are simultaneously engaged in the creation and dissemination of knowledge. In keeping with the University’s land-grant mission, the College provides service and outreach to a variety of stakeholders.

Learning Objectives

Based on the College’s mission, the College has established the following learning objectives for its students:
• Knowledge of Business: Students will have strong working knowledge of fundamental concepts in accounting, finance, management, marketing, information technology, strategy and law.
• Critical Thinking: Students will learn to effectively and persuasively assimilate and evaluate information to solve business problems.
• Quantitative Reasoning: Students will be able to interpret, represent and evaluate quantitative information and integrate such information into business decisions and recommendations.
• Effective Written Communication: Students will be able to develop and organize ideas; adopt an appropriate tone; employ correct grammar, sentence structure and mechanics; use appropriate vocabulary; and correctly cite sources for facts, quotations and ideas.
• Effective Oral Communication: Students will be able to develop and organize ideas; successfully employ technology in support of a message; speak extemporaneously with minimal hesitations and fillers; adopt an appropriate tone; use appropriate vocabulary; employ correct grammar and sentence structure; and manage presentation pacing and timing effectively.
• Ethical Decision Making and Social Responsibility: Students will recognize the ethical and societal implications of proposed actions; employ decision-making tools to evaluate the ethical and societal effects of a variety of options; and make sound decisions in accordance with the analysis and evaluation of options.
• Life-Long Learning: Students will be immersed in an environment that encourages life-long learning through extensive opportunities to learn in team settings and to develop effective team skills; to develop research skills to advance learning; and to strengthen critical thinking skills.

Throughout the business curriculum, students receive significant exposure to each of these learning objectives. The level of student learning related to each objective is assessed in the senior year.

The Gary K. Bracken Center for Excellence in Undergraduate Business Education

The College’s commitment to undergraduate student success is embodied in The Gary K. Bracken Center for Excellence in Undergraduate Business Education, which is both a physical place and a philosophy.

The Bracken Center is physically located within the College of Business in Reid Hall, where it offers access to internship and career information, employer interviews, state-of-the-art conference rooms for student use and the Bracken Business Communication Clinic (BBCC). The BBCC is staffed by business writing professionals who coach students on oral presentations and written assignments, including basic grammar, punctuation, sentence structure and tenses, and business themes, content and organization of material.

The philosophy of the Bracken Center is reflected in its mission to facilitate excellence in undergraduate business education through a high quality learning environment. The foundation for student success is based on “Three Pillars.”
1. Learning to Do - Excellent Academic Preparation
   • Innovative, challenging, and practical curriculum
   • Small classes taught exclusively by faculty, not by graduate students
   • Focus on experiential, hands-on learning

2. Learning to Act - Developing Professional Skills
   • Student commitment to professionalism and the student PRIDE Code of Excellence
   • Emphasis on team work and oral and written communication
   • Guidance in finding internships and jobs, including “Meet the Recruiters” events and resume and interviewing assistance.

3. Learning to Be - Nurturing Personal Growth
   • Individualized attention to help students recognize their strengths and interests
   • Faculty advisors/mentors assigned to all students from their very first day on campus
   • Study abroad opportunities supported by fellowships to help pay for travel expenses

The College considers student professionalism and personal development to be essential complements to academic excellence. Business students in conjunction with the faculty have therefore developed a Student PRIDE Code of Excellence to help guide students in their academic, professional and personal choices:

Student PRIDE Code of Excellence

We, the students of the MSU College of Business, understand that in choosing to enroll at MSU we are investing in our professional futures. Therefore, we proudly commit to the following Code of Excellence:

Performance: I am accountable for and take pride in my own learning and conduct.

Respect: I treat with respect all members of my community, including peers, staff and faculty.

Integrity: I am ethical in all that I do.

Diligence: I do my best work at all times.

Engagement: I challenge myself to invest proactively in my academic, professional and personal development.

The College offers a wide array of opportunities for students to develop their academic, professional and personal skills, including:

- First Year and Senior Seminars consisting of no more than 20 students.
- Career Perspectives course designed to provide a foundation for professional interactions during the transition from an academic to a business environment.
- Courses in which students serve as consultants for real firms and not-for-profit organizations
- Minors in Accounting; Business Administration; Entrepreneurship and Small Business Management; International Business; and Management of Information Technology (see below for more detail on these minors)
- Student clubs, including Accounting/Beta Alpha Psi, Beta Gamma Sigma, Finance, International Business, HR/Management, Marketing, and Students in Free Enterprise (entrepreneurship)
- Internships at local, regional and national companies and government agencies
- Study abroad opportunities and short term international programs, including a most-expenses-paid internship in Tokyo, Japan. The Bracken Center offers scholarships specifically to support international activities.
- David B. Orser Executive Speakers Forum which brings several high-profile professionals to the College annually to interact with students and offer insights into business.

The Bracken Center also provides assistance to faculty members to support their teaching and research activities.

The Alderson Program in Entrepreneurship and the Center for Entrepreneurship for the New West

The Alderson Program in Entrepreneurship enables students to study entrepreneurship through the College’s minor in Entrepreneurship and Small Business Management. The culmination of the Program is a course through which students gain valuable experience working with start-up or growth technology companies through the Center for Entrepreneurship for the New West, which assists scientists at MSU in commercializing their scientific discoveries. This partnership not only allows students to apply knowledge gained from their academic work to businesses, but also makes a significant contribution to the economic development of the state of Montana. The Alderson Program has been recognized by Entrepreneur Magazine as one of the top 10 entrepreneur-emphasis programs in the U.S.

Degree Programs

The College grants two degrees: a Bachelor of Science in Business, with options in Accounting, Finance, Management, and Marketing; and a Master of Professional Accountancy. For information about the College’s Master of Professional Accountancy program, please see the Division of Graduate Education section elsewhere in this catalog.

The College of Business undergraduate curriculum is structured on a four-stage model. The four stages include the University Core, the Business Pre-Core, the Business Core, and the option courses. Courses are numbered to reflect their position within the curriculum. 100-level courses are generally taken in the freshman year, 200-level courses in the sophomore year, 300-level courses in the junior year, and 400-level courses in the senior year.

The University Core, which is required of all MSU students, is described elsewhere in this catalog.

The Business Pre-Core consists of 100- and 200-level courses that are necessary to develop fundamental knowledge and skills in business, accounting, mathematics, statistics, economics, information technology, and communication. Completion of the Business Pre-Core is required for formal admission to the College. The Business Pre-Core includes:

BUS 101 - Freshman Seminar*
BUS 201 - Managerial Communication
BUS 211 - Business Software Applications

ACTG 201 - Principles of Financial Accounting
ACTG 202 - Principles of Managerial Accounting (ACTG, MGMT and MKTG students)
ACTG 223 - Principles of Acct II (ACTG and FIN students)
M 161 - Survey of Calculus
ECNS 202 - Principles of Macroeconomics
ECNS 204 - Microeconomics
STAT 216 - Introduction to Statistics
STAT 217 - Intermediate Statistical Concepts or
MGMT 231 - Business Research Methods

* Students transferring into the College of Business, either from another institution or from another MSU department, who have already earned credit for a University Seminar (US) course must take MGMT 204 instead of BUS 101.

The Business Core courses, most of which are 300-level courses designed for juniors, establish the basis for business education in management, marketing, finance, information technology, production and operations management, law, and strategy and policy. The Business Core courses are prerequisites for most upper-level option courses. The Business Core courses include:

BUS 301 - Management and Organization
BUS 302 - Career Perspectives
BUS 311 - Information Systems
BUS 331 - Operations Management
BUS 341 - Principles of Marketing
BUS 351 - Finance
BUS 361 - Introduction to Law
BUS 474 - Business Senior Seminar

The option courses, most of which are 400-level courses designed for seniors, enhance the depth of understanding in one area of business: accounting, finance, management or marketing. Please see the descriptions of the option requirements for more detail on the option courses.

Formal Admission to College of Business

All business majors must be formally admitted to the College of Business in order to enroll in all upper-division (300-400 level) option courses (ACTG, FIN, MGMT, MKTG) and BUS 474, Business Senior Seminar.

The performance criteria for formal admission to the College of Business are as follows:

- Junior Standing (completion of 60 semester credits)
- Completion of all Business Pre-Core Courses with no grade less than a C-
- Score of at least 3 on the ACT Workkeys Written Exam
- Minimum 3.00 cumulative MSU GPA (grade point average) for Priority Admission

Admission to the College of Business is competitive, and the number of students admitted each term is limited by the instructional, classroom and resource constraints of the College. To be considered for admission, students must submit a completed admission application prior to the deadlines below. Students who meet all performance criteria and have a 3.00 or higher cumulative MSU GPA will be given priority admission. Applications from transfer students and students with cumulative grade point averages less than 3.00 will be considered on a case-by-case basis with preference based on academic performance. Applications from students with a cumulative grade point average less than 2.50 will not be considered.

To graduate with a Bachelor of Science degree in Business, a student must earn a C- or better in all required business courses.

Applications for formal admission to the College will be considered twice a year. The application deadlines for admission are as follows:

- Admission for Fall/Summer Term On or before May 1st
- Admission for Spring Term On or before December 1st

Applications are available in the College of Business Student Services Office, 338 Reid Hall. Notification of admission decisions will be made via the student's official MSU e-mail.

The Montana Board of Regents has established a common policy on minimum course grades across all campuses in the Montana University System. According to the policy, a grade of C- or better is required to satisfy requirements for pre-requisite and required courses in majors, minors, and certificate programs and for all core requirements. Further, a grade of C- or better is required in all courses that will be counted toward the 42 upper-division credits required in all degrees. Courses with a passing grade of D-, D, or D+ may only be counted toward the overall 120 credit requirement. This policy creates a minimum requirement, which may be superseded by more stringent requirements within specific majors. Any such requirements are explained within the descriptions of those curricula.

Advising and Student Services

The College’s Office of Student Services coordinates new and transfer student orientation, continuing student registration, formal admission to the College, and certification of College degree requirements. Each student is also assigned a faculty advisor to consult about the student’s career-related goals and objectives. Please refer to http://www.montana.edu/wwwdb/Current_Students/AdvisingFAQsInfo.htm for answers to Frequently Asked Questions.

Acceptance of Transfer Credits and Residency Requirements

University undergraduate programs in business administration normally concentrate professional business courses in the last two years of a four-year program. The objective is to allow students the opportunity to build a foundation of work in the arts, sciences, and humanities prior to beginning professional course work. As a result of this approach and because of the standards and requirements of AACSB - International, most students transferring into the College from another university should do so no later than the end of their sophomore year.

Students taking their first two years of work at a junior college or at another four year institution should take only those business courses offered at the freshman or sophomore level at Montana State University. Lower-division business courses may not be used to satisfy upper-division course requirements of the College of Business.

If at all possible, students should complete courses which will transfer to Montana State University as the equivalent to the Business Pre-Core.

All students transferring to the College of Business must meet the College of Business residency requirement. Students are required to complete at least the following 28 credits in residence at MSU.

Minimum of 12 credits of upper division required
- option courses/4 courses ........................................ 12
- Minimum of 12 credits of upper division required
- BUS courses/4 courses ........................................... 12
- BUS 474, Senior Seminar ........................................ 4

Total 28
For additional guidance on transferring to Montana State University, see the Admissions section of this catalog and contact the Office of Student Services, College of Business at business@montana.edu.

Pre-Professional Requirements for the Master of Business Administration (MBA)
The College does not offer a Master of Business Administration degree. The following courses are recommended for non-business undergraduate students who are considering graduate study in business at another institution. These courses provide the “common body of knowledge” required for most MBA programs. Completion of these courses can reduce the time required to obtain an MBA, but students should correspond with the Graduate Admissions Officer at their intended graduate school to confirm the acceptability of these courses.

Accounting

Accountants are business professionals who work with people to identify, analyze, and solve business problems. Completing an accounting option opens the door to a wide range of career opportunities. The accounting option is designed to help students develop the necessary technical expertise and broad-based business knowledge required for long-term success in careers such as audit, assurance, tax consulting, corporate accounting/finance, not-for-profit/government, financial analysis/venture capital, and financial planning.

Students planning to pursue CPA certification or advanced financial positions should also complete the Master of Professional Accountancy Program. Students completing MSU’s undergraduate and graduate accounting programs are in high demand and often have multiple job offers at graduation.

ACCOUNTING OPTION

Freshman Year  
BUS 101US-First Year Seminar* F S
ECNS 202-Principles of Macroeconomics 3
M 161-Q-Survey of Calculus 3
Non-Business, Non-Economics and General Electives and University Core 12
15 15

Sophomore Year  
ACTG 201-Principles of Financial Accounting 3
ACTG 223-Principles of Accounting 3
BUS 201-Managerial Communication 3
BUS 211-Business Software Applications 3
ECNS 204-Microeconomics 3
M 161-Q-Survey of Calculus 3
Non-Business, Non-Economics and General Electives and University Core 8
15 15

Junior Year  
ACTG 327-Inter Fin Acct & Reporting I 3
ACTG 328-Inter Fin Acct & Reporting II 3
ACTG 410-Cost Mgmt/ Accnt 3
BUS 301-Management and Organization 3
BUS 302-Career Perspectives 1
BUS 311-Information Systems 3
BUS 351-Operations Management 3
BUS 341-Principles of Marketing 3

Master of Professional Accountancy

The College of Business offers the Master of Professional Accountancy degree. This demanding and highly reputed program should be considered by students who are interested in pursuing CPA certification or advanced financial positions. Information about this program can be found in the Division of Graduate Education section of the catalog.

Finance

Finance is the art and science of managing money. Financial management involves corporations raising and employing funds in order to maximize shareholders’ wealth. The investments field involves balancing the expected return and risk characteristics of securities in order to make optimal portfolio investment decisions. Financial institutions and markets serve as conduits through which the economy matches supply and demand of investable funds so that scarce resources are allocated efficiently. Career opportunities include credit, financial, and securities analysts, bank examiners, loan officers, comptrollers, treasurers, portfolio managers, financial services representatives, financial planners, and insurance underwriters.
FINANCE OPTION

Freshman Year  
**F**  
BUS 101US-First Year Seminar*  ............3  
ECNS 202-Principles of Macroeconomics ........3  
M 161Q-Survey of Calculus .................4  
Non-Business, Non-Economics  
and General Electives  
and University Core ..............................12......8  
15 15

Sophomore Year  
**F**  
ACTG 201-Principles of 
Financial Accounting .................................3  
ACTG 225-Principles of Acct II ......................3  
BUS 201-Managerial Communication ............3  
BUS 211-Business Software Applications ........5  
ECNS 201B-Microeconomics .....................3  
WRIT 201-College Writing II .....................3  
STAT 216Q-Introduction to Statistics ..........3  
Take one of the following:  
STAT 217Q-Intermediate  
Statistical Concepts .............................3  
MGMT 231IS-Business  
Research Methods .................................3  
Non-Business, Non-Economics  
Electives and University Core ..................3......3  
15 15

Junior Year  
**F**  
BUS 301-Management and Organization .......3  
BUS 302-Career Perspectives ...............1  
BUS 311-Information Systems ....................3  
BUS 351-Operations Management ............3  
BUS 351-Finance ..................................3  
BUS 341-Principles of Marketing .............3  
BUS 361-Introduction to Law ...................3  
ECNS 301-Intermediate  
Micro with Calculus ...............................3  
FIN 352-Intermediate Finance .................3  
Non-Business, Non-Economics  
Electives and University Core ...............3......2  
15 15

Senior Year  
**F**  
BUS 471-Business Senior Seminar ...............4  
FIN 453-Financial Statement Analysis ........3  
FIN 455-Investments ..............................3  
FIN 457R-Financial Institutions ..............3  
Choose three of the following:  
FIN 450-Real Estate and  
Investment Analysis .............................3  
FIN 451-Entrepreneurial Finance ..............3 or 3  
FIN 452-International Finance ..............3  
FIN 456-Investments Management ............3  
FIN 458-Commercial Bank  
Management (on demand) ..................3  
FIN 459-Current Financial Topics  
(on demand)  
Non-Business, Non-Economics  
and General Electives University Core ........3......2  
15 15

Business majors must be formally admitted to the College of Business in order to enroll in all upper- 
division (300-400 level) option courses (ACTG,  
FIN, MGMT, MKTG) and BUS 474, Business Senior Seminar.

A minimum of 120 credits is required for gradua- 
tion; 42 of these credits must be in courses 
numbered 300 and above; 54 credits must be non-

Management

The management option prepares women and men to think critically and to act decisively in the dynamic global marketplace. Management option graduates are ready to make immediate contributions to organizations in a variety of roles such as analysts, managers, and team members. An academically and professionally experienced management faculty whose priority is excellence in teaching, provides students with contemporary business management theory and practice. Emphasis is placed on the application of theory and knowledge in solving practical problems. The curriculum focuses on the development of personal capacity in leadership, critical thinking, problem solving, and ethical decision making at all organizational levels from first line supervision through middle management to executive levels.

MANAGEMENT OPTION

Freshman Year  
**F**  
BUS 101US-First Year Seminar*  ............3  
ECNS 202-Principles of Macroeconomics ........3  
M 161Q-Survey of Calculus .................4  
Non-Business, Non-Economics  
and General Electives  
and University Core ..............................12......8  
15 15

Sophomore Year  
**F**  
AGTG 201-Principles of  
Financial Accounting .................................3  
AGTG 220-Principles of Managerial Acct ....3  
BUS 201-Managerial Communication ............3  
BUS 211-Business Software Applications ........5  
ECNS 201B-Microeconomics .....................3  
STAT 216Q-Introduction to Statistics ..........3  
Take one of the following:  
STAT 217Q-Intermediate  
Statistical Concepts .............................3  
MGMT 231IS-Business Research Methods ........3  
Non-Business, Non-Economics  
and General Electives and  
University Core .................................6......3  
15 15

*Students transferring into the College of Business, 
either from another institution or from another 
MSU department, who have already earned credit 
for a University Seminar (US) course must take 
MGMT 204 instead of BUS 101.

**Advisor Approved Electives: Three courses (9 credits), all in addition to university core, of any 
three relevant upper-division courses pre-approved 
by the student’s faculty advisor. 

An internship may be taken for 2-12 credits but 
counts as one elective.

Junior Year  
**F**  
BUS 301-Management and Organization .......3  
BUS 302-Career Perspectives ...............1  
BUS 311-Information Systems .................3  
BUS 331-Operations Management .............3  
BUS 341-Principles of Marketing .............3  
BUS 351-Finance ..................................3  
BUS 361-Introduction to Law ...................3  
MGMT 366-Managerial Analysis and Action I .......3  
Non-Business, Non-Economics  
and General Electives and  
University Core .................................6......3  
15 15

Senior Year  
**F**  
BUS 474-Business Senior Seminar ...............4  
MGMT 403-Human Resource Management ........3  
MGMT 466-Managerial  
Analysis and Action II .........................3  
MGMT 475R-Management Practicums ........3  
Management Electives** .......................3......6  
Advisor Approved Electives** ..................3......6  
Non-Business, Non-Economics  
and General Electives and  
University Core .................................2......0  
14 16

*Management Electives

Take two of the following (6 Credits):  
MGMT 314- Business Web  
Site Design .........................................3  
MGMT 315-Networks and  
Telecommunications ................................3  
MGMT 402-Leadership in  
Business Organizations ..........................3  
MGMT 406-Negotiation  
and Dispute Resolution ..........................3  
MGMT 412-Design of  
E-Commerce Sites ................................3  
MGMT 413-Contemporary  
Support Systems ...................................3  
MGMT 414-Data-Driven  
Business Web Services .........................3  
MGMT 415-Management of  
Information Technology (on demand)  
MGMT 455-Managing Quality  
and Productivity (on demand) ................3  
MGMT 460-Business Tutorial .................3  
MGMT 461-Small Business  
Management .........................................3  
MGMT 462-Entrepreneurship ...............3  
MGMT 463-Entrepreneurial  
Experience .........................................3  
MGMT 464-International  
Management .........................................3  
MGMT 465-International  
Practicum (on demand)  
MGMT 468-Business, Ethics  
and Society (on demand) .......................3  
MGMT 469-Comm & Social  
Enterprise .........................................3  
MGMT 472-Legal/ Social Framework of  
Business Regulation (on demand) .............3  
MGMT 475-Modern Management  
of Western Resources .........................3  
MGMT 476-Internships .........................3  
MGMT 505-Strategic Management of  
Technological Innovations (on demand)  

**Advisor Approved Electives: Three courses (9 credits), all in addition to university core, of any 
three relevant upper-division courses pre-approved 
by the student’s faculty advisor. 

An internship may be taken for 2-12 credits but 
counts as one elective.
All business majors must be formally admitted to the College of Business in order to enroll in all upper-division (300-400 level) option courses (ACTG, FIN, MGMT, MKTG) and BUS 474, Business Senior Seminar.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above; 54 credits must be non-business/non-economics rubrics (although ECNS 101, ECNS 202, ECNS 204, MGMT 251 may be included); University Core credit requirements must be satisfied.

Any students transferring to the College of Business must meet the College of Business residency requirement.

Marketing

Marketing is the art and science of managing relationships between buyers and sellers. As such, every product, service and idea that is offered requires marketing. In addition to businesses, marketing technologies are used by non-profit organizations, government agencies, political entities, and other types of organizations. Modern marketing decisions are based on statistical analyses, market tests, and other research techniques. Studying marketing prepares students to enter this growing and ever-changing sector of the global economy in positions such as marketing managers, sales managers, retail buyers, marketing representatives, professional salespersons, internet or direct response marketing managers, and advertising account representatives.

MARKETING OPTION

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>F</th>
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<tbody>
<tr>
<td>BUS 101/US-First Year Seminar*</td>
<td>5</td>
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<tr>
<td>M 161Q-Survey of Calculus</td>
<td>3</td>
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</tr>
<tr>
<td>Non-Business, Non-Economics and General Electives and University Core</td>
<td>12</td>
<td>8</td>
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</table>

*Students transferring into the College of Business, either from another institution or from another MSU department, who have already earned credit for a University Seminar (US) course must take MGMT 204 instead of BUS 101.

Sophomore Year

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>ACTG 201-Principles of Financial Accounting</td>
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<tr>
<td>ACTG 202-Principles of Managerial Accounting</td>
</tr>
<tr>
<td>BUS 201-Managerial Communication</td>
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<tr>
<td>BUS 211-Business Software Applications</td>
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<tr>
<td>ECNS 204-Microeconomics</td>
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<tr>
<td>STAT 210Q-Introduction to Statistics</td>
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</tbody>
</table>
| Take one of the following:
| STAT 217Q-Intermediate Statistical Concepts | 3 |
| MGMT 251S-Business Research Methods | 3 |
| Non-Business, Non-Economics and General Electives and University Core | 6 | 3 |

Junior Year

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<thead>
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<th>Credits</th>
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<tbody>
<tr>
<td>BUS 301-Management and Organization</td>
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<td>BUS 302-Career Perspectives</td>
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<td>BUS 311-Information Systems</td>
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<tr>
<td>BUS 351-Operations Management</td>
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<tr>
<td>BUS 341-Principles of Marketing</td>
</tr>
<tr>
<td>BUS 351-Finance</td>
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<tr>
<td>BUS 361-Introduction to Law</td>
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<td>MKTG 342R-Marketing Research</td>
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<td>MKTG 343-Consumer Behavior</td>
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<tr>
<td>Non-Business, Non-Economics and General Electives and University Core</td>
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</table>

Senior Year

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<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>BUS 474-Business Senior Seminar</td>
</tr>
<tr>
<td>MKTG 445-Professional Selling</td>
</tr>
<tr>
<td>MKTG 443-Promotion</td>
</tr>
<tr>
<td>MKTG 449-Marketing Management</td>
</tr>
</tbody>
</table>
| Take one of the following (3 credits):
| MKTG 441-International Marketing | 3 |
| MKTG 444-Retail Management | 3 |
| MKTG 446-Marketing for Entrepreneurs | 3 |
| MKTG 447-Marketing Mix Design | 3 |
| MKTG 476-Internship | 3 |
| MKTG 489 and 490-Research | 3 |
| Approved Restricted Elective | 3 |
| Non-Business, Non-Economics Electives and University Core | 09 | 08 |

Business Minors

The following business minors are offered by the College of Business. All minors are open to students from majors outside of business.

- Accounting (not available to accounting-option students)
- Business Administration (not available to business-major students)
- Entrepreneurship and Small Business Management
- International Business
- Management of Information Technology

In accordance with the Board of Regents’ policy, students must earn a C- or better in all courses in a minor.

ACCOUNTING MINOR

The course work in the Accounting minor helps students understand the role that accounting plays in business decisions. Students who minor in accounting will learn how to prepare and analyze income statements, balance sheets, cost/managerial reports, and tax returns.

Students must complete all of the following courses:

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>BUS 211-Business Software Applications</td>
</tr>
<tr>
<td>ACTG 201-Principles of Financial Accounting</td>
</tr>
<tr>
<td>ACTG 225-Principles of Accounting II</td>
</tr>
<tr>
<td>ACTG 327-Intermediate Financial Accounting</td>
</tr>
<tr>
<td>ACTG 321R-Economic Systems</td>
</tr>
</tbody>
</table>

In addition students must complete any three (9 cr.) of the following list of 3 credit courses:

- ACTG 351-Finance
- ACTG 328-Intermediate Financial Accounting
- ACTG 410-Cost Accounting
- ACTG 420-Cost Accounting II
- ACTG 421-Accounting Information Systems I
- ACTG 401-Principles of Federal Taxation
- ACTG 415-Government & Nonprofit Accounting

Elective Courses

9

Total Required Credits

24

*ACTG 328 is a prerequisite for these courses.
Students are required to complete at least 9 credits of the above-listed upper division required and/or elective courses in residence at MSU.

**BUSINESS ADMINISTRATION MINOR**

Students seeking a minor in business administration must complete the following courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 201--Managerial Communication</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201--College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 221--Intermediate Tech Writing</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 201--Principles of Fin Acct</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 202--Principles of Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>BUS 301--Management and Organization</td>
<td>3</td>
</tr>
<tr>
<td>BUS 341--Principles of Marketing*</td>
<td>3</td>
</tr>
<tr>
<td>BUS 351--Finance*</td>
<td>3</td>
</tr>
<tr>
<td>BUS 361--Introduction to Law*</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202--Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204B--Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201--College Writing II</td>
<td>3</td>
</tr>
</tbody>
</table>

*Of the four required courses denoted with *, three must be taken in residence at MSU.

**ENTREPRENEURSHIP AND SMALL BUSINESS MANAGEMENT MINOR**

Enrollment in the minor is open to business and non-business students.

Students seeking the Entrepreneurship and Small Business Management minor will take the following courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201--Principles of Financial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 202--Principles of Managerial Acct</td>
<td>3</td>
</tr>
<tr>
<td>or ACTG 225--Principles of Act II</td>
<td>3</td>
</tr>
<tr>
<td>BUS 211--Business Software Applications</td>
<td>3</td>
</tr>
<tr>
<td>BUS 301--Management and Organization</td>
<td>3</td>
</tr>
<tr>
<td>BUS 311--Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 314--Business Web Site Design</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 412--Design of E-Commerce Sites</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 414--Data-Driven Web Services</td>
<td>3</td>
</tr>
<tr>
<td>Take two(6 credits) of the following:</td>
<td></td>
</tr>
<tr>
<td>MGMT 315--Networks and Telecommunications</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 413--Contemporary Support Systems</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 421--Accounting Information Systems II</td>
<td>3</td>
</tr>
</tbody>
</table>

Students are required to complete at least 9 credits of the above-listed upper division required and/or elective courses in residence at MSU.

**MANAGEMENT OF INFORMATION TECHNOLOGY MINOR**

Enrollment in the minor is open to business and non-business students.

Program objectives include:
- To provide perspectives, concepts, and tools to evaluate and exploit business opportunities and challenges presented by changing information technology.
- To develop managerial skills to facilitate organizational change that accompanies adoption and implementation of new information technologies.
- To understand and cope with the complexities of business risk including data security and regulatory compliance.
- To examine the linkages between information technology, business strategy, and creating competitive advantage.

Students seeking the Management of Information Technology minor will complete the following courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201--Principles of Financial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 202--Principles of Managerial Acct</td>
<td>3</td>
</tr>
<tr>
<td>or ACTG 225--Principles of Act II</td>
<td>3</td>
</tr>
<tr>
<td>BUS 211--Business Software Applications</td>
<td>3</td>
</tr>
<tr>
<td>BUS 301--Management and Organization</td>
<td>3</td>
</tr>
<tr>
<td>BUS 311--Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 314--Business Web Site Design</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 412--Design of E-Commerce Sites</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 414--Data-Driven Web Services</td>
<td>3</td>
</tr>
<tr>
<td>Take two(6 credits) of the following:</td>
<td></td>
</tr>
<tr>
<td>MGMT 315--Networks and Telecommunications</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 413--Contemporary Support Systems</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 421--Accounting Information Systems II</td>
<td>3</td>
</tr>
</tbody>
</table>

Students are required to complete at least 9 credits of the above-listed upper division required and/or elective courses in residence at MSU.

**INTERNATIONAL BUSINESS MINOR**

The objectives of the International Business minor are:
- To provide students a broad-based interdisciplinary educational experience that will enable students to succeed in a culturally diverse global business environment.
- To enable students to acquire the basic skills and knowledge necessary for a career in international business.

Foreign language study is not required but is strongly recommended. As many as 11 credits of language study may be applied toward the minor as electives. The 17 credits of electives must come from at least three different disciplines including, for example, language, geography, history, political science, religious studies or business. A study abroad experience is also strongly recommended.

Students completing the International Business minor will complete the following courses. Students are responsible for fulfilling the appropriate prerequisites for all courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MKTG 242D--Intro to International Bus</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 314--International Economics</td>
<td>3</td>
</tr>
<tr>
<td>MKTG 411--International Marketing</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 414--International Management</td>
<td>3</td>
</tr>
<tr>
<td><strong>General Electives</strong></td>
<td>11</td>
</tr>
<tr>
<td>*<strong>Restricted Electives</strong></td>
<td>6</td>
</tr>
</tbody>
</table>

**COLEGUE OF EDUCATION, HEALTH AND HUMAN DEVELOPMENT**

**Undergraduate Programs Available:**
- Teacher Education Program
- Department of Education
- Department of Health and Human Development
- B.S. in Elementary Education
- B.S. in Secondary Education
- B.S. in Technology Education
- Teaching Minors
- B.S in Community Health
PROGRAMS OF INSTRUCTION – EDUCATION, HEALTH AND HUMAN DEVELOPMENT

- B.S in Early Childhood Education and Child Services
- B.S in Family and Consumer Sciences
- B.S in Food and Nutrition
- B.S in Health and Human Performance
- B.S in Health Enhancement (Health and Physical Education) K-12
- B.S. in Sustainable Food & Bioenergy Systems

The College of Education, Health and Human Development provides studies for those persons interested in careers in the helping professions associated with education, school and family counseling, family and consumer sciences, physical education/movement science, health, and nutrition. These functions are carried out within the College’s two departments, the Department of Education, and the Department of Health and Human Development.

The Department of Education is composed of two units: Curriculum and Instruction, for the preparation of undergraduate teacher education majors who seek teaching careers in either elementary or secondary schools; and Educational Leadership, which offers graduate programs in public school teaching, administration, and adult and higher education.

The Department of Health and Human Development administers a variety of curricula that prepare students for various careers including community health, dietetics, exercise science, early childhood education and child services, family and consumer sciences, kinesiology and nutrition science. Teaching careers are offered in family and consumer sciences and health enhancement K-12 (health and physical education).

In addition to its baccalaureate degree programs, the college offers programs leading to the Master of Education, the Master of Science in Health and Human Development, the Education Specialist degree, and the Doctor of Education with emphasis in Administration, Adult and Higher Education, and Curriculum and Instruction.

The college cooperates with other agencies in Montana in the improvement of educational programs and services through its Center for Community-School Development and Field Services, Center for Bilingual/Multicultural Education, Center for Excellence in Adult Learning Research, Child Development Center, Early Childhood Education Distance Partnership, Human Development Clinic and other public service centers and activities.

Montana State University is a member of the American Association of Colleges for Teacher Education and is accredited by the Northwest Association of Secondary and Higher Schools. Professional programs for the preparation of elementary and secondary teachers at the baccalaureate level are accredited by the Teacher Education Accreditation Council, as are the master’s level programs for the preparation of elementary school principals, high school principals, and guidance counselors, and the doctoral programs in administration, curriculum and instruction. All education programs are approved by the Montana Board of Public Education. Mental Health, Marriage and Family, and School Counseling programs are accredited by the Council for Accreditation of Counseling and Related Educational Programs of the American Counseling Association. The Dietetics program is accredited by the American Dietetic Association’s Council on Accreditation for Dietetics Education.

Teacher Education Program

Selection of Candidates for Teaching

Montana State University is one of the units in the University System charged with the responsibility of recommending candidates for teacher licensure. In discharging this responsibility, the College of Education, Health and Human Development attempts to encourage, train, and recommend for licensure only those students who show promise of teaching excellence. Consequently, certain criteria have been established for admission to the Teacher Education Program, and screening procedures have been provided at several points in the program. A student to be screened out of the program for reasons other than academic performance may have the right of review by the Teacher Licensure and Professional Practices Committee.

Criteria for Selection and Retention

1. Admission to the Teacher Education Program: Any student who wishes to enter the Teacher Education Program must complete an “Application for the Teacher Education Program.” These forms are available at www.montana.edu/field-placement/tepp-approval.html. The plan must be signed by the advisor(s), and the forms turned into the Advising Center, Reid Hall 132. Students should apply to the Teacher Education Program during the semester prior to the semester they will take their methods class or first teaching practicum.

The requirements for admission are 1) a cumulative grade-point average of at least 2.5; 2) a 2.5 grade-point average in the teaching major, minor, professional area, and “Prerequisites for Elementary Methods Courses” with no grade below a “C” in any of these areas; 3) a 2.5 grade-point average in the communication and quantitative areas of the university core course requirements (9 credits minimum) with no grade lower than a “C” (courses designated core US, W, and Q); 4) approval of the advisor(s); and 5) no record of immoral conduct related to the teaching profession nor been judged guilty of a criminal offense as outlined by Sec. 20-4-110 of the MCA.

2. Application and Approval for Student Teaching: Certain requirements must be met by all students desiring to student teach: 1) maintenance of the same standards required for admission into the program including satisfactory clearance on a federal criminal background check; 2) completion of all required courses; 3) certification in first aid with CPR; and 4) proof of liability; 5) approval of advisors (s).

Student teaching is limited to seniors. Application must be made to the Director of Field Placement and Licensure later than the following times: Student teaching in the fall - by the end of the first week in December; Student teaching in the spring - by the end of the second week in April. If special services or accommodations (for a disability)
are needed or required while student teaching, arrangements will be made.

3. Recommendation and Approval for Licensure: The requirements for recommendation by Montana State University for licensure include completion of courses in the Teacher Education Program as outlined in the individual’s approved plan; maintenance of the same standards as are required for student teaching (item 2 above); and approval of advisors and the Director of Field Placement and Licensure.

The Praxis II exam must be successfully passed in every teaching major and minor before teacher licensure can be obtained. A list of specific tests and passing scores can be obtained from the MSU Field Placement and Licensure Office. A copy of the Praxis II score must be on file in the MSU Field Placement and Licensure Office before a recommendation form can be submitted to the Montana Office of Public Instruction. All Education majors must meet Montana requirements for the Professional Educator Preparation Program Content Standards.

Residency Requirements for Professional Education Courses

In each of the teacher licensure programs, students must take at least half of the professional courses that are required prior to student teaching while attending classes on the Montana State University-Bozeman campus. (Credits earned through correspondence, extension, Extended Studies, or distance education at Montana State University-Bozeman do not qualify as residential credits.) Also, most methods courses and the teaching practicum experience(s) must be taken at the MSU-Bozeman campus, and students must also enroll for student teaching through MSU-Bozeman.

In all secondary teacher education programs, students will take a total of 32-34 professional education credits. Twelve of these credits will be in student teaching through MSU-Bozeman. Of the remaining 22 credits, students must take a minimum of 11 credits (including the major methods class and the teaching practicum experience) while attending classes on the MSU-Bozeman campus.

In the elementary teacher education program, students will take a total of 66-68 professional education credits. Ten to 12 of these credits will be in student teaching through MSU-Bozeman. Of the remaining 56-58 credits, students must take a minimum of 29 credits (including 21 credits in Blocks A & B, which includes the paraprofessional experience) while attending classes on the MSU-Bozeman campus.

All students working toward teacher licensure in elementary and/or secondary education must enroll at Montana State University-Bozeman campus according to the above described criteria in order to successfully complete the program.

Second Degree and Non-degree Licensure

Students already holding valid Bachelor’s degrees may fulfill licensure requirements by completing a second undergraduate degree, or in some cases, a non-degree program. Students should contact the Field Placement and Licensure Office for further information. Non-degree and second-degree students must meet the same standards for program entrance and student teaching as first-degree students.

To be recommended for licensure, a person must have completed a minimum of 10 credits from Montana State University-Bozeman specific programs.

Teacher Education Admission, Retention, Graduation, and Licensure Criteria

The education of a teacher is multifaceted. It requires assimilation of subject knowledge, basic skills, and teaching knowledge (pedagogy) concurrent with the development of appropriate professional, behavioral, and social attributes for successful teaching. This document clarifies the ways in which graduates of the Montana State University-Bozeman Teacher Education Program are required to demonstrate these program basics before entering the field of teaching.

*The program does not discriminate on the basis of race, color, creed, religion, national origin, gender, sexual orientation, age, marital status, or disability. When requested, the University will provide reasonable accommodations to otherwise qualified students with disabilities.

This program policy is an extension of, and in conformity with, the Department of Education Admission, Retention, Graduation, and Licensure Policies and Procedures.

Policy

The Elementary and Secondary Teacher Education Programs endeavor to select applicants who have the ability to become highly competent teachers. As an accredited teacher education program, the curriculum in teacher education adheres to the standards and guidelines of the pre-service program outlined by the Montana Office of Public Instruction (OPI) and the National Council for the Accreditation of Teacher Education (NCATE).

Within these guidelines, the Teacher Education Faculty have the freedom and ultimate responsibility for the selection and evaluation of its students; the design, implementation, and evaluations of its curriculum; and the determination of who should be recommended for a degree and state licensure. Admission and retention decisions are based not only on prior satisfactory academic achievement, but also on a range of factors which serve to ensure that the candidate can demonstrate the program basics required in the Teacher Education Program.

The Department has the responsibility to the public to assure that its graduates can become fully competent and caring teachers. Thus, it is important that persons admitted possess the intelligence, integrity, compassion, and physical and emotional capacity necessary for teaching in K-12 classrooms.

Professional Expectations For Prospective Teachers

The Professional Expectations for prospective teachers required by the Department of Education at Montana State University include communication competencies, intellectual (conceptual, integrative, and quantitative) abilities for problem solving and effective teaching, and professional, behavioral, and social competencies relevant to the performance of a professional educator.

Communication competencies are demonstrated by behaviors such as:
- Using the appropriate grammar (syntax, inflection, and word choice) in oral communication
- Speaking distinctly and with confidence
• Communicating with sensitivity to the situation and circumstances of professors, students, peers, and colleagues
• Using correct spelling, standard English language mechanics, and meaningful word choice in written expression

Professional behavioral, and social competencies are demonstrated by behaviors such as:
• Ability to master relevant content in subjects commonly taught in K-12 schools
• Ability to master pedagogical principles and their application in field settings at a level deemed appropriate by the faculty
• Ability to comprehend, memorize, analyze, and synthesize material
• Ability to develop reasoning and decision-making skills appropriate to the practice of teaching

Department of Education

The Department of Education has three program areas: Curriculum & Instruction, Educational Leadership, and Adult & Higher Education. As the undergraduate teacher education unit, Curriculum & Instruction provides programs in elementary education and secondary education.

Curriculum & Instruction also offers a masters degree program for advanced professional development for practicing teachers and other education professional, and a doctoral level (Ed.D) for those preparing to teach in education departments at the university level.

The Educational Leadership program offers a masters level certification and degree program for the principalship, and a doctoral level certification program (Ed.D.) to prepare individuals for the superintendency.

The program in Adult and Higher Education offers Masters and Doctoral level programs for those seeking careers in Higher Education or other post-secondary educational venues.

Mission Statement

The mission of the Department of Education is to prepare highly qualified professional educators and administrators through exemplary campus and distance based programs and field placements in quality public and private schools. In addition, the department contributes to the State of Montana and the nation through the faculty’s active research and outreach efforts.

Goals

The goals for the Department of Education Teacher Education Programs emulate the Standards adopted by the Interstate New Teacher Assessment and Support Consortium (INTASC).

The teacher:
• Goal 1 - understands the central concepts, tools of inquiry, and structure of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students;
• Goal 2 - understands how children learn and develop, and can provide learning opportunities that support their intellectual, social, and personal development;
• Goal 3 - understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners;
• Goal 4 - understands and uses a variety of instructional strategies to encourage students’ development of critical thinking, problem solving, and performance skills;
• Goal 5 - uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation;
• Goal 6 - uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration and supportive interaction, in the classroom;
• Goal 7 - plans instruction based on knowledge of subject matter, students, the community, and curriculum goals;
• Goal 8 - understands and uses formal and informal assessment strategies to ensure the continuous intellectual, social, and physical development of the learner;
• Goal 9 - is a reflective practitioner who continually evaluates the effects of his or her choices and actions on others (students, parents, and other professionals in the learning community), and who actively seeks out opportunities to grow professionally; and
• Goal 10 - fosters relationships with school colleagues, parents, and agencies in the larger community to support students’ learning and well being.

Elementary Education

Department of Education

http://www.montana.edu/wwweduc/

The Department of Education offers a teacher preparation program for students seeking teaching careers in grades kindergarten through eight (K-8). The program is designed to provide a basic general education and a wide breadth of experience in the sciences, language arts, humanities, social studies, art, music, mathematics, and health enhancement necessary for a classroom teacher at these grade levels.

Prospective elementary school teachers follow a program of study the first
two years which is essentially the same for all students. There is sufficient flexibility, however, for specialization in the various teaching options available.

One of the major attributes of the elementary education program at Montana State University is its extensive field-based component. This includes an early experience in the freshman year that is designed for students to observe and interview teachers and their students. Its emphasis is to clarify career directions and it is therefore required prior to all other professional coursework. Prior to student teaching, each student is required to take two practicum semesters. During these semesters the student spends four half-days for eight weeks in a classroom while concurrently completing methods courses on campus. The final field-based experience is student teaching where students spend twelve or fourteen weeks in actual supervised teaching in a school setting.

The elementary education K-8 curriculum and four options within the program are available in the department. Early childhood education, mathematics, science, and special education are offered to permit students to specialize in these specific areas in addition to completing the elementary school curriculum. The options, while not providing additional endorsements in the specialties addressed, do allow for added study in each area.

Graduate degree programs are offered for students who wish to pursue advanced programs in teaching or curriculum supervision in education (See College of Graduate Studies’ web site at http://www.montana.edu/)

**PROGRAM SEQUENCE**

**ELEMENTARY EDUCATION K-8**

**Freshman Year**

**Credits**

Take one of the following:

- HDCF 150S-Lifespan Human Development
- HDCF 160-1st Hum Dev Birth-Adol

EDCJ 102-Early Field Experience

EDCJ 240D-Intro Multicultural Ed

WRIT 101E-College WritIng

Take one of the following:

- GPHY 241D-Geography of World Regions
- GPHY 212D-Human Geography

M 153-Math for K-8 Teachers I

M 156Q-Math K-12 Teachers II

US Core Elective

**Applied Fine Arts Restricted Core Elective:**

Take one of the following:

- ART 112R-Art Fundamentals
- HHD 205D-Dance as Cultural Exp
- HHD 207A-Dance Appreciation
- MUSI 103RA-Fund of Music Creation
- MTA 103RA-Understanding Photography

**Natural Science Restricted Core Elective:**

Take one of the following:

- BIOL 100N-Organism Function
- MB 101N-Unseen Universe: microbes

Take one of the following:

- GEO 105C-Earth to Enviromd Geology
- GPHY 111C Intro to Physical Geography

**Sophomore Year**

**Credits**

**Social Science Restricted Core Elective:**

Take one of the following:

- NAS 106D-Intro Native Am Studies
- NAS 210D-Amer Indians in Montana
- NAS 282D Indians in Cont Soc

Take one of the following:

- EDGJ 208-Ed Prv Hum Dev Sch Age
- EDGJ 320-Foud of Ed Tech

**History Core Elective:**

Take one of the following:

- HSTA 101H-Western Civilization II
- HSTH 101H-American History I
- HSTA 102H-American History II

**English Literature**

**Restricted Humanities Elective**

Take one of the following:

- EDGJ 105-Tech Grammar/Struct Engnl Lng
- LIT 110H-Intro to Lit
- LIT 214D-Regional Lit
- NAS 940-Amer Lit

**Inquiry Arts Restricted Elective:**

Take one of the following:

- ART 203A-Ancient-Primitive Art
- ART 203A-Renaissance-Modern Art
- MTA 110A-Film in America
- MUSI 211A-Enjoyment of Music
- MUSI 307A-World Music

Take one of the following:

- CHMY 1121N-Intro Gen Chemistry
- PHYS 103N-Our Physical World
- PHYS 201N-Physics by Inquiry
- PSCI 210S-Intro to American Government

**Electives**

32-34

Note: Courses listed in the sophomore year include a total of 7 credits that are to be combined with the required courses listed in the first semester of the junior year. Timing and scheduling on the student’s part will determine which 7 credits will be combined with the first semester junior required courses.

**Junior Year**

**Credits**

**First Semester**

- EDCJ 305-Foundations of Assessment
- EDCJ 304-Children’s Literature
- HDCF 356-Exceptional Needs

**Second Semester**

- EDCJ 320-Teaching Practicum
- EDCJ 303-Pri & Prac of Emer Lit (K-3)
- EDCJ 302-Teaching Elem Science
- EDCJ 301-Teaching Practicum
- EDCJ 303-Pri & Prac of Emer Lit (K-3)

**Senior Year**

**Credits**

**First Semester**

- Block A or Block B
- Block A
- EDCJ 301-Teaching Practicum
- EDCJ 305-Pri & Prac of Emer Lit (K-3)
- EDCJ 302-Teaching Elem Science
- EDCJ 301-Teaching Practicum
- EDCJ 303-Pri & Prac of Emer Lit (K-3)

**Second Semester**

- EDCJ 301-Teaching Practicum
- EDCJ 303-Pri & Prac of Emer Lit (K-3)
- EDCJ 302-Teaching Elem Science
- EDCJ 301-Teaching Practicum
- EDCJ 303-Pri & Prac of Emer Lit (K-3)

Certification in first aid and CPR required prior to student teaching semester.

**Second Semester**

- EDCJ 410-Student Teaching
- EDCJ 414-Professional Issues

29-31

A minimum of 128 credits is required for graduation. 42 of these credits must be in courses numbered 300 and above.
EARLY CHILDHOOD EDUCATION OPTION

The early childhood education option leads to a permissive special competency designed for students in elementary education or teachers seeking re-certification. Individuals receiving this competency will receive specialized training in working with children age eight and under and their families in the areas of developmentally appropriate practices and curriculum, parent involvement, and integrating children with special needs. Individuals who have completed the requirements (and the 20 credits) will have a permissive special competency added to their elementary endorsement. This special competency alerts perspective employers of training and skills in early childhood education.

All early childhood education option students are to follow the elementary education K-8 curriculum, with these exceptions:

<table>
<thead>
<tr>
<th>Delete:</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives</td>
<td>15</td>
</tr>
<tr>
<td>HDCF 454--Practicum Childh Teach</td>
<td>3</td>
</tr>
</tbody>
</table>

20 credits

* Students choosing this option voluntarily select a program that requires additional coursework beyond the 128 credits required for a standard four-year degree.

<table>
<thead>
<tr>
<th>Add:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EDEL 406--Teaching the Primary Grades</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 271--Paraprofessional Experience</td>
<td>1</td>
</tr>
<tr>
<td>HDCF 350--Early Child Cmtn Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 352--Curr for Early Childh Ed</td>
<td>4</td>
</tr>
<tr>
<td>EDEL 435--Assessment &amp; Intervent</td>
<td>4</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>EDEL 410--Student Teaching</td>
<td>5</td>
</tr>
<tr>
<td>HDCF 454--Practicum Childh Teach</td>
<td>3</td>
</tr>
</tbody>
</table>

18/20 credits

MATHEMATICS OPTION

This option is offered to allow students to concentrate in mathematics in addition to majoring in the elementary education curriculum. It is primarily intended for students who plan to teach middle school mathematics and also desire elementary education background. The program is also attractive to students who plan to teach upper intermediate grades and desire a stronger mathematics background. This option does not lead to State endorsement in mathematics. However, a notation will appear on the student’s transcript.

All mathematics education option students are to follow the elementary education K-8 curriculum, with these exceptions:

<table>
<thead>
<tr>
<th>Delete:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Add:</th>
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</thead>
<tbody>
<tr>
<td>EDSO 471--Tchr Mid Sch Math</td>
</tr>
<tr>
<td>STAT 216Q--Introduction to Statistics</td>
</tr>
<tr>
<td>Choose one from:</td>
</tr>
<tr>
<td>M 420--Geom,Measure, and Data Mid Gr</td>
</tr>
<tr>
<td>M 424-Alg Think &amp; Num Sense Mid Gr</td>
</tr>
<tr>
<td>Restricted Electives in Mathematics</td>
</tr>
</tbody>
</table>

Mathematics Electives Recommended: (cannot double count in any credits)

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 149Q-Secrets of the Infinite</td>
</tr>
<tr>
<td>M 176Q-Language of Mathematics</td>
</tr>
<tr>
<td>M 151Q-Precalculus</td>
</tr>
<tr>
<td>M 161Q-Survey of Calculus</td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
</tr>
<tr>
<td>M 420-Geom,Measure, &amp; Data Mid Gr</td>
</tr>
<tr>
<td>M 424-Alg Think &amp; Num Sense Mid Gr</td>
</tr>
<tr>
<td>STAT 217Q--Intro Statistical Concepts</td>
</tr>
<tr>
<td>Or another approved Mathematics course</td>
</tr>
</tbody>
</table>

Students choosing this option voluntarily select a program that requires additional coursework beyond the 128 credits required for a standard four-year degree.

SCIENCE EDUCATION OPTION

All science option students are to follow the elementary K-8 curriculum, with these exceptions:

(Not: Some of the listed courses may be taken in the regular elementary education K-8 curriculum, thus decreasing the number of credits required in this option.)

<table>
<thead>
<tr>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives</td>
</tr>
<tr>
<td>Add:</td>
</tr>
<tr>
<td>EDCI 434--Literacy Assessment &amp; Instruction</td>
</tr>
<tr>
<td>HDCF 357--Exceptional Needs Lab</td>
</tr>
<tr>
<td>HDCF 458--Assessment &amp; Intervent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Restricted electives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take other approved Special Education Course offerings from MSU-Billings or other universities</td>
</tr>
</tbody>
</table>

Students choosing this option voluntarily select a program that requires additional coursework beyond the 128 credits required for a standard four-year degree.

SECONDARY EDUCATION

The Department of Elementary Education recognizes that many of its elementary education majors understand the necessity of gaining skills in the area of special education. Courses from related fields have been selected which provide preparation for pre-service teachers to gain additional knowledge and skills beneficial to working with disabled students. This option does not lead to State endorsement in special education. However, a notation will appear on the student’s transcript.

All special education option students are to follow the elementary education K-8 curriculum with these exceptions:

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives</td>
</tr>
<tr>
<td>Add:</td>
</tr>
<tr>
<td>EDCI 434--Literacy Assessment &amp; Instruction</td>
</tr>
<tr>
<td>HDCF 357--Exceptional Needs Lab</td>
</tr>
<tr>
<td>HDCF 458--Assessment &amp; Intervent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Restricted electives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take other approved Special Education Course offerings from MSU-Billings or other universities</td>
</tr>
</tbody>
</table>

Students choosing this option voluntarily select a program that requires additional coursework beyond the 128 credits required for a standard four-year degree.

SECONDARY EDUCATION

College of Education

The Department of Elementary Education offers teacher education programs for students seeking teaching careers in specific subject areas for grades five through twelve. Most of the programs are administratively inter-departmental, with the exception of General Science.
Broadfield, Social Studies Broadfield, and Technology Education Broadfield, which are totally administered and housed within the Department of Education. Therefore, students who wish to complete any of the aforementioned majors will enroll in the Department of Education, whereas students who wish to complete any of the other majors will enroll in the departments offering the teaching options in their chosen areas. (See below.)

In addition to its secondary programs, the Department of Education provides foundation coursework which is valuable to teachers at all levels in such areas as history and philosophy of education, multicultural education, educational psychology, human development, assessment, curriculum, instructional computing, and exceptionality. Teaching minors, that is, preparation for a second teaching field in addition to the major field, are offered by many departments. Teaching minors are required to accompany some teaching majors but are not required for broadfields or extended majors. Graduate degree programs are available for secondary teachers who are already licensed.(See College of Graduate Studies’ web site at http://www.montana.edu/.)

All students in secondary education programs must apply for admission to the Teacher Education Program at the beginning of the semester prior to taking the EDSD methods course(s) in their major(s) and minor(s). Application to the Secondary Education program should be turned into the Departmental Advising Center, Reid Hall 132.

Professional Requirements
For Secondary Education

All prospective teachers are required to take courses in certain areas of professional education. A grade of “C” or better is required in all professional education courses. A “C-” is not acceptable. (See “Teacher Education Program” for entrance requirements.)

EDCI 209 - Ed Psy Adol Dev ......................... 3
EDCI 320 - Found of Ed Tech ....................... 2
EDCI 360 - Found of Asmnt ......................... 2
EDSD 301 - Teaching Practicum .................... 3
EDSD 4XX - Teaching methods in minor ........ 3
EDSD 4YY - Teaching methods in major ........ 3
EDSD 410 - Student Teaching ....................... 12
EDCI 240D - Multicultural Education ............. 3
EDSD 413C - Professional Issues .................. 2
HDCF 356 - Exceptional Needs (0-21) ............. 3

Note: A student must be admitted into the Teacher Education Program before enrolling in a methods class (EDSD 4XX or EDSD 4YY).

Secondary level endorsement will cover grades five through twelve for all applicants graduating from approved programs. Within the approved programs, emphasis must be placed on student growth and development, behavior, and reading and writing skills. Student teaching and observation periods when combined, must cover both 7-12 and 5-6 grade levels.

Sequencing Your Required Education Courses

The faculty in the Department of Education recommends that any students completing a secondary education program adhere to the following sequence. We want to make sure that you have met all prerequisites when you attempt to enroll in our courses. As you fall behind in this time-line, all subsequent courses should be moved back in time as well.

Note: While we recommend this sequence, there will be some variance, especially between courses taken by the end of the junior year and first semester senior year.

Freshman Year

1st Semester
   HDFC 1501S - Lifespan Human Devlpmt .... 3

or
   HDFC 160 - Hum Dev Birth-Adol

2nd Semester
   EDCI 102 - In-School Experience

Sophomore Year

1st Semester
   EDCI 209 - Ed Psy Adol Dev

Sophomore-Junior Years

Sophomore Year - 2nd Semester through Junior Year - 2nd Semester

   EDCI 320 - Found of Ed Tech
   EDCI 360 - Found of Asmnt
   HDFC 356 - Exceptional Needs 0-21
   EDCI 410 - Student Teaching

Junior-Senior Years

Junior Year - 2nd Semester through Senior Year and Graduation

   EDS 4XX - Teaching methods in minor
   EDS 4YY - Teaching methods in major
   EDCI 360 - Found of Asmnt

Followed by (these two courses will be your last sequence of courses in Secondary Education):

   EDCI 410 - Student Teaching
   EDCI 413C - Professional Issues

Teaching Options Available

Option 1: Major in Secondary Education

Students enroll/major in the Department of Education.
   • General Science Broadfield
   • Social Studies Broadfield
   • Technology Education Broadfield
   • English
   • Chemistry
   • Biology
   • Family and Consumer Sciences
   • Health Enhancement Broadfield
   • Mathematics
   • Modern Languages K-12 (French, German, Spanish)
   • Music (School Music K-12)
   • Physics

Option 2: Subject Area Majors with Teaching Options

Students enroll/major in the appropriate departments outside of the Department of Education. (Also, see “Teacher Education Program” for entrance requirements.)

   • Agricultural Education Broadfield
   • Art Education K-12 Broadfield
   • Music (School Music K-12)
   • Physics
### Option 3: Teaching Minors

- Art K-12
- Biology
- Chemistry
- Earth Science
- Economics
- English
- Family and Consumer Sciences
- Government
- History
- Mathematics
- Modern Languages (French, German, Spanish)
- Physics
- Psychology
- Reading K-12
- Technology Education

### General Science Broadfield Option

The General Science Broadfield program prepares and provides licensure for prospective middle and senior high school teachers for all school science areas. (See “Teacher Education Program” for entrance requirements.)

### GENERAL SCIENCE

#### BROADEFIELD OPTION

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTR 102IH</td>
<td>West Civilization I</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 140D</td>
<td>Modern Asia</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 215</td>
<td>Elements Organic Chem</td>
<td>5</td>
</tr>
<tr>
<td>EDCT 320</td>
<td>Found of Ed Tech</td>
<td>2</td>
</tr>
<tr>
<td>GEO 101</td>
<td>Principles of Physical Geog</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 205</td>
<td>College Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 206</td>
<td>College Physics</td>
<td>2</td>
</tr>
<tr>
<td>HSTR 102IH</td>
<td>West Civilization I</td>
<td>4</td>
</tr>
</tbody>
</table>

### Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOD 101</td>
<td>Biology of Organisms</td>
<td>4</td>
</tr>
<tr>
<td>BIOD 102</td>
<td>Molec &amp; Cellular Biol</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 131</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 132</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>EDCT 102</td>
<td>In-School Experience</td>
<td>1</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 150</td>
<td>Lifespan Human Dev</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 160</td>
<td>Human Dev Birth-Adol</td>
<td>3</td>
</tr>
<tr>
<td>M 170</td>
<td>Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 181</td>
<td>Calclus &amp; Anl Geom</td>
<td>4</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 257</td>
<td>Elements Organic Chim</td>
<td>4</td>
</tr>
<tr>
<td>EDCT 320</td>
<td>Found of Ed Tech</td>
<td>2</td>
</tr>
<tr>
<td>GEO 101</td>
<td>Intro to Physical Geog</td>
<td>4</td>
</tr>
<tr>
<td>GPH 111</td>
<td>Intro to Physical Geog</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 205</td>
<td>College Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 206</td>
<td>College Physics</td>
<td>2</td>
</tr>
<tr>
<td>HSTR 101IH</td>
<td>West Civilization I</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 102IH</td>
<td>West Civilization I</td>
<td>4</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOD 300</td>
<td>Principles of Genetics</td>
<td>5</td>
</tr>
<tr>
<td>BIOD 405</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>EDCT 360</td>
<td>Found of Assmnt</td>
<td>2</td>
</tr>
<tr>
<td>EDCT 240D</td>
<td>Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDSD 400</td>
<td>Lab Safety Seminar</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 311N</td>
<td>Solar System Astronomy</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 356</td>
<td>Exceptional Needs (0-21)</td>
<td>3</td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOD 411</td>
<td>Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOD 450</td>
<td>Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 305</td>
<td>Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>GEO 211</td>
<td>Earth History &amp; Evolution</td>
<td>3</td>
</tr>
<tr>
<td>MB 301</td>
<td>General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>University Core and Elective</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

### Social Studies Broadfield Option

(See “Teacher Education Program” for entrance requirements.)

The Social Studies Broadfield program prepares prospective middle and high school teachers to teach an array of social science areas. Upon completion of this program of study, graduates gain licensure to teach history, government, and other school-level social science subjects.

### SOCIAL STUDIES

#### BROADEFIELD OPTION

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 101W</td>
<td>College Writing</td>
<td>3</td>
</tr>
<tr>
<td>EDS 102</td>
<td>In-School Experience</td>
<td>1</td>
</tr>
<tr>
<td>HSTR 417</td>
<td>History of Science 1500-1800</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 419</td>
<td>History of Science 1800-1900</td>
<td>3</td>
</tr>
<tr>
<td>NAS 320</td>
<td>American Indians in Montana</td>
<td>3</td>
</tr>
<tr>
<td>NAS 405</td>
<td>Gender Issues in Nat Am Studies</td>
<td>3</td>
</tr>
<tr>
<td>NAS 340</td>
<td>Am Indian Literature</td>
<td>3</td>
</tr>
<tr>
<td>NAS 430</td>
<td>Am Indian Edhc</td>
<td>3</td>
</tr>
<tr>
<td>PSCI elective (upper division 300-400)**</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

### Technology Education

##### College of Education

Technology Education is an integrated discipline designed to develop technological literacy as part of all students’ fundamental education. Through the study of past, present, and future technological systems, and their resources, processes, and impacts on society students will better understand the role of technology in society.

The Technology Education Program at MSU is for individuals wishing to teach technology at the middle or high school level or work within industry where a broad understanding of technological concepts is important.
Two technology education options are available to allow for diversity in personal interests and career aspirations. The Broadfield Teaching Option is designed for in-depth study of Technology Education. The Industrial Technology Option is tailored for those individuals who are pursuing a career in industry which requires a broad background in technology plus an understanding of the social impacts of decisions regarding technology.

The Technology Education Program is sequenced into three phases to develop a progression of inter-related information. The foundation phase constitutes the introduction to technology. This introduction forms the base for future study and an understanding of basic technological concepts.

The synthesis phase begins the in-depth study of the primary technology education components of communication, construction, manufacturing, and power/energy. During this phase students in the teaching option are involved in professional education course work and students in the industrial technology option begin selecting course work which is tailored to meet specific career goals.

The capstone phase of the program is structure to integrate the information and experiences of the preceding phases through applied learning activities. Students in the teaching option teach at the middle/high school level. Students in the non-teaching option intern in business and/or industry areas related to their career interests.

TECHNOLOGY EDUCATION
BROADFIELD TEACHING OPTION

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE 207-Materials and Processes</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 121N-Intro to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>COM 110US-Public Communication</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 102-To School Experience</td>
<td>1</td>
</tr>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 150IS-Lifespan Human Devlpmt</td>
<td>3</td>
</tr>
<tr>
<td>TE 101-Intro to Technology Ed</td>
<td>1</td>
</tr>
<tr>
<td>TE 113-Basic Electronics/Comp Networks</td>
<td>2</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 209-Ed Psy Adol Dev</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 360-Found of Asmnt</td>
<td>2</td>
</tr>
<tr>
<td>HDHL 106-Drug Hlth Issue for Ed</td>
<td>1</td>
</tr>
<tr>
<td>M 151Q-Precalculus</td>
<td>4</td>
</tr>
<tr>
<td>TE 230-2D Comp-Aided Drafting</td>
<td>3</td>
</tr>
<tr>
<td>TE 250CS-Technology and Society</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>TE 214-Materials &amp; Safety</td>
<td>3</td>
</tr>
<tr>
<td>MET 314-Mach Tech &amp; Indus Safety</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>ARCH 241-Build Const</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 205-College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>TE 330-Transportation Tech</td>
<td>3</td>
</tr>
<tr>
<td>TE 331-Electronic &amp; Video Communication</td>
<td>4</td>
</tr>
<tr>
<td>TE 417-Mass Producion</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 356-Exceptional Needs 0-21</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

INDUSTRIAL TECHNOLOGY OPTION

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 121N-Intro to Gen Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>COM 110US-Public Communication</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>TE 101-Intro to Technology Ed</td>
<td>1</td>
</tr>
<tr>
<td>TE 113-Basic Electronics</td>
<td>2</td>
</tr>
<tr>
<td>TE 207-Materials and Processes</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>29</td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 205-College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>TE 230-2D Comp-Aided Drafting</td>
<td>3</td>
</tr>
<tr>
<td>M 160Q-Precalculus</td>
<td>4</td>
</tr>
<tr>
<td>M 175Q-Calculus Technology</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>TE 214-Materials Mach &amp; Safety</td>
<td>3</td>
</tr>
<tr>
<td>MET 314-Mach Tech &amp; Indus Safety</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>31</td>
</tr>
</tbody>
</table>

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>AGED 333-Constr Tech</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 241-Build Const</td>
<td>3</td>
</tr>
<tr>
<td>TE250CS-Technology and Society</td>
<td>3</td>
</tr>
<tr>
<td>TE 330-Transportation Tech</td>
<td>3</td>
</tr>
<tr>
<td>TE 331-Electronic &amp; Video Communicatn</td>
<td>4</td>
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<tr>
<td>University Core and Electives</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>31-32</td>
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</table>

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE 417-Mass Production</td>
<td>3</td>
</tr>
<tr>
<td>TE 476-Internship</td>
<td>8</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

Teaching Minors
- Art K-12
- Biology
- Chemistry
- Earth Science
- Economics
- English
- Family and Consumer Sciences
- Government
- History
- Mathematics
- French K-12
- German K-12
- Spanish K-12
- Physics
- Psychology
- Reading K-12
- Technology Education

ART K-12

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART 110RA-2D Art Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>ART 111RA-3D Art Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>ART 112RA-Drawing Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>ART 202RA-Ancient - Medieval Art</td>
<td>4</td>
</tr>
<tr>
<td>ART 203RA-Renaissance-Modern Art</td>
<td>4</td>
</tr>
<tr>
<td>ART 205-Painting</td>
<td>4</td>
</tr>
<tr>
<td>ART 250A-Representational Draw</td>
<td>4</td>
</tr>
<tr>
<td>Take one class from the following:</td>
<td></td>
</tr>
<tr>
<td>ART 206-Metalsmithing</td>
<td>4</td>
</tr>
<tr>
<td>ART 207-Sculpture</td>
<td>4</td>
</tr>
<tr>
<td>ART 208-Ceramics</td>
<td>4</td>
</tr>
<tr>
<td>EDEL 332-Teaching Art</td>
<td>3</td>
</tr>
<tr>
<td>EDS 453-Methods of Teach Art</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>34</td>
</tr>
</tbody>
</table>

BIOLOGY

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 101N-Biology of Organisms</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 102-Molec &amp; Cellular Biol</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 301-Principles of Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 303-Principles of Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 405-Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 406-Rocky Mountain Ecosys</td>
<td>2</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>MB 101N-Unseen Universe: Microbes</td>
<td>3</td>
</tr>
<tr>
<td>MB 301-General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>BIOL 411-Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 430-Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>Biology Electives (except BIOL 100)</td>
<td>3</td>
</tr>
<tr>
<td>EDS 406-Methods of Teach Sec Science</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>29-30</td>
</tr>
</tbody>
</table>
CHEMISTRY

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 340-General Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 211-Elements of Organic Chem</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 361-Elements of Physical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 362-Elements of Physical Chem Lab</td>
<td>1</td>
</tr>
<tr>
<td>CHMY 505 -Crit Concepts in Chem</td>
<td>3</td>
</tr>
<tr>
<td>EDSD 466-Method Teach Sec Science</td>
<td>(3)</td>
</tr>
</tbody>
</table>

EARTH SCIENCE

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 101N-Intro to Physical Geology</td>
<td>4</td>
</tr>
<tr>
<td>GPHY 111CS-Intro to Physical Geography</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 307-Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 303-Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>GEO 205R-Mineralogy</td>
<td>4</td>
</tr>
<tr>
<td>GEO 211-Earth History and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>GEO 312-Dinosaur Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 510-Invertebrate Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>EDSD 466-Methods Teach Sec Sci</td>
<td>(3)</td>
</tr>
</tbody>
</table>

Students who are required to take more than 8 credits listed above in their major must take additional elective physical science courses in the Earth Sciences, Geography, or Geology rubric with the advice and consent of their minor advisor in Earth Sciences.

ECONOMICS

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 101E-Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202-Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS294S-Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 313-Money and Banking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 319-Intro Micro with Econ Ed Apps</td>
<td>3</td>
</tr>
<tr>
<td>EDS 458-Method Teach Soc Study</td>
<td>3</td>
</tr>
</tbody>
</table>

NOTE: ECNS 251 (Honors Economics, 4 credits) may be substituted for the three-course sequence: ECNS 101, ECNS 202, and ECNS 204.

ENGLISH

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIT 110H-Intro to Lit.</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>LIT 249-Bible as Lit.</td>
<td>3</td>
</tr>
<tr>
<td>LIT 223-Classical Foundations of Lit.</td>
<td>3</td>
</tr>
<tr>
<td>LIT 225-British Lit I.</td>
<td>3</td>
</tr>
<tr>
<td>LIT 224-British Lit II.</td>
<td>3</td>
</tr>
<tr>
<td>LIT 210-Survey of Am Lit I</td>
<td>3</td>
</tr>
<tr>
<td>LIT 211-American Lit II</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201-College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 338-Language for Teachers</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>LIT 300-Literary Criticism</td>
<td>3</td>
</tr>
<tr>
<td>LIT 308-Multicultural Lit</td>
<td>3</td>
</tr>
<tr>
<td>LIT 440-Studies in World Lit</td>
<td>3</td>
</tr>
<tr>
<td>LIT 337-Oral Traditions</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 461-Integrative Teaching Methods</td>
<td>3</td>
</tr>
<tr>
<td>EDS 457-Methods Teach Engl</td>
<td>3</td>
</tr>
</tbody>
</table>

FRENCH K-12

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRCH 101-Elementary French I</td>
<td>4</td>
</tr>
<tr>
<td>FRCH 102D-Elementary French II</td>
<td>4</td>
</tr>
<tr>
<td>FRCH 201D-Intermediate French I</td>
<td>4</td>
</tr>
<tr>
<td>FRCH 220D-French Lang Culture</td>
<td>3</td>
</tr>
<tr>
<td>Select three credits from the following:</td>
<td></td>
</tr>
<tr>
<td>FRCH 303-Histoire Civilisation</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 320-La France Aujourd Hui</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 323-Adv Grammar &amp; Comp</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 324-Adv Comp &amp; Phonetic</td>
<td>3</td>
</tr>
<tr>
<td>Select three credits from the following:</td>
<td></td>
</tr>
<tr>
<td>FRCH 401-French Literature I</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 402-French Literature II</td>
<td>3</td>
</tr>
<tr>
<td>EDS 462-Methods of Teach Mod Lang</td>
<td>4</td>
</tr>
</tbody>
</table>

GERMAN K-12

Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRMN 101-Elementary German I</td>
<td>4</td>
</tr>
<tr>
<td>GRMN 102D-Elementary German II</td>
<td>4</td>
</tr>
<tr>
<td>GRMN 210D-Intermediate German I</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 220D-German Language &amp; Cult</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 330-Adv Gram Comp I</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 331-Adv Gram Comp II</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 401-linguistics-Phonetics</td>
<td>3</td>
</tr>
<tr>
<td>Select three credits from the following:</td>
<td></td>
</tr>
<tr>
<td>ML 544-Instr Perspectives</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 550-German Culture &amp; Civilization</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 503IH-Issues of German Cinema</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 515-Survey of German Literature</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 520-Contemporary German Literature</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 540R-Sem: German Lit &amp; Cult</td>
<td>3</td>
</tr>
</tbody>
</table>

GOVERNMENT

Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSCE 210H-Intro to American Government</td>
<td>6</td>
</tr>
<tr>
<td>PSCE 246-American Presidency</td>
<td>3</td>
</tr>
<tr>
<td>PSCE 306-Legislative Process</td>
<td>3</td>
</tr>
<tr>
<td>PSCE 471-American Constitutional Law</td>
<td>3</td>
</tr>
<tr>
<td>PSCE 314-Political Parties and Elections</td>
<td>3</td>
</tr>
<tr>
<td>PSCE 316P-Media and Politics</td>
<td>3</td>
</tr>
<tr>
<td>PSCE 411-Montana Local Politics</td>
<td>3</td>
</tr>
<tr>
<td>PSCE 416-Politics of Food and Hunger</td>
<td>3</td>
</tr>
<tr>
<td>PSCE 429-International Human Rights</td>
<td>3</td>
</tr>
<tr>
<td>EDS 458-Methods of Teaching Social Studies</td>
<td>3</td>
</tr>
</tbody>
</table>

The Department offers a Teaching Minor in History to strengthen the academic portfolios of non-majors preparing for teaching careers. Students are required to consult with the Department's certification officer prior to declaring the Teaching Minor.

HISTORY

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 101H-Western Civilization I</td>
<td>4</td>
</tr>
<tr>
<td>HIST 102H-Western Civilization II</td>
<td>4</td>
</tr>
<tr>
<td>HIST 102H-American History I</td>
<td>4</td>
</tr>
<tr>
<td>HIST 102H-American History II</td>
<td>4</td>
</tr>
<tr>
<td>HIST 102D-Latin American History</td>
<td>4</td>
</tr>
<tr>
<td>HIST 140D-Asian History</td>
<td>4</td>
</tr>
<tr>
<td>HIST 160D-World History</td>
<td>4</td>
</tr>
</tbody>
</table>

All required:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDS 458-Methods Teach Soc Studies</td>
<td>3</td>
</tr>
</tbody>
</table>
### MATHEMATICS
A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q-Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>M 273Q-Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 242-Methods of Proof</td>
<td>3</td>
</tr>
<tr>
<td>M 328-Higher Math for Sec Teachers</td>
<td>5</td>
</tr>
<tr>
<td>M 329-Modern Geometry</td>
<td>3</td>
</tr>
<tr>
<td>M 426-Modeling for Teachers</td>
<td>3</td>
</tr>
<tr>
<td>STAT 352-Elementary Statistics</td>
<td>3</td>
</tr>
<tr>
<td>EDSM 461-Meth Teach Sr Hi Math</td>
<td>(3)</td>
</tr>
</tbody>
</table>

### PHYSICS
A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 211-Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 221-Hours Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212-Gen &amp; Mod Phys II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 222-Hours Gen &amp; Mod Phys II</td>
<td>4</td>
</tr>
<tr>
<td>EDSM 466-Method Teach Sc ISc</td>
<td>(3)</td>
</tr>
<tr>
<td>PHYS 213-Gen &amp; Mod Phys III</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 351-Intro Theoretical Phys</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 361-Physical Measurements I</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 361-Physical Measurements II</td>
<td>2</td>
</tr>
</tbody>
</table>

### PSYCHOLOGY
A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 100S-Intro to Psychology</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 221-Research Design &amp; Analysis I</td>
<td>4</td>
</tr>
<tr>
<td>PSYX 251-Research Design &amp; Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 350-Physiological Psychology</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 354-Sensation &amp; Perception</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 370-Psychology of Learning</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 390-Memory and Cognition</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 340-Abnormal Psychology</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 360-Social Psychology</td>
<td>3</td>
</tr>
<tr>
<td>EDSM 458-Method Teach Soc Study</td>
<td>(3)</td>
</tr>
</tbody>
</table>

### READING K-12
A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 406-Young Adult Literature</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 434-Literacy Assessment and Instruction</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 491-Intro to Instruction Ldrshp for Lit Ed</td>
<td>3</td>
</tr>
</tbody>
</table>

### SPANISH K-12
Select three credits from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 101-Elementary Spanish I</td>
<td>4</td>
</tr>
<tr>
<td>SPNS 102D-Elementary Spanish II</td>
<td>4</td>
</tr>
<tr>
<td>SPNS 201D-Intermediate Spanish I</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 220D-Spanish Language &amp; Culture</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 323-Adv Grammar &amp; Phonetics</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 324-Spanish Adv Conversat &amp; Comp</td>
<td>3</td>
</tr>
</tbody>
</table>

### TECHNOLOGY EDUCATION
A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.50 or higher.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE 207-Materials and Processes</td>
<td>4</td>
</tr>
<tr>
<td>AGED 333-Const Tech</td>
<td>3</td>
</tr>
<tr>
<td>TE 406-Curr &amp; Facilities Plan</td>
<td>3</td>
</tr>
<tr>
<td>TE 101-Intro to Technology Ed</td>
<td>1</td>
</tr>
<tr>
<td>TE 290-2D Comp Aided Drafting</td>
<td>3</td>
</tr>
<tr>
<td>TE 330-Transportation Tech</td>
<td>3</td>
</tr>
<tr>
<td>TE 331-Electronic &amp; Video Communicat</td>
<td>4</td>
</tr>
<tr>
<td>TE 417-Manufacturing Technology</td>
<td>3</td>
</tr>
<tr>
<td>EDSM 452-Methods Teach Ag &amp; TE</td>
<td>(3)</td>
</tr>
</tbody>
</table>

### Health and Human Development
**College of Education, Health and Human Development**
http://www.montana.edu/hhd/

The Department of Health and Human Development prepares students for careers that are dedicated to the enrichment of human well-being. Consequently, rewarding career opportunities are available to graduates within human service professions in private, educational, and public settings. Specific areas of study include community health, dietetics/nutrition science, exercise science/kinesiology, early childhood education and child services, and family and consumer sciences. Students interested in teaching can pursue programs in family and consumer sciences and health enhancement (health and physical education) K-12.

Health and Human Development offers graduate master's-level degrees with options in counseling, including marriage and family counseling, mental health counseling, and school counseling; family and consumer sciences, including early childhood education and family science; family financial planning; exercise and nutrition sciences; and health promotion and education. (See the graduate catalog for further information on graduate programs.)

In addition to the career options, the department offers a variety of recreational activity courses. Some physical activity courses are offered as a service to the general student population with no prerequisite. These include skiing, fly fishing, bowling, billiards, etc. User fees for HHD 100 and some courses are charged. The fees vary depending on the activity. Each student enrolling in an activity course will be asked to sign an activity course waiver and release form.

**Mission Statement**

The Department of Health and Human Development strives to enrich human well-being through teaching, research, and outreach.

**Degrees and Options**

The department offers six Bachelor of Science degrees. They include a B.S. in Community Health; a B.S. in Early Child Education and Child Services; a B.S. in Family and Consumer Sciences with Teaching or Nonteaching options; a B.S. in Food and Nutrition with options in Dietetics, Nutrition Science; a B.S. in Health Enhancement K-12 (health and physical education teaching); and a B.S. in Health and Human Performance with options in Exercise Science or Kinesiology. For students who wish to pursue an interdisciplinary B.S. in Sustainable Food and Bioenergy Systems, the department offers an option in Sustainable Food Systems.

The department offers a Master of Science in Health and Human Development with options in Counseling (including marriage and family counseling and mental health counseling); Family and Consumer Sciences (including...
early childhood education and family science); Family Financial Planning; Exercise and Nutrition Sciences; and Health Promotion and Education.

The department offers a Master of Education in School Counseling.

Minor Fields of Study

Minors provide a concentration of courses outside the student’s major and are intended to complement major course work. The minor is posted on the student’s transcript. Minors are available in Coaching and in Child Services. A teaching minor is available in Family and Consumer Sciences. (See the course requirements on minors in the appropriate section of this catalog.)

Degree Requirements

Bachelor of Science degrees in Community Health, Early Childhood Education and Child Services, Family and Consumer Sciences (nonteaching), Food and Nutrition, and Health and Human Performance shall be conferred upon the successful completion of specified requirements and a minimum of 120 credits. The Bachelor of Science degrees in the teaching options of Family and Consumer Sciences and Health Enhancement K-12 (health and physical education) shall be conferred upon the successful completion of specified requirements and a minimum of 128 credits. All undergraduate students must complete a minimum of 42 upper division credits.

The Master of Science in Health and Human Development shall be conferred upon completion of specified requirements and a minimum of 30 credits for the options of Family and Consumer Sciences, Exercise and Nutrition Sciences, and Health Promotion and Education. A minimum of 42 credits is required for the Family Financial Planning program. A minimum of 60 credits is required in the graduate Counseling programs. The Master of Education in School Counseling carries a minimum of 48 credits. (See the graduate catalog for further information.)

Certifications and Licensures

Certifications and licensures are dependent on the student’s eligibility to sit for certification and licensing examinations and passing those examinations. Several fields of study in the Department of Health and Human Development prepare students to sit for certification and licensing examinations. Many, but not all, certifications and licensures are offered as post-baccalaureate opportunities. See your advisor for additional information. The following certifications are related to Health and Human Development disciplines:

Accredited Family Financial Counselor

The Department of Health and Human Development offers a three-course series (HDCF 338 Personal and Family Finance I, HDCF 339 Personal and Family Finance II, and HDCF 342 Family Financial Counseling) that can aid students in becoming credentialed as an Accredited Financial Counselor (AFC). The AFC credential is offered nationally through the Institute for Personal Finance. The credential requires two tests, an internship and a year of work experience in helping consumers and families with financial matters. The three courses prepare students to take the two tests. The department then helps the student find placement for an internship in helping consumers and families with finances. The AFC credential allows students to credibly indicate their expertise in personal and family finance to potential employers.

Certified in Family and Consumer Sciences

Students completing the Family and Consumer Sciences major and the restricted electives will be eligible to sit for the Certification in Family and Consumer Sciences (CFCS) exam set by the American Association of Family and Consumer Sciences. The CFCS credential communicates to others within and outside of the profession that the individual certified in family and consumer sciences possesses a broad professional knowledge base in the field.

Certified Family Life Educator

Students completing the Family and Consumer Sciences major and the restricted electives will be eligible to apply for the CFLE granted by the National Council on Family Relations. Interested Community Health students may also complete additional courses and apply for provisional certification. Certified Family Life Educators serve as consultants, directors, educators, and coordinators in settings such as social services, child care, health and welfare, recreation, youth programs, community action, drug/alcohol rehabilitation centers, senior citizen programs, parent education, family service agencies, extension, and retirement/convalescent care centers.

Certified Health Education Specialist

Completion of the Community Health major establishes eligibility to sit for the Certified Health Education Specialist examination (CHES). The CHES exam measures the possession, application, and interpretation of knowledge essential to the practice of community health/health education. The CHES certification is a national standard for health education practice and assists employers in identifying qualified health education practitioners.

Certified Personal Trainer/ Certified Strength Coach

The National Strength and Conditioning Association provides opportunities to become a certified personal trainer or a certified strength coach.

Coaching Certification

Faculty in Health and Human Development partner with the Montana High School Association (MHSHA) in the development and implementation of a coaching certification program. Although MHSHA awards the certification, successful completion of the Coaching Concentration offered in the department will prepare the future coach for the profession.

Family and Consumer Sciences Teacher

The Family and Consumer Sciences Teacher Preparation program is designed for students who want to become teachers of Family and Consumer Sciences in public or private schools. Upon completion of the degree, students are eligible for licensure from the State of Montana in teaching grades 5-12.

Health Enhancement (Health and Physical Education) K-12 Teacher

The Health Enhancement K-12 Teacher Preparation program is designed for students who want to become teachers of Health Enhancement (Health Education/Physical Education) in public or private schools. Upon completion of the degree, students are eligible for licensure from the State of Montana in teaching grades K-12 with reciprocity in other states.
Health Fitness Instructor and Exercise Test Technologist

The American College of Sports Medicine, the premier organization for health/fitness professionals and clinicians, offers the Health/Fitness Instructor and Exercise Test Technology certifications at sanctioned test locations throughout the Pacific Northwest. The certification exams include written and practical components that emphasize the application of knowledge and hands-on skills typically acquired in an undergraduate Exercise Science or Kinesiology program.

Licensed Professional Counselor or Licensed Clinical Professional Counselor

Counseling programs in the graduate program in Health and Human Development lead to the opportunity to become licensed in Montana as a Licensed Professional Counselor (LPC) or Licensed Clinical Professional Counselor (LCPC). Following completion of a master’s degree, the student must complete a minimum of 1500 hours of supervised counseling practice prior to sitting for and passing the LPC examination.

Registered Dietitian

The Food and Nutrition Dietetics option gives the students an opportunity to apply to a national post-baccalaureate supervised practice/dietetic internship. Upon its completion, the student may sit for the RD examination given by the Commission on Dietetic Registration, the credentialing agency for The American Dietetic Association. The RD status enables a person to become licensed in Montana as a Licensed Nutritionist by the Board of Medical Examiners.

Academic Advisors

The Health and Human Development academic advising office, staffed with academic advisors to serve the needs of students, is located in Hosaecus PE Complex. Students are expected to meet with an advisor each semester to discuss their plan of study, select courses, and register for courses. In addition, students are encouraged to meet with an academic advisor to discuss issues and questions regarding professional programs, career opportunities, and academic concerns. Academic advisors can assist students to appropriate referrals when necessary.

To receive advising or to inquire about programs in the Department of Health and Human Development, contact the Health and Human Development Advising Center by phone at 406.994.4001 or by e-mail at hhd advis ing@montana.edu.

Course Requirements and Curricula for Majors

The curriculum and specific course requirements for each major and minor are available in the Department of Health and Human Development and are listed below.

Curricula in Health and Human Development

COMMUNITY HEALTH MAJOR

Graduates of the community health major are employed in entry-level positions conducting planning, administration, evaluation, research, and teaching in community health settings. The undergraduate program is concerned with improving health and well-being for all through the promotion of healthful lifestyles, healthy family functioning, community actions for health, and conditions that make it possible to live healthful lives. The program draws on public health, education, psychology, sociology, family science, and other social and behavioral sciences. Students are prepared to work in a variety of settings including family planning agencies, nonprofit agencies, state and federal health agencies, schools, and community health centers. This program stresses community involvement because community health emphasizes an interactive process in which target populations are active participants in their health, rather than passive recipients. Student involvement will take the form of class assignments, practicum, internships, and service. Students will be prepared to assess individual and community needs; plan, implement, and evaluate effective health programs; coordinate provision of services; act as a resource person; and communicate health needs, concerns and resources.

Persons enrolling in this option should seriously consider earning a graduate degree in public health or some related area at some point in their career. Students must receive a grade of “C” or higher in all required courses as outlined in the major.

Completion of the community health major establishes eligibility to sit for the Certified Health Education Specialist (CHES) examination. The CHES exam measures the possession, application, and interpretation of knowledge essential to the practice of community health/education. The CHES certification is a national standard for health education practice and assists employers in identifying qualified health education practitioners.

Interested students may also complete additional courses and apply for provisional certification for the Certified Family life Educator (CFLE) program accredited by the National Council on Family Relations.

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>COM 110US-Public Communication</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 150US-Lifespan Human Development</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 221-Health Anatomy and Physiology</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 262-Well-Being Principles &amp; Practices</td>
<td>3</td>
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<tr>
<td>Math Any 100 level Math course or Math Placement test</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 100IS-Intro to Psychology</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 101IS-Introduction to Sociology</td>
<td>3</td>
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<tr>
<td>WRIT 101W-College Writing</td>
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Sophomore Year

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>HDFC 263-Relation &amp; Family System</td>
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</tr>
<tr>
<td>HDEN 221CS-Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>HDHE 230-Drugs and Society</td>
<td>3</td>
</tr>
<tr>
<td>HDHE 240-Human Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 221-Health Anatomy &amp; Physiology</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q-Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 221-Intermediate Tech Writing</td>
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Junior Year

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>BCHM 104RN-Biochem of Health NS Major</td>
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<tr>
<td>MB 201-Infectious Disease</td>
<td>3</td>
</tr>
<tr>
<td>PSIC 210IS-Intro to American Government</td>
<td>3</td>
</tr>
<tr>
<td>PSIC 214S-Principles of Political Sci</td>
<td>3</td>
</tr>
<tr>
<td>PSIC 265-Intro to State &amp; Local Govt</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 201-Social Problems</td>
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Total: 30

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
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<td>Freshman</td>
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<tr>
<td>Sophomore</td>
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<tr>
<td>Junior</td>
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<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>HDPE 395-Theories of Helping Relationships</td>
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</tr>
<tr>
<td>HDPE 421-Research Methods</td>
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</tr>
<tr>
<td>HDPE 464-Gen.Race.Clas &amp; Fam Dev</td>
<td>3</td>
</tr>
<tr>
<td>HDHE 410-Human Response to Stress</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 425-Health Psychology</td>
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Take one of the following

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HDFC 509-Aging and Adult Devel</td>
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<tr>
<td>HDFC 429-Sm Business Oper in HHID</td>
<td>3</td>
</tr>
<tr>
<td>HDEN 451-Sustainable Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>HDHE 451-Health and Healing</td>
<td>3</td>
</tr>
<tr>
<td>MED 462-Health Care Systems</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 469-Social Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 338-Biomedical Ethics</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 462-Psychology of Prejudice</td>
<td>3</td>
</tr>
<tr>
<td>Any 300 or 400 level SOCI course</td>
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<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>University Core and Electives</td>
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<td></td>
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### EARLY CHILDHOOD EDUCATION AND CHILD SERVICES MAJOR

The early childhood education and child services major emphasizes the dual focus of education and services within the context of families, educational and child service settings, communities, and society. The major focuses on early childhood education, child development, developmentally appropriate practices, early intervention with children with special needs, assessment and intervention, advocacy, program administration, and working directly with children and families in a variety of early childhood and service settings. The early childhood education and child services major provides a strong background for students seeking careers in a wide variety of settings including early childhood education, child care-related programs and businesses, early intervention with children with special needs and preschool special education settings, child services and child-focused community agencies, state or federal agencies, nonprofit settings that support children and families, and administrators of child service programs. Additionally, this program provides a distance education program to Montana Tribal Colleges and respective Head Start Programs through the Early Childhood Education Distance Partnership Program.

The early childhood education and child services major provides a strong background for admission to graduate programs in early childhood education, child development, child and family studies, social work, counseling, and other related behavioral and social science disciplines. Students must receive a grade of "C" or higher in all required courses as outlined in the major.

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HDCF 425R-Family Law and Public Policy</td>
<td>3</td>
</tr>
<tr>
<td>HDHL 452-Health Disparities</td>
<td>3</td>
</tr>
<tr>
<td>HDHL 440-Principles of Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>HDHL 445-Prog Planning &amp; Eval in Health</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 415-Mgmt in Health Enhancement &amp; Fitness</td>
<td>3</td>
</tr>
<tr>
<td>HHD 476-Internship</td>
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</tr>
<tr>
<td>University Core and Electives</td>
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<td><strong>Total</strong></td>
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<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 160-Early Childhood-Adolescence</td>
<td>3</td>
</tr>
<tr>
<td>Math-Min 106 level Math course or Math Placement test</td>
<td>3</td>
</tr>
<tr>
<td>US 101US-First Year Seminar</td>
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<tr>
<td>Supporting Courses</td>
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<td>University Core</td>
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<td><strong>Total</strong></td>
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<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HDCF 250-Signing Exact English I</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 265-Relations in Family System</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 271-Paraprofessional</td>
<td>3</td>
</tr>
<tr>
<td>HDPN 221CS-Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>NAS 201D-American Indians in Montana</td>
<td>3</td>
</tr>
<tr>
<td>Supporting Courses</td>
<td>11</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCF 319-Theories &amp; Skills Help Relation</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 356-Relations &amp; Mgmt in ECE</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 352-Curriculum for ECE</td>
<td>4</td>
</tr>
<tr>
<td>HDCF 355-Exceptional Children</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 357-Exceptional Children Lab</td>
<td>1</td>
</tr>
<tr>
<td>HDCF 371-Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>Supporting Courses</td>
<td>13</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCF 432-Social Competence in EC</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 442-Literacy in EC</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 454-Practicum in EC Teach</td>
<td>5</td>
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<tr>
<td>HDCF 455R-Admin of Human Svc Proc</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 458-Assess &amp; Intervention</td>
<td>4</td>
</tr>
<tr>
<td>HDCF 466-Health &amp; Movement in EC</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

### FAMILY AND CONSUMER SCIENCES MAJOR

The Family and Consumer Sciences (FCS) profession is dedicated to enhancing the relationships among individuals, families, communities and the environments in which they function. The family and consumer sciences profession takes leadership in improving individual, family, and community well-being; impacting the development, delivery, and evaluation of consumer goods and services; influencing the creation of policy; and shaping societal change, thereby enhancing the human condition.

Students in FCS take a common core of foundation courses in content areas based upon American Association of Family and Consumer Sciences (AAFCS) standards. In addition, students take restricted supporting courses in the program.

Both teaching and nonteaching options are available.

Both teaching and nonteaching options take the following core classes:

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCF 338-Surv of Family Finance &amp; Cons Iss</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 160-Early Childhood-Adol Devel</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 239-Contemp Consumer Issues</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 263-Relationships &amp; FamilySys</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 338-Personal and Family Finance I</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 371-Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 425R-Family Law &amp; Public Policy</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 457-Managing Work and Family</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 440-Parenting</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 447-Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 549-Gen.Race,Class &amp; Fam Div</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 212G-Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 240-Human Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 410-Human Response to Stress</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

### Nonteaching Option

The family and consumer sciences nonteaching option emphasizes the family as a dynamic social unit and examines diverse families in contemporary society. The program focuses on family behavior, strengths, and challenges using family-specific theoretical frameworks (family systems, family crisis) and research methods. Social, cultural, historical, political, and economic trends that influence family functioning and well-being are addressed. Students study a wide range of family issues including development across the lifespan, changing family structures, intergenerational relations. Additionally, human response to stress and crisis, family policies and laws, family finance and economics, work and family issues, and human service delivery and decision-making are included.

The family and consumer sciences nonteaching option provides a strong background for students seeking careers in human services, family life education, family policy, and financial counseling. However, graduate training will be necessary for students wishing to enter the counseling/therapy fields. The curriculum prepares students to work in a wide range of organizations and settings, state or federal agencies, nonprofit settings, and for admission to graduate programs in family science, family resource management, human development, social work, law, and other related behavioral and social science disciplines. Also, graduates of the program may be involved in family-owned business and work in occupations requiring knowledge of family finance including financial counseling.
Students completing the degree may apply for provisional certification as a Certified Family Life Educator. MSU’s family and consumer sciences major is accredited by the National Council on Family Relations. Provisional certification is awarded at the completion of a baccalaureate degree and course work in the 11 family life substance areas. After two years’ work experience, you may apply for full CFLE certification. Students must receive a grade of “C “ or higher in all required courses as outlined in the major.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>HDFC 138--Surv Fam Finance &amp; Cons Iss</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 160--Early Child-Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>HHD 175--Well-Being Principles &amp; Practices</td>
<td>3</td>
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<tr>
<td>US 101US--First Year Seminar</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W-College Writing</td>
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<tr>
<td>Univ Core (D,IA,US) and Electives</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>HDFC 259--Contemp Consumer Iss</td>
<td>3</td>
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<tr>
<td>HDFC 263--Relationships in Family Systems</td>
<td>3</td>
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<tr>
<td>HDFN 221CS--Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>HDHL 230--Drugs and Society</td>
<td>3</td>
</tr>
<tr>
<td>HDHL 249--Human Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q-Intro to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Univ Core (D,IA,US) and Electives</td>
<td>11-15</td>
</tr>
</tbody>
</table>

Note: STAT 216 must be completed with passing grades of “C “ or better, before taking upper division courses.

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HDFC 338--Pers &amp; Family Finance I</td>
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<tr>
<td>HDFC 360--Adult Devel &amp; Aging</td>
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<tr>
<td>HDFC 371--Research Methods</td>
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<td>HHD 175--Well-Being Principles &amp; Practices</td>
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<tr>
<td>HDHL 410--Human Response to Stress</td>
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<tr>
<td>STAT 216Q-Intro to Statistics</td>
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</tr>
<tr>
<td>Univ Core (D,IA,US) and Electives</td>
<td>11-15</td>
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</table>

Additional courses as outlined in the major.

**Senior Year**

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>HDFC 429--Small Business Operations</td>
<td>3</td>
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<tr>
<td>HDFC 437--Managing Work &amp; Family</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 449--Parenting</td>
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</tr>
<tr>
<td>HDFC 447--Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 464--Gen Ed, Race, Class &amp; Div</td>
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<tr>
<td>HDFC 429--Small Business Operations</td>
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</tr>
<tr>
<td>HDFC 437--Managing Work &amp; Family</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 449--Parenting</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 447--Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 464--Gen Ed, Race, Class &amp; Div</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 429--Small Business Operations</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 437--Managing Work &amp; Family</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 449--Parenting</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 447--Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 464--Gen Ed, Race, Class &amp; Div</td>
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<tr>
<td>HDFC 429--Small Business Operations</td>
<td>3</td>
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<tr>
<td>HDFC 437--Managing Work &amp; Family</td>
<td>3</td>
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<tr>
<td>HDFC 449--Parenting</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 447--Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 464--Gen Ed, Race, Class &amp; Div</td>
<td>3</td>
</tr>
</tbody>
</table>

**Teaching Option**

Family and consumer sciences students learn to work through credit and not-for-credit education systems to empower individuals and families across the lifespan to manage the challenges of living and working in a diverse, global society. The unique focus is on families, work, and their interrelationships. The curriculum at MSU is in synch with the National Standards for Family and Consumer Sciences Teachers and the National Standards for Family and Consumer Sciences Students. Therefore, students choosing this option will be well qualified to seek employment in a variety of educational settings including secondary public and private schools, extension, and public and private agencies. Students completing the program successfully will qualify for a Montana teaching license in Family and Consumer Sciences grades 5-12. Students are encouraged to complete the Certified Family Life Educator and Accredited Financial Counselor designations as well as a teaching minor in a second field while attending MSU to further increase their professional opportunities.

Additionally, the family and consumer sciences major prepares undergraduate students to pursue graduate degrees in a variety of areas including family and consumer sciences, curriculum and instruction, school counseling, and adult education. Students must receive a grade of “C “ or higher in all required courses as outlined in the major.

Note: The family and consumer sciences teaching option requires 128 credits.

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE 161--Intro to Design</td>
<td>3</td>
</tr>
<tr>
<td>EDSD 102--In School Experience</td>
<td>1</td>
</tr>
<tr>
<td>HDFC 138--Surv Fam Finance &amp; Cons Iss</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 150B--Lifespan Human Development</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 160--Early Child-Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>HDHL 106--Drug Health Issues for Ed</td>
<td>3</td>
</tr>
<tr>
<td>M 1ax = “C “ or better in any 100-level or above Math course or Math placement test within the past 12 months needed as prerequisite for STAT 216Q.</td>
<td>0.5</td>
</tr>
<tr>
<td>WRIT 101W-College Writing</td>
<td>3</td>
</tr>
<tr>
<td>Univ Core (USIA,BH,IN,IS) and Electives</td>
<td>12</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDFC 429--Small Business Operations</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 437--Managing Work &amp; Family</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 449--Parenting</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 447--Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 464--Gen Ed, Race, Class &amp; Div</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 429--Small Business Operations</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 437--Managing Work &amp; Family</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 449--Parenting</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 447--Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 464--Gen Ed, Race, Class &amp; Div</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 429--Small Business Operations</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 437--Managing Work &amp; Family</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 449--Parenting</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 447--Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 464--Gen Ed, Race, Class &amp; Div</td>
<td>3</td>
</tr>
</tbody>
</table>

**Food And Nutrition Major**

The Department of Health and Human Development offers a major in the study of food and nutrition. Students who choose the nutrition science option intend to pursue a health profession or research-related career, for example, medicine, dentistry, industry, academia, etc.

**Dietetics Option**

The dietetics option at Montana State University-Bozeman has been granted initial accreditation as a Didactic Program in Dietetics by the Commission on Accreditation for Dietetics Education (CADE) of the American Dietetic Association (ADA), a specialized accrediting body recognized by the Council on Higher Education Accreditation and the United States Department of Education, 120 Riverside Plaza, Suite 200, Chicago, IL 60606-6995, (312) 899-0040, x. 5400. A graduate will attain a verification statement upon completing the CADE-approved dietetics program curriculum in addition to a minimum of a “C “ or better in each required course at graduation. A graduate is then eligible to apply for a CADE-accredited supervised practice/dietetic internship or other post-baccalaureate experience. Upon completion of the post-graduate dietetic internship, students are eligible to take the national registration exam for dietitians. Once the individual has passed the exam, the individual is then a “registered dietitian.” The dietetics option has a strong foundation in food and...
nutrition, food service management, and science components. Registered dietitians may find employment in health care facilities; industrial, school, and university food services; community nutrition services; private practice; sales for food service or health products; and other related fields.

**Nutrition Science Option**

The nutrition science option is designed to prepare a student for admission to medical (allopathic or osteopathic), dental, or graduate school with an emphasis on nutrition and biochemistry. A student can receive a verification statement if additional didactic program in dietetics course requirements are met. Although the nutrition science option provides a strong background for most professional schools, students must contact individual schools for specific post-baccalaureate entrance requirements. Information about degree requirements can be obtained from the Health and Human Development advising office, Hosaues PE Complex.

**Standards of Work**

Students must receive a grade of “C” or higher in all required courses as outlined in the major.

### DIETETICS OPTION

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>COM 110US-Public Communication</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W-College Writing</td>
<td>1</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>ECNS 101S-Economic Ways of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 138-Surv Family Finance &amp; Cons Iss.</td>
<td>3</td>
</tr>
<tr>
<td>HDFC 239-Contemporary Consumer Issues</td>
<td>3</td>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>M 097Q-Survey of Algebra (or higher)</td>
<td>3</td>
</tr>
<tr>
<td>M 145Q-Math for Liberal Arts</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>HDFC 150S-Lifespan Human Development</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 1005-Survey to Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
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</tr>
<tr>
<td>ANTH 101D-Intro to Anthropology</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 101S-Intro to Sociology</td>
<td>3</td>
</tr>
<tr>
<td>University Core</td>
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</tr>
</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDFN 321-Nutrition in the Lifecycle</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 322-Culinary Skills &amp; Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 325-Culinary Mgmt Practicum</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 351-Nutrition and Society</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 401-Nutrition Assmt &amp; Counseling</td>
<td>3</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDFN 406-Seminar</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 421-Micronutrient Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 422-Micronutrient Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 425-Medical Nutritional Therapy IV</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 426-Medical Nutritional Therapy II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Health And Human Performance Major**

The undergraduate major in Health and Human Performance (HHP) at Montana State University is a general pre-health professional curriculum that prepares students for health-related graduate programs (e.g., physical therapy, occupational therapy, medical school, etc.), exercise science graduate programs (e.g., exercise physiology, health promotion, biomechanics), as well as entry-level occupations within the health and wellness industry. HHP majors can choose to focus their coursework within one of the following curriculum options: exercise science or kinesiology. Students within the exercise science option intend to pursue a health-related graduate degree to meet their career aspirations, whereas students within the kinesiology option will pursue careers within the health and wellness industry that do not require a graduate degree.

**Exercise Science Option**

The exercise science option within the Health and Human Performance (HHP) major focuses on both clinical and performance-based understandings of human movement. The exercise science option emphasizes a cross-disciplinary understanding of human movement through non-departmental courses in biology, anatomy and physiology, chemistry, physics, math, and statistics. These courses then serve as the foundation for mechanical (e.g., biomechanics), physiological, and nutritional perspectives within the departmental courses. The exercise science option specifically allows students to customize their junior and senior year courses as needed for later application to health-related graduate programs in physical therapy, occupational therapy, medical physician assistant, sports medicine, exercise science graduate programs (exercise physiology, health promotion, biomechanics), as well as medical school. Additional careers for
exercise science students can include those within the health and fitness industry (e.g., those requiring ACSM Certified Health Fitness Specialist and/or Certified Clinical Exercise Specialist certifications), corporate wellness programs, exercise rehabilitation programs (cardiac rehabilitation, gait laboratories, sport medicine facilities, older adult programs, etc.), as well as careers in the sport and rehabilitative medicine equipment industries. Regardless of a student’s career goals, each student’s course work will culminate in one of the following “capstone experience” courses: HDPE 465, Exercise Testing and Prescription; HDPE 489/490, Undergraduate Research; or a preapproved internship (HHD 476).

Students must receive a grade of “C” or higher in all required courses as outlined in the major.

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 102-Molecular &amp; Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>M 101Q-Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>PSYX 109Q-Intro to Psychology</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>9-11</td>
</tr>
<tr>
<td><strong>Freshman Year Credits</strong></td>
<td>28-31</td>
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### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOL 207-Anatomy &amp; Physiology I</td>
<td>4</td>
</tr>
<tr>
<td>HDFN 221CS-Human Nutrition</td>
<td>5</td>
</tr>
<tr>
<td>HDPE 222-Foundations of Exercise Science</td>
<td>3</td>
</tr>
<tr>
<td><strong>Take one of the following sequences:</strong></td>
<td></td>
</tr>
<tr>
<td>PHNS 203-College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHNS 206-College Physics II</td>
<td>4</td>
</tr>
<tr>
<td>PHNS 211-General &amp; Mod Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHNS 212-General &amp; Mod Physics II</td>
<td>4</td>
</tr>
<tr>
<td>STAT 216Q-Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q-Intermediate Statistical Concepts</td>
<td>3</td>
</tr>
<tr>
<td><strong>Sophomore Year Credits</strong></td>
<td>29-32</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 298-Anatomy &amp; Physiology II</td>
<td>4</td>
</tr>
<tr>
<td>HDFC 371-Research Methods</td>
<td>5</td>
</tr>
<tr>
<td>HDPE 320-Anatomical Kinesiology</td>
<td>4</td>
</tr>
<tr>
<td>HDPE 322-Exercise Physiology</td>
<td>4</td>
</tr>
<tr>
<td>HDPE 329R-Bio mechanics</td>
<td>4</td>
</tr>
<tr>
<td><strong>Junior Year Credits</strong></td>
<td>11-17</td>
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### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDPE 465-Exercise Testing &amp; Prescription</td>
<td>4</td>
</tr>
<tr>
<td>HDPE 489R-Undergraduate Research</td>
<td>26</td>
</tr>
<tr>
<td>HHD 476-Internship</td>
<td>26</td>
</tr>
<tr>
<td><strong>Senior Year Credits</strong></td>
<td>30</td>
</tr>
</tbody>
</table>

### Health Enhancement:

#### Health Education:

Health Education majors prepare students who want to become teachers of Health Education (Health and Physical Education) in public schools. Upon completion of the degree, students are eligible for certification in teaching Health Education, Physical Education, and/or Health Education in Montana and other states. Health Education is a comprehensive approach to combining the traditional areas of Health Education and Physical Education. It is a contemporary curriculum where healthy lifestyles and concepts are achieved through skillful movement with an emphasis on physical fitness, healthy lifestyle management skills, and understanding of the total self (physical, intellectual, emotional, and social). In addition to the traditional approach to teaching fundamental movement, skills, games, and dance, this curriculum emphasizes the overall health of the individual as a value in life and enhances critical thinking, decision-making and problem-solving skills of future teachers and their students. Courses within this curriculum represent a combination of content knowledge (health enhancement, health education, and physical education) along with a strong background in pedagogical content knowledge (teaching methods and curriculum). Students majoring in Health Enhancement develop a professional development portfolio based on national beginning teacher standards. The final semester consists of student teaching in two public school placements.

### Criteria for selection and retention:

Admission to the Teacher Education Program. Any student who wishes to enter the Teacher Education Program must complete an "Application for the
The requirements for admission are 1) cumulative grade point average of at least 2.5; 2) a “C” grade point average in all required courses; 3) approval of the advisor; and 4) no record of immoral conduct related to the teaching profession or any conviction of a criminal offense as outlined by Section 204-110 of the Montana Code Annotated.

Application and approval for student teaching. Certain requirements must be met by all students desiring to student teach. These are 1) maintenance of the same standards required for admission into the program including satisfactory clearance on a federal criminal background check; 2) completion of all required courses; 3) certification of first aid and CPR; and 4) approval of advisor.

Student teaching is limited to seniors. Application must be made to the Director of Field Placement and Certification no later than the following times:

Fall student teaching: by the end of the first week in December of the year prior to student teaching.

Spring student teaching: by the end of the second week of April of the year prior to student teaching.

The Praxis II exam in the area of physical education must be successfully passed one semester prior to student teaching.

Recommendation and approval for licensure. The requirements for recommendation by Montana State University for licensure include completion of courses in the Teacher Education Program as outlined in the individual’s approved plan; maintenance of the same standards as required for student teaching; and approval of the advisor and the Director of Field Placement and Certification.

**Freshman Year**
- **COM 110US-Intro to Public Communication** 3
- **HDPE 130B-Lifespan Human Development** 3
- **HDPE 192-Paraprofessional Experience I** 1
- **HDPE 222-Found of ES Science** 3
- **HDPE 251-Teaching Fitness/Act.** 3
- **HDPE 267-Introduction to Coaching** 3
- **M 145Q-Math for Liberal Arts** 3
- **WRIT 101W-College Writing I** 3
- **University Core and Electives** 11

**Sophomore Year**
- **EDC 209-Ed Psych and Adolescent Devel** 3
- **EDG 210D-Multicultural Education** 3
- **HDPE 221CS-Human Nutrition** 3
- **HDPE 240-Methods and Teach Elem Hlth Enhance** 1
- **EDSD 413--Professional Issues** 2
- **EDSD 410--Student Teaching** 6

**Junior Year**
- **EDDL 335--Teaching Elem Hlth Enhance** 3
- **EDDL 465-Mid & Sec Hlth Enhance Methods** 3
- **HDPE 322-Teacher Education** 3
- **HDPE 317-Paraprofessional Experience II** 1
- **HDPE 320-Elementary Kinesiology** 4
- **University Core and Electives** 13

**Senior Year**
- **EDDL 410-Student Teaching** 6
- **EDSD 410-Student Teaching** 6
- **EDSD 413-Professional Issues** 2
- **HDPE 322-Exercise Physiology** 4
- **HDPE 445R--Applied Sport Psychology** 3
- **University Core and Electives** 6

**Electives (select 9 credits from the following courses):**
- **HDPE 411-Nutr for Sports & Exer** 3
- **HDPE 316-Football Coaching Theory** 1
- **HDPE 317-Basketball Coaching Theory** 1
- **HDPE 318-Soccer Coach Theory** 1
- **HDPE 319-Volleyball Coaching Theory** 1
- **HDPE 362-Track & Field Theory** 2
- **HDPE 367-Coaching Application** 1
- **HDPE 456-Principles of Strength and Conditioning** 3
- **HDPE 467-Advanced Concepts in Coaching** 3
- **HDID 128-Social Dance** 3
- **HDID 175-Well-Being Principles & Practices** 3

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Child Services Minor**

The nonteaching Child Services minor emphasizes a dual focus of education and services to children within educational, familial, and community-based programs. Students in the minor examine current research, theory and practice related to child and adolescent development, exceptional children, assessment and intervention practices with children and families, and professional skill development. The minor is designed to enhance the student’s major area of study and is a strong complement to human development, education, psychology, nursing, and related social science majors.

**Credits**
- **HDCF 250-Signing Exact English I** 3
- **HDPE 319-Theories & Skills Help Rel** 3
- **HDPE 357-Exceptional Child Lab** 3
- **HDPE 458-Assessment & Intervention** 4

**Approved Substitutions** 3

**Coaching Minor**

This coaching minor is one of the few in the northern Rocky Mountain region and is specifically designed to prepare those interested in coaching any sport at any entry level. It was designed with the National Standards for Sport Coaches that was developed by professional coach educators from the National Association of Sport and Physical Education (NASPE) and other sport organizations and universities across the USA.

HDPE 267, Introduction to Coaching is the ‘keystone’ course for this major. All students should start here.

In most cases, there will be NO credits given for PRIOR coaching experience that has not resulted in a written evaluation from an athletic director, director of coaching, head coach or other sport administrator. The sports specific courses (Theory of coaching football, basketball, soccer, track and field, volleyball, etc.) have HDPE 267 as their prerequisite. No student should attempt taking any of these classes without successful completion of HDPE 267.
Students must receive a “C” or better (with the exception of HDPE 367, which is P/F) for the following courses:

**Required Classes**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDPE 267</td>
<td>Introduction to Coaching</td>
<td>3</td>
</tr>
<tr>
<td>HDN 210C</td>
<td>Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>HDML 455</td>
<td>The Ethics of Care</td>
<td>3</td>
</tr>
<tr>
<td>*HDPE 367</td>
<td>Coaching Application*</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 445R</td>
<td>Applied Sport Psychology</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 467</td>
<td>Advanced Concepts in Coaching</td>
<td>3</td>
</tr>
</tbody>
</table>

Take one of the following:

- HDPE 222 - Foundations of Exercise Science
- HDPE 322 - Exercise Physiology

Students must receive a “C” or better for the following courses:

**Elective Classes**

Take three of the following courses:

- HDPE 516 - Football Coaching Theory
- HDPE 517 - Basketball Coaching Theory
- HDPE 318 - Soccer Coaching Theory
- HDPE 519 - Volleyball Coaching Theory
- HDPE 362 - Track & Field Theory

*Upon approval of the instructor.*

Take one of the following:

- HDPE 436 - Principles of Strength & Conditioning
- HDFN 411 - Nutrition for Sports & Exercise
- HDFN 221CS - Human Nutrition
- HDPE 367 - Coaching Application*

*HDPE 367 - Coaching Application* requires a passing grade in HDPE 251, 252, and 253.

**Sustainable Food & Bioenergy Systems**

This program is a unique interdisciplinary curriculum designed for students interested in the interconnected processes of crop production, processing, distribution, and utilization for food and bioenergy uses. The degree focuses on ecologically sound, socially just, and economically viable farming methods, food and health, and other food and bioenergy system-related issues. Students work closely with faculty to gain hands-on experience in practical applications, and in specific, self-selected focus areas through internships with Montana industries. The degree plan is intended to encompass a wide range of food- and bioenergy-related areas in order to prepare students for career opportunities in agricultural business, public health and community food security, natural resource conservation, bioenergy production industries, marketing, distribution, and local food systems. Graduates will be capable of addressing interdisciplinary food and farming system problems such as food safety, agricultural biosecurity, rural economic decline and poverty, obesity, loss of indigenous foods, and bioenergy-related issues.

**Sustainable Food Systems Option**

The Sustainable Food Systems Option draws from both the physical and social sciences in the areas of food and nutrition, family and consumer sciences, plant sciences, environmental sciences, ecology, sociology, and political science. Emphasis in this option is on health and consumer issues related to food production and food systems. Students gain hands-on experience in culinary fundamentals and management, organic gardening, and independent research projects. Internships are designed to provide experience with food processing, food cooperative management, alternative food distribution systems, and small business operations. Having a better understanding of the interconnections among food production, food policy, food security and health, helps prepare graduates capable of addressing interdisciplinary food system problems such as obesity, food insecurity and poverty, food safety, and loss of indigenous foods, among others.

**Career Opportunities**

Graduates from this option find careers in environmental industries and consulting firms that solve problems associated with agroecosystems or agricultural practices; government jobs in environmental management and policy making; agricultural industry positions associated with precision agriculture, pest management, general agronomy, and information services. Students will be prepared for graduate training that leads to independent research in basic and applied ecology, environmental biology, cropping systems, precision agriculture, ecologically-based pest management, or weed science.

**Sustainable Crop Production Option**

Where does our food come from? Are there ways to sustainably maintain production levels and yet protect our natural resources? Is it possible to improve the quality and nutrition of our food supply? Are local food systems a viable alternative to corporate agricultural production? Can crops grown for bioenergy production reduce our use of fossil fuels and lessen carbon dioxide emissions? The answers to these questions and many more are discovered by students in the Sustainable Crop Production Option. The curriculum is designed to acquaint students with a broad range of principles and issues in sustainable crop production, including soil fertility, plant physiology, greenhouse production, pest management, and small business management. Both large- and small-scale food and bioenergy production systems are examined.
Career Opportunities
Graduates from this option are prepared for careers in community nutrition, community food security, public health, Extension education, food and nutrition policy and education, food enterprise, culinary arts and management, community supported agriculture, food processing, food marketing, retailing and distribution.

Curricula in Sustainable Food and Bioenergy Systems

SUSTAINABLE FOOD SYSTEMS
OPTION
Health and Human Development (HHD)

Freshman Year
Credits
HDFN 146-Intro SFBS Seminar .................3
ECNS 101-Environ. Way Thinking ..........3
PSPP 102C-Plant Sci, Res Envir ..........3
Take one of the following:
CHMY 121N-Intro to General Chemistry .......4
CHMY 141-College Chemistry I ..............4
Take one of the following:
M 121-College Algebra .........................3
M 1 45-Q-Mathematics for Liberal Arts ...3
SOCT 101B-Intro to Sociology ...............3
HIDM 276-Internship ..........................3
University Core and Electives ...............3

Sophomore Year
Credits
HDFN 229-Contemp Cons Issues .............3
HDFN 221C-Human Nutrition ................3
HDFN 226-Culinary Fund .....................3
HDFN 227-Culinary Fund Lab ...............3
LRES 110-Land Res Envir Sci ..............3
MB 101N-Microbial Today's World .......3
PSPP 341-Field Crop Production ..........3
Take one of the following:
PSPP 318-Biometry ..........................3
STAT 216Q-Introduction to Statistics ....3
Take one of the following:
NAS 201-Am Indians Montana ...............3
PSPP 290D-Intro Iml Rel Relations .......3
University Core and Electives ...............3

Junior Year
Credits
CHBE 205-Energy & Sustainability ..........3
HIDC 371-Res Methods .......................3
HDFN 322-Culinary Mgmt Practicum .......3
HDFN 325-Culinary Mgmt Practicum .......3
HDFN 351-Nutrition & Society ..............3
LRES 201N-Soil Resource ....................3
LRES 428-Crop Sys Sust Agriculture ......3
Take two of the following:
AEC 315-Ag in Global Context ..........3
PSPP 345-Organic Market Gardening ......3
HDFN 454R-Culinary Mgmt Farm to Table ..3
University Core and Electives ...............3

Senior Year
Credits
Take one of the following:
HDCF 429-Small Bus Ops ....................3
MGMT 469-Com Sot Entrepreneurship ..........3
HDFN 421-Nutrition in the Lifecycle ......3
HDFN 451R-Sustainable Food Systems ....3
HDFN 499-Capstone .........................3
HHD 476-Internship ........................3
Take one of the following:
NAS 415-Native American Food Systems ...3
PSPP 436-Politics of Food & Hunger ........3
Take two of the following:
PSPP 357-Veg Production .................3
LRES 421-Holistic Thought ................3
PSPP 491-Special Topics ........................3
University Core and Electives ...............5

AGROECOLOGY OPTION
Land Resources and Environmental Sciences (LRES)

Freshman Year
Credits
LRES 146-Intro SFBS Seminar ..............3
BIOL 101N-Organism Function ..............4
BIOL 106-Molecular & Cellular Biology ....4
PSPP 102C-Plant Sci, Res Envir ..........3
Take one of the following:
CHMY 121N-Intro to General Chemistry .......4
CHMY 141-College Chemistry I ..............4
Take one of the following:
M 121-College Algebra .........................3
M 1 45-Q-Mathematics for Liberal Arts ...3
SOCT 101B-Intro to Sociology ...............3
HIDM 276-Internship ..........................3
University Core and Electives ...............3

Sophomore Year
Credits
ECNS 101-Biochem of Health ................3
CHMY 125-Intro to Organic & Biochem ......3
LRES 301N-Soil Resources ....................3
LRES 298-Internship ..........................3
Take one of the following:
PSPP 318-Biometry ..........................3
STAT 216Q-Introduction to Statistics ....3
Take one of the following:
NAS 201-Am Indians Montana ...............3
PSPP 290D-Intro to International Rel ......3
Take two of the following:
AEC 210B-Econ Ag Business ................3
MB 301-General Microbiology ..............3
ECNS 201S-Microeconomics .................3
HDFN 322-Culinary Skills Mgmt ............3
HDFN 325-Culinary Mgmt Practicum .......3
University Core and Electives ...............3

Junior Year
Credits
CHBE 205-Energy & Sustainability ..........3
PSPP 341-Field Crop Production ..........3
BIOL 301-Principles of Genetics ...........3
HDFN 351-Nutrition & Society ..............3
LRES 310-Professional Preparation .......1
LRES 351-Nutrient Cycling ..................3
LRES 428-Crop Sys Sust Agriculture ......3
Take two of the following:
AEC 315-Ag in Global Context ..........3
PSPP 345-Organic Market Gardening ......3
PSPP 337-Vegetable Production ..........3
LRES 421-Holistic Thought Mgmt ..........3
HDFN 445R-Culinary Mgmt Farm to Table ..3
University Core and Electives ...............3

Senior Year
Credits
Take one of the following:
HDCF 429-Small Bus Ops ....................3
MGMT 469-Com Sot Entrepreneurship ..........3
HDFN 421-Nutrition in the Lifecycle ......3
HDFN 451R-Sustainable Food Systems ....3
LRES 498-Internship ........................3
LRES 499-Capstone .........................3
LRES 453-Weed Ecology & Mgmt ..........3
PSPP 421-Concepts of Plant Pathology ......3
Take one of the following:
NAS 415-Native American Food Systems ...3
PSPP 436-Politics of Food & Hunger ........3
Take two of the following:
BIOL 430-Plant Physiology .................3
LRES 401-Integrated Pest Manag ..........3
LRES 452-Soil & Environ Microbiol .......3
PSPP 491-The Polit Econ of Energy ........3
University Core and Electives ...............3

SUSTAINABLE CROP PRODUCTION
OPTION
Plant Sciences and Plant Pathology (PSPP)

Freshman Year
Credits
PSPP 146-Intro SFBS Seminar ..............3
BIOL 101N-Organism Function ..............4
ECNS 101S-Environ. Way Thinking .......3
PSPP 102C-Plant Sci, Res Envir ..........3
Take one of the following:
NAS 201-Am Indians Montana ...............3
LRES 110-Land Res Envir Sci ...............3
LRES 290D-Intro to International Rel ......3
Take one of the following:
PSPP 318-Biometry ..........................3
STAT 216Q-Introduction to Statistics ....3
Take one of the following:
NAS 201D-Am Indians Montana ..........3
PSPP 290D-Intro to International Rel ......3
Take one of the following:
AEC 210B-Econ Ag Business ................3
MB 301-General Microbiology ..............3
ECNS 201S-Microeconomics .................3
HDFN 322-Culinary Skills Mgmt ............3
HDFN 325-Culinary Mgmt Practicum .......3
University Core and Electives ...............3

Sophomore Year
Credits
HDFN 229-Contemp Cons Issues .............3
HDFN 221C-Human Nutrition ................3
HDFN 226-Culinary Fund .....................3
HDFN 227-Culinary Fund Lab ...............3
LRES 110-Land Res Envir Sci ..............3
MB 101N-Microbial Today's World .......3
PSPP 341-Field Crop Production ..........3
Take one of the following:
NAS 201D-Am Indians Montana ..........3
PSPP 290D-Intro to International Rel ......3
Take one of the following:
AEC 210B-Econ Ag Business ...............3
MB 301-General Microbiology ..............3
ECNS 201S-Microeconomics .................3
HDFN 322-Culinary Skills Mgmt ............3
HDFN 325-Culinary Mgmt Practicum .......3
University Core and Electives ...............3

Junior Year
Credits
CHBE 205-Energy & Sustainability ..........3
BIOL 303-Prin of Ecology .................4
HDFN 299-Contemp Consumer Issues .......3
HDFN 351-Nutrition and Society .........3
LRES 428-Crop Sys Sust Agriculture ......3
LRES 428-Crop Sys Sust Agriculture ......3
LRES 428-Crop Sys Sust Agriculture ......3
LRES 428-Crop Sys Sust Agriculture ......3
University Core and Electives ...............3

Senior Year
Credits
Take one of the following:
HDCF 429-Small Bus Ops ....................3
MGMT 469-Com Sot Entrepreneurship ..........3
HDFN 421-Nutrition in the Lifecycle ......3
HDFN 451R-Sustainable Food Systems ....3
LRES 498-Internship ........................3
LRES 499-Capstone .........................3
LRES 453-Weed Ecology & Mgmt ..........3
PSPP 421-Concepts of Plant Pathology ......3
Take one of the following:
NAS 415-Native American Food Systems ...3
PSPP 436-Politics of Food & Hunger ........3
Take two of the following:
BIOL 430-Plant Physiology .................3
LRES 401-Integrated Pest Manag ..........3
LRES 452-Soil & Environ Microbiol .......3
PSPP 491-The Polit Econ of Energy ........3
University Core and Electives ...............3

University Core and Electives ...............3
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PROGRAMS OF INSTRUCTION – EDUCATION, HEALTH AND HUMAN DEVELOPMENT
COLLEGE OF ENGINEERING

Dr. Robert J. Marley, Dean, and Director of the Engineering Experiment Station
Dr. Anne K. Camper, Associate Dean for Research and Graduate Studies
Heidi M. Sherick, Assistant Dean for Undergraduate Programs and Diversity

The College of Engineering provides administrative structure and support to the following academic departments and baccalaureate degree programs:

- Department of Chemical & Biological Engineering
  - BS Bioengineering
  - BS Chemical Engineering

- Department of Civil Engineering
  - BS Civil Engineering
  - BS-Resources Engineering Option
  - Civil Engineering Option
  - BS Construction Engineering Technology

- Department of Computer Science
  - BS Computer Science

- Department of Electrical & Computer Engineering
  - BS Computer Engineering
  - BS Electrical Engineering

- Department of Mechanical & Industrial Engineering
  - BS Industrial Engineering
  - BS Mechanical Engineering
  - BS Mechanical Engineering Technology

The College of Engineering offers five minors:
- Aerospace
- Computer Science
- Computer Engineering
- Electrical Engineering
- Military Studies

The College of Engineering provides administrative support for the Reserve Officers’ Training Corps (ROTC) programs in the Air Force and Army. A complete description of each individual degree program is provided later in this section under the heading of the appropriate department. The following is a highlight of the mission, goals, and objectives of the College of Engineering and applies to all of its programs.

College Mission
The College of Engineering will serve the State of Montana and the nation by:
- Fostering lifelong learning
- Integrating learning and discovery
- Developing and sharing technical expertise
- Empowering students to be tomorrow’s leaders

College Vision
The College of Engineering at Montana State University will be an outstanding collaborative community that achieves excellence in learning, innovation, discovery, and knowledge transfer. To realize this vision, the college will:
- Leverage shared interests and talents among faculty and students in order to create knowledge across disciplinary lines.
- Effectively and efficiently balance breadth with depth in undergraduate education in order to prepare students for the global workforce.
- Be a leader in innovation and discovery in our identified focus areas.
- Successfully integrate research and innovation into the learning experience of both undergraduate and graduate students.
- Be recognized for the level of knowledge transfer to industry, governments, and citizens in the state of Montana.

College Core Values
Members of the MSU College of Engineering community approach all of their work with the following deeply held core values:
- **Life-long learning.** The college is a community that believes in and fosters life-long learning in all of its members—undergraduate students, graduate students, faculty, and staff. Life-long learning also extends beyond the college community to state and national constituencies.
- **Knowledge Discovery.** At the heart of the college community’s activities are knowledge discovery and dissemination and the creativity that accompanies these activities. We believe that knowledge discovery informs and enriches the life-long learning of the entire college community.
- **Collaboration.** We believe that collaboration and collegiality both inside and outside of our college community enrich all college activities.
- **Inclusiveness.** The college is a community that welcomes and encourages diverse points of view and backgrounds, believing that this inclusiveness enriches our creative learning environment.
- **Professionalism.** The College of Engineering community approaches all activities with a high degree of professionalism, working with integrity, honesty, and commitment to excellence.

College Goals
The goals of the College of Engineering are as follows:
- Prepare the MSU COE community to engage effectively with the global community.
- Build on growing college synergy and increase cross-disciplinary activities at every level of the COE community, including not only faculty research and creative activity but also the student experience.
- Establish the college as a leader in the state and national technological community.

Engineering Program Educational Objectives, Assessment, and FE Exam Requirement
ABET, Inc., the recognized accreditor for college and university programs
in applied science, computing, engineering, and technology, has established standards and criteria for the accreditation of undergraduate engineering and engineering technology programs. Individual programs have program educational objectives that are consistent with ABET and with the needs of the program’s constituents. Assessment of program objectives is a dynamic and ongoing process. One assessment strategy is to examine the results of the Fundamentals of Engineering (FE) examination. The FE exam is a nationally normalized test that is required of graduating engineering seniors at MSU. Students are required to enroll in ENGR 499 (Engineering Program Assessment), take the FE Exam, and make an honest and serious effort to pass the exam. Review sessions are available leading up to the exam.

For a complete and up-to-date listing of all program specific objectives as well as other educational outcomes assessment strategies, please refer to the College of Engineering web site at http://www.coe.montana.edu.

Student Performance and Retention

Students admitted to MSU will automatically be eligible for admission to College of Engineering (COE) programs. The College of Engineering is committed to retaining each admitted student within the COE and MSU, and to helping them achieve their fullest academic potential. Students are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the COE Bachelor of Science degree requirements. If repeating a course is necessary in order to meet this requirement, students are expected to repeat the course successfully (C- or better) prior to taking a follow-on course for which the repeated course is a prerequisite.

Accreditation

The following engineering programs are specifically accredited by the Engineering Accreditation Commission of Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700:

- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Industrial Engineering
- Mechanical Engineering

Because the Bioengineering degree is new it has not yet gone through an accreditation review process. The program will seek accreditation in the near future.

The following engineering technology programs are accredited by the Technology Accreditation Commission of Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700:

- Construction Engineering Technology
- Mechanical Engineering Technology

The Computer Science program is accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700.

College of Engineering Program Fee

Engineering education is more expensive to deliver than education in most other disciplines, both at MSU and nationally. MSU strives to develop and maintain modern laboratories that benefit student learning. Because of increased equipment and maintenance costs, students enrolled within the College of Engineering (COE) at Montana State University in Bozeman are charged a program-wide fee with the following primary goals:

1. Help ensure that College programs maintain quality instructional laboratories, technical infrastructure within the College, and the ability to conduct staff-intensive program assessment (required for professional accreditation).
2. Help meet the higher cost of engineering education by augmenting existing state funds.
3. Help to support and increase student access to advanced technology within each of the COE programs.
4. Greatly increase the College’s ability to leverage private support for our programs, such as through matching grants.

Other engineering course fees (with the exception of CET and Fundamentals of Engineering exam fees) have been eliminated and the expenses formerly covered by these individual course fees will now be recovered from the program fee. The following fee structure is in place:

- $81 per semester for Freshmen (flat rate).
- $116 per semester for Sophomores through graduate level (flat rate).
- $46 flat rate for summer session collected once (one or more sessions), any level of student.

For more information about the Engineering Program Fee please refer to the College of Engineering web site http://www.coe.montana.edu.

Total Credit Requirements

Montana State University requires a minimum of 120 semester credits for graduation. Of these, 42 credits must be in upper division courses (numbered 300 and above). All degree programs within the College of Engineering meet or exceed these standards, and specific requirements for each are tabulated in the sections describing these programs.

General Education Core

More than ever, engineers, technologists, and computer scientists must possess communication skills and an awareness of how design and policy decisions affect society. These topics plus other general education offerings are provided through a coherent program of general education required by all College of Engineering degree programs. University core requirements for communication, mathematics, and sciences are met or exceeded by all College of Engineering degree programs, and the College of Engineering encourages students’ participation in the broader areas of humanities, social sciences, arts and diversity. These areas are designed to complement the technical content of the degree program.

College of Engineering students who are exempt from the Core 2.0 College Writing requirement because of their ACT or SAT scores are required to take a college-level writing class to fulfill the writing requirement. College-level writing classes include WRIT 201, WRIT 202, and WRIT 203.
Electives
The engineering, technology, and computer science curricula as tabulated include "core curricula and elective" credits. Courses are selected by the student and advisor to fulfill block requirements in the core curriculum areas as well as professional electives. The student may also petition her or his department to include up to six advanced military science credits in her or his professional elective program.

Design Projects with Student Teams
The College of Engineering provides opportunities for students to engage in design projects, including working in multidisciplinary design teams.

Most programs require students to take ENGR 310, Introduction to Engineering Design, which is a multidisciplinary design course. This course gives students the background and skills that they need to be successful in their senior capstone design course and also helps students understand the complexities and benefits of working with students from other engineering disciplines, as well as computer science.

In the senior capstone course, students generally work with other students from their own discipline to solve an engineering design problem. A typical design project involves a student team synthesizing a solution to meet the needs of a customer, which could be an engineering company, a faculty member, or a governmental organization.

The student design team presents results in written and oral formats, and in many cases, the result includes a working prototype. All engineering and computer science students engaged in these design projects work in student design teams based on the needs to accomplish the goals of the project.

Capstone design projects contribute to the educational objectives of the academic programs by engaging seniors in challenging, team-oriented, real-world design efforts. The teams include the students and professionals from the sponsors as well as faculty supervisors for each project. At the conclusion of their design experience, the students will have accomplished the following:

1. Designed and developed information, or built a prototype as necessary, for a system, component, or process to meet design objectives.
2. Used creativity in meeting the design objectives.
3. Independently learned new information and applied this information to meet design objectives.
4. Worked effectively as a design team member.
5. Prepared and presented an effective written and/or oral technical report to the sponsor.
6. Accomplished a logical and practical sequence of safe and workable operations while meeting the design objectives.
7. Provided a global, societal, and economic context to the design as appropriate for the project.

Cooperative Education/Internship
The College of Engineering encourages students to gain professional experience related to their discipline that can complement and enhance their academic studies. To help gain professional experience, departments within the College operate a variety of cooperative education and internship programs. Most College of Engineering departments partner with regional and national companies to provide a structured program for qualified students. Interested students should contact Career Services and their respective department offices for more information about these programs.

Engineering Minority Program (EMPower)
The College of Engineering at MSU is committed to equal access to educational opportunities for all students. This commitment has led to nationally recognized efforts to help provide such opportunities. The Engineering Minority Program (known as EMPower) provides enrichment programs for pre-college students and focuses on customized retention plans and support of social and academic networks including scholarships for underrepresented minorities.

The Designing Our Community (DOC) Program, which is part of EMPower, seeks to enhance outreach, recruitment and retention to increase the number of Native Americans who graduate from MSU with engineering or computer science degrees. The College of Engineering has targeted the enhancement of Native American education as a top priority over the next 5 years. Our vision is to become firmly established as the premier institution of choice for Native American students in engineering, engineering technology and computer science in the northern Rockies and the northern Great Plains regions and to be a successful partner with Native American communities in developing the future workforce.

Chemical and Biological Engineering
Department of Chemical & Biological Engineering
http://www.chbe.montana.edu/

The Department of Chemical and Biological Engineering (CHBE) prepares students with the knowledge and skills to contribute to society and their profession. The basis of both chemical and biological engineering is the useful transformation of materials from one form to another. This transformation may be brought about by chemical or biological processes. Both chemical and biological engineers often function as process engineers. A typical process involves chemical or biological reactions followed by separation of desired products. But there are distinct differences in the design and operation of chemical and biological systems, and the chemical engineering and bioengineering degrees allow students to focus on either area of specialization. Both fields are continuing to develop as today’s research efforts create exciting new opportunities. Chemical engineers practice in a variety of fields: chemical manufacturing and petroleum refining, waste minimization and environmental engineering, materials and microelectronics, pharmaceuticals, bioengineering and biomedicine, and many others. Biological engineers work in many of the same areas: environmental engineering, materials, pharmaceuticals, Bioengineering and biomedicine and the list will continue to expand as the field develops.

The outcome of the undergraduate program in chemical engineering is an accredited B.S. Ch.E. degree. We antici-
have been developed to provide these skills through faculty members who have extensive knowledge and experience in the field.

Curriculum in Bioengineering

The curriculum is 128 credits comprised of a Basic Program plus Electives which students select to meet both University Core requirements and requirements of the Bioengineering degree.

Student Performance and Retention

Requirements: Students starting their academic program in the fall of 2005 or later are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the Bachelor of Science degree requirements. Moreover, students must achieve a C- or better grade in M 171, 172, 273, 274, CHMY 141, 143, 211, CHBE 120, 215, 226, University Seminar, and College Writing prior to taking follow-on courses.

Basic Program:

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>F</th>
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<tbody>
<tr>
<td>CHBE 100-Intr to Chem &amp; Biol Engr</td>
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<tr>
<td>CHBE 120-Chem &amp; Biol Engr Comp</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 172Q-Calculus II</td>
<td>4</td>
<td></td>
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<tr>
<td>US or W Core course</td>
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<td>3</td>
</tr>
<tr>
<td>Univ Core Electives (IA, IH, IS or D)</td>
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Sophomore Year

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<tbody>
<tr>
<td>CHMY 211-Elements of Organic Chemistry</td>
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<tr>
<td>CHBE 215-Materials Science</td>
<td>3</td>
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<tr>
<td>CHBE 215-Elementary Prin I</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 226-Principles of Bioengineering</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 321-Fluid Mechanics Operations</td>
<td>3</td>
</tr>
<tr>
<td>M 275Q-Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 274-Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211-Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212-Gen &amp; Mod Phys II</td>
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Junior Year

<table>
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<tbody>
<tr>
<td>BCHM 549-General Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>BIOL 501-Genetics</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 324-Bioengineering Transport</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 326-Biomaterials Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 438-Bioprocess Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 310-Intr to Engr Design</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 350 -Applied Data Analysis</td>
<td>2</td>
</tr>
<tr>
<td>MB 301-General Microbiology</td>
<td>2</td>
</tr>
<tr>
<td>Univ Core Electives (IA, IH, IS or D)</td>
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Senior Year

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<tbody>
<tr>
<td>CHBE 411R-CHBE Design I</td>
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</tr>
<tr>
<td>CHBE 412R-CHBE Design II</td>
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</tr>
<tr>
<td>CHBE 461-Bioengineering Laboratory L</td>
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<tr>
<td>CHBE 492-Bioengineering Laboratory II</td>
<td>2</td>
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<tr>
<td>Bioengineering Elective</td>
<td>3</td>
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<tr>
<td>Technical Elective</td>
<td>6</td>
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<tr>
<td>Univ Core Electives (IA, IH, IS or D)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 499 (FE Exam)</td>
<td>6</td>
</tr>
<tr>
<td>17</td>
<td>16</td>
</tr>
</tbody>
</table>

A minimum of 128 credits is required for graduation; 42 of which must be in courses numbered 300 and above.

Focus Areas in Bioengineering:

Focus Areas are lists of suggested technical electives for students who wish to study in an area of specialization. The Focus Areas in bioengineering include:

- Biomedical Engineering
- Environmental Engineering
- Bioprocess Engineering
- Food Engineering

Curriculum in Chemical Engineering

The curriculum is 128 credits comprised of a Basic Program plus Electives which students select to meet both University Core requirements and requirements of the Chemical Engineering degree.

Student Performance and Retention

Requirements: Students starting their academic program in the fall of 2005 or later are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the Bachelor of Science degree requirements. Moreover, students must achieve a C- or better grade in M 171, 172, 273, 274, CHMY 141, 143, 211, CHBE 120, 215, 226, University Seminar, and College Writing prior to taking follow-on courses.

Freshman Year

<table>
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<tr>
<th>F</th>
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<tbody>
<tr>
<td>CHBE 100-Intr to Chem &amp; Biol Engr</td>
<td>2</td>
</tr>
<tr>
<td>CHBE 120-Chem &amp; Biol Engr Comp</td>
<td>2</td>
</tr>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 274-Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211-Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212-Gen &amp; Mod Phys II</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
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</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 211-Elements of Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>CHBE 215-Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 215-Elementary Prin I</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 226-Principles of Bioengineering</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 321-Fluid Mechanics Operations</td>
<td>3</td>
</tr>
<tr>
<td>M 275Q-Multivariable Calculus</td>
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</tr>
<tr>
<td>M 274-Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211-Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212-Gen &amp; Mod Phys II</td>
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<td>16</td>
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Junior Year

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>BCHM 549-General Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>BIOL 501-Genetics</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 324-Bioengineering Transport</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 326-Biomaterials Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 438-Bioprocess Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 310-Intr to Engr Design</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 350 -Applied Data Analysis</td>
<td>2</td>
</tr>
<tr>
<td>MB 301-General Microbiology</td>
<td>2</td>
</tr>
<tr>
<td>Univ Core Electives (IA, IH, IS or D)</td>
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</tr>
<tr>
<td>15</td>
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Senior Year

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
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</thead>
<tbody>
<tr>
<td>CHBE 411R-CHBE Design I</td>
<td>5</td>
</tr>
<tr>
<td>CHBE 412R-CHBE Design II</td>
<td>5</td>
</tr>
<tr>
<td>CHBE 461-Bioengineering Laboratory L</td>
<td>2</td>
</tr>
<tr>
<td>CHBE 492-Bioengineering Laboratory II</td>
<td>2</td>
</tr>
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<td>Bioengineering Elective</td>
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<tr>
<td>Technical Elective</td>
<td>6</td>
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<tr>
<td>Univ Core Electives (IA, IH, IS or D)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 499 (FE Exam)</td>
<td>6</td>
</tr>
<tr>
<td>17</td>
<td>16</td>
</tr>
</tbody>
</table>

Pate seeking accreditation for the bioengineering degree in the near future.

Our program objectives can be stated as follows:

- will be confident in their ability to apply chemical or bioengineering fundamentals
- will be proactive problem solvers
- will pursue lifelong learning
- will be effective communicators
- will be effective team members
- will be highly ethical engineering professionals

Specific educational objectives for all engineering students are stated in the College of Engineering portion of this document.

The Department provides graduate programs that lead to masters degrees in chemical engineering and environmental, as well as the PhD in Engineering, with chemical engineering and environmental engineering options. The graduate program complements students’ undergraduate experience by providing opportunities for advanced study, undergraduate research, and cooperative education experience. The Department serves the State of Montana and the nation through education, research, and service, while encouraging diversity in the student population, to meet the mission of Montana State University and the College of Engineering.

The preparation of men and women competent to develop, design, and operate new chemical or biological systems, or to perform the research and development to improve existing products and processes, is a comprehensive process. Thus the curricula in chemical engineering and bioengineering are founded on the study of engineering principles of basic science, particularly chemistry, physics, biology, and mathematics. Safety and concern for the environment and the society must be overriding concerns to chemical and bioengineering practitioners, and developing this awareness is another aspect of the Department’s educational goals. Both chemical and biological engineers typically work as teams of professionals, sharing expertise and knowledge for greater achievement, so teamwork and communication are emphasized. The following curricula
### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHBE 213-Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 215-Elementary Prin I</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 216-Elementary Prin II</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 321-Fluid Mechanics Operations</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 211-Elements of Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>M 273Q-Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 274-Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211-Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212-Gen &amp; Mod Phys II</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16 17</strong></td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 340-General Biochemistry</td>
<td>5</td>
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<tr>
<td>CHBE 307-Chemical Engr Thermo I</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 322-Heat Transfer Operations</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 325-Mass Transfer Operations</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 328-Chemical Reaction Eng</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 348-Bioprocess Engineering</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;E 350--Applied Engr Data Analysis</td>
<td>2</td>
</tr>
<tr>
<td>ENGR 310-Intro to Engr Design</td>
<td>3</td>
</tr>
<tr>
<td>Unit Core Electives (IA, IH, IS or D)</td>
<td>3 3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16 15</strong></td>
</tr>
</tbody>
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### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHBE 407-Chem Engr Thermo II</td>
<td>2</td>
</tr>
<tr>
<td>CHBE 411R-CHBE Design I</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 412R-CHBE Design II</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 424-Transport Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 442-CHBE Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>CHBE 445-CHBE Laboratory II</td>
<td>2</td>
</tr>
<tr>
<td>CHBE 451-Process Dyn &amp; Control</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 373-Phys Chem Kinetics &amp; Thermo</td>
<td>5</td>
</tr>
<tr>
<td>ENGR 499-Engr Prog Asmt</td>
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</tr>
<tr>
<td>Technical Electives (IA, IH, IS or D)</td>
<td>5 5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16 16</strong></td>
</tr>
</tbody>
</table>

A minimum of 128 credits is required for graduation; 42 of which must be in courses numbered 300 and above.

### Focus Areas in Chemical Engineering:

Focus Areas are lists of suggested technical electives for students who wish to study in an area of specialization. The Focus Areas in Chemical Engineering include:

- Process & Product Engineering
- Biochemical Engineering
- Environmental Engineering
- Materials Engineering

### Dual Degree Program in Bioengineering

In partnership with Istanbul Technical University (ITU), the department offers a dual degree program in Bioengineering intended for Turkish students enrolled at ITU. Students in the program complete unique course-work in Bioengineering at both campuses-coursework that neither campus alone can offer. Students are resident at ITU during years 1 and 3 and at MSU during years 2 and 4, and graduates receive degrees from both institutions. Detailed curricular requirements are available from the department.

### Civil Engineering

**Department of Civil Engineering**  
[http://www.coe.montana.edu/ce/](http://www.coe.montana.edu/ce/)

Montana State University’s Department of Civil Engineering anticipates that the engineering and construction community will evolve quickly with several very fundamental precepts for success. Among these is the premise that the engineers and constructors of the future will continue to rely on fundamental engineering science and contemporary computational tools to guide their choices. We therefore choose to focus on fundamental engineering basics and the application of modern engineering tools. Our civil and environmental engineering programs will be acknowledged for their strong emphasis and rigor in engineering science, design, and applications. Our construction programs will be acknowledged for their emphasis on engineering and management skills and the application of those skills to the construction industry. The emphasis of these programs will continue to be preparation of students for professional practice in the engineering and construction industries.

Incorporating our vision into the traditional mission of a land grant institution leads to a strong emphasis on undergraduate education. However, in making this a substantial portion of our mission, we must also look beyond the undergraduate classroom. To ensure a quality faculty, and up-to-date curricula, we must ensure a vibrant broad-based graduate program at the master’s level and a smaller subset of specialty areas at the doctorate level. A strong master’s program also positions the department favorably for the possibility of future changes in professional degree requirements and is consistent with our vision for education at MSU. The graduate program is essential to attract good faculty and provide for their professional development, and to provide opportunities for students interested in study beyond the baccalaureate degree.

### Mission

- Foremost, we will provide undergraduate education founded on a rigorous treatment of engineering fundamentals coupled with modern engineering tools. We see competency in mathematics, physical science, and engineering mechanics, as crucial to our mission.
- Provide graduate education opportunities in a majority of traditional civil engineering areas.
- The department will maintain sufficient breadth to provide post-baccalaureate education focused on professional practice.
- The department will provide graduate opportunities in a subset of focus areas coupled to vibrant research programs with sound external funding.

### Civil Engineering

Civil Engineers design and construct facilities which improve the welfare and raise the living standards of people. These installations are usually permanent and expensive; each one is unique, offering challenging opportunities for ingenuity and creative design. A registered civil engineer is a professional with legal responsibilities and authority. Civil Engineering graduates enjoy splendid opportunities for employment in Montana, the Pacific Northwest, and the rest of the nation.

The following subareas comprise the field of civil engineering: environmental engineering for water and wastewater treatment, solid and toxic waste handling, and air and water pollution problems; geotechnical engineering for making use of soil, rock, and ice as foundation materials; structural engineering for buildings, bridges, dams, piers, towers, and other erected facilities; transportation engineering for highways, railroads, airports, and pipelines; water resources engineering for water supply, irrigation, flood control, aquatic habitat improvement, groundwater management, and hydroelectric power generation; construction of engineered facilities; and engineering measurements, which include surveying, photogrammetry, and mapping.

The Civil Engineering Bachelor of Science Program is a traditionally structured program that provides graduates with a strong background in math, basic sciences and engineering mechanics, and prepares graduates to become registered professional engineers capable of practicing civil engineering in the areas of environmental, geotechnical, structural, transportation and water resources engineering. The
background of graduates that select the Bio-Resources option is focused on soil, water resources and environmental concerns. The educational objectives of the Civil Engineering Bachelor of Science Program describe what graduates can expect to accomplish during the first three years after graduation.

All graduates can expect to be able to:

• enter the profession of Civil Engineering and advance in the profession to become registered professional engineers and leaders in the field of Civil Engineering;

• work on multi-disciplinary teams and effectively communicate with Civil Engineers of various sub-disciplines, architects, contractors, the public and public agents, scientists and others to design and construct Civil Engineering projects.

• begin to develop expertise in one of the sub-disciplines of Civil Engineering and engage in the lifelong learning necessary to advance in the Civil Engineering profession;

• contribute to society and the Civil Engineering profession through involvement in professional related and/or other service activity, and

• conduct their affairs in a highly ethical manner holding paramount the safety, health and welfare of the public and striving to comply with the principles of sustainable development.

Some graduates can expect to be able to:

• enter the surveying profession and become licensed to practice surveying;

• begin careers in the construction industry;

• or earn advanced degrees in Civil Engineering or other fields.

Courses in the first two years of the program develop a student’s mathematical skills and understanding of the physical principles that underlie the practice of civil engineering. Engineering science courses in the second, third, and fourth years develop the student’s ability to apply mathematical and basic scientific principles to the solution of practical engineering problems. The third year student develops a broad perspective of the field and establishes the foundation for professional practice and further study. The student completes at least one course in each subarea of civil engineering by the end of this year. Most of these courses are combinations of engineering science and design experiences. The fourth year includes a capstone professional practice and design experience, elective courses in a subarea (or subareas) of civil engineering—most of which are combinations of engineering science and design experiences—and elective courses that help the student develop an appreciation for the role of the professional engineer in society. Additional experience in professional practice and design may be obtained through participation in the department’s optional internship program. Contemporary engineering aids are introduced in the first year and used in assignments throughout the rest of the program. Courses and assignments that develop oral and written communication skills are distributed throughout the curriculum and are components of the capstone professional practice and design experience in the fourth year.

Bio-Resources Engineering is an option within Civil Engineering. The first two years of this option are very similar to the first two years of the standard Civil Engineering curriculum. The third and fourth years allow students to build upon the basic Civil Engineering curriculum with courses that focus on soil, water, and environmental concerns. Bio-Resources Engineering students may take upper level professional electives in chosen areas of Civil Engineering, Mechanical Engineering, Chemical Engineering, Mathematics, Biology, or select courses offered in the College of Agriculture. Professional employment opportunities for Bio-Resources Engineering graduates exist in private industries dealing with land reclamation, soil and water remediation, hydraulic and hydrologic design, environmental impact and assessment, and natural resource management. State and federal agencies have also been frequent employers of engineers with Bio-Resources backgrounds.

Graduating students are required to take the Fundamentals of Engineering exam administered by the Montana Board of Professional Engineers and Land Surveyors as the first step toward professional registration. ENGR 499 (Engineering Program Assessment), a zero-credit course, is used to administer the exam. Students are encouraged to take the discipline-specific version. This examination is administered by the National Council of Engineering Examining Boards and is accepted nationwide through reciprocity with the Montana Board of Professional Engineers and Land Surveyors.

Students planning to take the comprehensive examination on surveying fundamentals as the initial step in becoming licensed as a registered land surveyor should review the educational requirements for admission to this examination. Students electing to fulfill the educational requirements for registration as a land surveyor and for the baccalaureate degree in engineering must complete the requirements for both objectives.

Graduate work leading to the Master of Science and Doctor of Philosophy degrees is recommended for qualified students desiring advanced professional attainment or careers in academic fields. The Civil Engineering Department offers a Master of Science degree targeted at qualified students interested in an advanced professional degree, for which the civil engineering work place is currently seeing an increased demand. The program consists of a concurrent schedule of undergraduate and graduate classes starting in 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.

**Student Performance and Retention Requirements**

Freshmen or transfer students entering the Civil Engineering Department must satisfy our Student Performance and Retention Requirements prior to advancement in their degree program. This means that students cannot enroll in advanced courses until a suite of key entry-level courses is completed at a minimum performance level. The following mechanisms will be used in the Student Performance and Retention Initiative efforts:

1. Students will be required to successfully complete a suite of key courses (marked with an *) prior to taking any course from a select list of
advanced courses (marked with a ††), and must attain at least a C- in each of the key courses. In addition, each key course can be repeated at most one time.

2. Once the suite of key courses is satisfactorily completed, students are allowed to advance in their degree program. Intentional attempts by a student to circumvent the Student Performance and Retention Requirements will be considered academic misconduct.

3. Students who have difficulty meeting these requirements will work with their advisor to discuss changes that may enhance their academic performance.

Curricula in the
Department of Civil Engineering

CIVIL ENGINEERING

Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CE 202</td>
<td>Applied Analysis &amp; Technical Communication*</td>
<td>4</td>
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<tr>
<td>CE 201</td>
<td>Surveying</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I *</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q</td>
<td>Calculus I*</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II*</td>
<td>4</td>
</tr>
<tr>
<td>ME 115</td>
<td>Engr Design Graph*</td>
<td>1</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II*</td>
<td>4</td>
</tr>
<tr>
<td>PHS 211</td>
<td>Gen &amp; Mod Phys I*</td>
<td>4</td>
</tr>
<tr>
<td>University Core</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>(Includes University Seminar and College Writing*)</td>
<td>14 17</td>
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Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BUS 201</td>
<td>Managerial Communications</td>
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<tr>
<td>WRIT 201</td>
<td>College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 102</td>
<td>Molecular &amp; Cellular Biology</td>
<td>4</td>
</tr>
<tr>
<td>GEO 101N</td>
<td>Intro to Physical Geology</td>
<td>4</td>
</tr>
<tr>
<td>GPHY 284</td>
<td>Intro to GIS</td>
<td>4</td>
</tr>
<tr>
<td>LRES 201</td>
<td>Soil Resources</td>
<td>3</td>
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<tr>
<td>MB 101N</td>
<td>Microbiology in Today's World</td>
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</tr>
<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
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<tr>
<td>EM 251</td>
<td>Statics*</td>
<td>3</td>
</tr>
<tr>
<td>EM 252</td>
<td>Dynamics †</td>
<td>3</td>
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<tr>
<td>EM 253</td>
<td>Mechanics of Materials †</td>
<td>3</td>
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<tr>
<td>I&amp;M 350</td>
<td>Applied Eng Data Analysis†</td>
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<tr>
<td>STAT 332</td>
<td>Statistics for Scientists &amp; Engineers†</td>
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<tr>
<td>M 273Q</td>
<td>Multivariable Calculus*</td>
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<td>M 274T</td>
<td>Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>ME 115</td>
<td>Engr Design Graphics Lab*</td>
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</tr>
<tr>
<td>PHS 212</td>
<td>Gen &amp; Mod Phys II</td>
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</tr>
<tr>
<td>University Core Electives for Civil Engineering Majors</td>
<td>9 12</td>
<td></td>
</tr>
</tbody>
</table>

* Key courses  † Advanced courses

University Core Electives for Civil Engineering Majors must include one of the following courses:

ECNS 101BS--Economic Way of Thinking
MGMT 231IS--Knowledge Creation & Inquiry in Business
MGMT 245D--Cultural Dimensions of International Business
MKTG 242D--Intro to Global Markets
PSCL 210IS--Intro to Political Science
PSCL 214IS--Principles of Political Science
PSCL 250D--Intro to International Relations

Electives must include: 12 credits of approved professional electives at the 300 level or above. A minimum of 2 courses in CE and not more than 5 courses in any one civil engineering sub-area are required. A minimum of 4 credits total from Individual Problems, Internships (max. 2 cr.), and Undergraduate Research may be counted toward professional electives. The professional electives program must contain a minimum of 2 design intensive courses. Students must successfully complete all key courses prior to taking any professional electives. A minimum of 3 credits per hour may be included from a completed MSU minor, a prior or concurrent BS/BA degree in another major, or courses in a completed MSU Honors Program. A student may petition to include other senior or graduate level courses consistent with the degree program but not listed here (requires Academic Advisor and Department Head approval).

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

Professional Elective Courses: Credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREN 432</td>
<td>Adv Eng Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>BREN 434</td>
<td>Lumped Parameter Systems &amp; Remediation</td>
<td>3</td>
</tr>
<tr>
<td>BREN 441</td>
<td>Natural Treatment Sys†</td>
<td>3</td>
</tr>
<tr>
<td>CE 307</td>
<td>Const Estimating &amp; Design Practice</td>
<td>3</td>
</tr>
<tr>
<td>CE 361</td>
<td>Legal Principles Surveying</td>
<td>3</td>
</tr>
<tr>
<td>CE 362</td>
<td>Public Land Surveying Systems</td>
<td>3</td>
</tr>
<tr>
<td>CE 365</td>
<td>Advanced Survey Computations</td>
<td>3</td>
</tr>
<tr>
<td>CE 404</td>
<td>Heavy Constr Equip &amp; Methods</td>
<td>3</td>
</tr>
<tr>
<td>CE 405</td>
<td>Constr Proj Planning &amp; Scheduling</td>
<td>3</td>
</tr>
<tr>
<td>CE 413</td>
<td>Reinforced Concrete Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 414</td>
<td>Steel Design</td>
<td>3</td>
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<tr>
<td>CE 415</td>
<td>Design of Masonry Structures</td>
<td>3</td>
</tr>
<tr>
<td>CE 416</td>
<td>Design of Wood and Timber Structures</td>
<td>3</td>
</tr>
<tr>
<td>CE 420</td>
<td>Earth &amp; Foundations</td>
<td>3</td>
</tr>
<tr>
<td>CE 425</td>
<td>Geotechnical Structures</td>
<td>3</td>
</tr>
<tr>
<td>CE 451</td>
<td>Open Channel Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>CE 453</td>
<td>Civil Conduit Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>CE 454</td>
<td>Public Transit System Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 456</td>
<td>Hydropavements</td>
<td>3</td>
</tr>
<tr>
<td>CE 452</td>
<td>Traffic Engineering</td>
<td>3</td>
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<tr>
<td>CE 454</td>
<td>Transportation Planning</td>
<td>3</td>
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<td>CE 456</td>
<td>Geometric Design</td>
<td>3</td>
</tr>
<tr>
<td>CE 465</td>
<td>Photogrammetry</td>
<td>2</td>
</tr>
<tr>
<td>CE 464</td>
<td>Project Design in Surveying</td>
<td>3</td>
</tr>
<tr>
<td>CE 470</td>
<td>Individual Problems</td>
<td>1-3</td>
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<tr>
<td>CE 476</td>
<td>Internship</td>
<td>2</td>
</tr>
<tr>
<td>CE 489</td>
<td>Undergrad Res/Creative Activity</td>
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<tr>
<td>CE 490</td>
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<td>1-4</td>
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<tr>
<td>EM 455</td>
<td>Adv Mech of Solids</td>
<td>3</td>
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<tr>
<td>EM 455</td>
<td>Fluid Dynamics</td>
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</tr>
<tr>
<td>ENVE 455</td>
<td>Air Pollution Control</td>
<td>4</td>
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<tr>
<td>ENVE 444</td>
<td>Hazardous Waste Management</td>
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<td>ENVE 445</td>
<td>Hazardous Waste Treatment</td>
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BIOSCIENCES

ENGINEERING OPTION

Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CE 202</td>
<td>Applied Analysis &amp; Technical Communication*</td>
<td>4</td>
</tr>
<tr>
<td>CE 201</td>
<td>Surveying</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I *</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q</td>
<td>Calculus I*</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II*</td>
<td>4</td>
</tr>
<tr>
<td>ME 115</td>
<td>Engr Design Graph*</td>
<td>1</td>
</tr>
<tr>
<td>PHS 211</td>
<td>Gen &amp; Mod Phys I*</td>
<td>4</td>
</tr>
<tr>
<td>University Core</td>
<td>9</td>
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</tr>
<tr>
<td>(Includes University Seminar and College Writing*)</td>
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Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 201</td>
<td>Managerial Communications</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201</td>
<td>College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 102</td>
<td>Molecular &amp; Cellular Biology</td>
<td>4</td>
</tr>
<tr>
<td>GEO 101N</td>
<td>Intro to Physical Geology</td>
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</tr>
<tr>
<td>GPHY 284</td>
<td>Intro to GIS</td>
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<tr>
<td>LRES 201</td>
<td>Soil Resources</td>
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<tr>
<td>MB 101N</td>
<td>Microbiology in Today's World</td>
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<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
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<tr>
<td>EM 251</td>
<td>Statics*</td>
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<tr>
<td>EM 252</td>
<td>Dynamics †</td>
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<tr>
<td>EM 253</td>
<td>Mechanics of Materials †</td>
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<tr>
<td>I&amp;M 350</td>
<td>Applied Eng Data Analysis†</td>
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<tr>
<td>STAT 332</td>
<td>Statistics for Scientists &amp; Engineers†</td>
<td>3</td>
</tr>
<tr>
<td>M 273Q</td>
<td>Multivariable Calculus*</td>
<td>4</td>
</tr>
<tr>
<td>M 274T</td>
<td>Intro to Differential Equations</td>
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</tr>
<tr>
<td>ME 115</td>
<td>Engr Design Graphics Lab*</td>
<td>1</td>
</tr>
<tr>
<td>PHS 212</td>
<td>Gen &amp; Mod Phys II</td>
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<tr>
<td>(Includes University Seminar and College Writing*)</td>
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Sophomore Year

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>BUS 201</td>
<td>Managerial Communications</td>
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<tr>
<td>WRIT 201</td>
<td>College Writing II</td>
<td>3</td>
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<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
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</tr>
<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
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<tr>
<td>EM 251</td>
<td>Statics*</td>
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<tr>
<td>EM 252</td>
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<td>EM 253</td>
<td>Mechanics of Materials †</td>
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<tr>
<td>I&amp;M 350</td>
<td>Applied Eng Data Analysis†</td>
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<td>STAT 332</td>
<td>Statistics for Scientists &amp; Engineers†</td>
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<tr>
<td>M 273Q</td>
<td>Multivariable Calculus*</td>
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<td>M 274T</td>
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<td>ME 115</td>
<td>Engr Design Graphics Lab*</td>
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<td>PHS 212</td>
<td>Gen &amp; Mod Phys II</td>
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<td>University Core</td>
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<tr>
<td>(Includes University Seminar and College Writing*)</td>
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Programs of Instruction – Engineering
PROGRAMS OF INSTRUCTION – ENGINEERING

Junior Year  
F  S  
CE 308—Construction Practice † 1—4—3  
CE 312—Structures I † 1—3—3  
CE 320—Geotechnical Engr † 3  
CE 331—Engr Hydrology † 2  
CE 352—Engr Hydraulics † 2  
CE 540—Prin of Envir Engr † 3  
EM 335—Mechanics of Fluids I † 3  
ENGR 310—Intro to Engineering Design † 3  

take one of the following:  
CHBE 213 —Material Science † 3  
EE 250 —Circuits, Devices, and Motors 4  
ME 320 —Thermodynamics † 3  
ME 324 —Engineering Thermodynamics † 3  

University Core and Electives † 6  
17 18

Senior Year  
F  S  
BREN 432—Adv Engr Hydrology † 3  
BREN 441—Natural Treatment Sys † 3  
CE 401—Prof Practice & Ethics † 1  
CE 457—Senior Project I † 2  
CE 458—Senior Project II † 2  
ENGR 499—Engr Prog Assmnt † 0  
Analytical Elective (Contact the CE Dept for an approved list of courses) † 3  
University Core and Electives † 9 6  
15 14

* Key course  † Advanced course

University Core Electives for Civil Engineering/Bio-Resources Option majors must include one of the following courses:  
ECNS 101B—Economic Way of Thinking † 3  
MGMT 219—Knowledge Creation & Inquiry in Business 3  
MGMT 245D—Cultural Dimensions of International Business 3  
MKTG 242D—Intro to Global Markets 3  
PSCL 210B—Introduction to American Government 3  
PSCL 214S—Principles of Political Science † 3  
PSCL 250D—Intro to International Relief † 3

Additional requirements: Professional electives must include 12 credits total with 1 course from the Water Resources Engineering Group and 1 course from the Environmental Engineering Group. A maximum of 4 credits total from Individual Problems, Internships (max 2 cr.), and Undergraduate Research may be counted toward professional electives. The professional elective program must contain a minimum of 2 design intensive courses. Students must successfully complete all key courses prior to taking any professional electives. A maximum of 3 credit-hours may be included from a completed MSU minor, a prior or concurrent BS/BA degree in another major, or courses in a completed MSU Honors Program. A student may petition to include other senior or graduate level courses consistent with the degree program but not listed here (requires Academic Advisor and Department Head approval).

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

Professional Elective Courses:  

Water Resources Engineering Group  
BREN 434—Groundwater Supply and Remediation † 3  
CE 431—Open Channel Hydraulics † 3  
CE 435—Closed Conduit Hydraulics † 3  
EM 435—Fluid Dynamics † 3

Environmental Engineering Group  
ENVE 445—Air Pollution Control † 3  
ENVE 444—Hazardous Waste Management † 3  
ENVE 445—Hazardous Waste Treatment † 3

Supporting Topics Group  
BIOL 305—Principles of Ecology † 3  
BREN 470—Individual Problems † 1—3  
BREN 489—Undergrad Research/ Creative Activity † 1—4  
CE 313—Structure II † 3  
CE 350—Transportation Engineering † 3  
CE 420—Engr & Foundation Engr † 3  
CE 427—Geotechnical Structures † 3  
CE 466—Photogrammetry † 3  
CE 470—Individual Problems † 1—3  
CE 476—Internship † 2  
GPHY 384—Adv GIS and Spatial Analysis † 3  
LRES 385—Soil and Environmental Chemistry † 3  
LRES 384—Watershed Hydrology † 3  
LRES 433—Soil & Environmental Physics † 3  
LRES 460—Soil Remed & Envirod Sci † 3  
LRES 461—Restoration Ecology † 3

Construction Engineering Technology  

The Construction Engineering Technology Bachelor of Science Program is a technically rigorous, production oriented, and construction specialty neutral program that prepares graduates to enter and advance to leadership positions in the construction industry. The educational objectives of the Construction Engineering Technology Bachelor of Science Program describe what graduates can expect to accomplish during the first years after graduation. All graduates can expect to be able to:

• enter the construction industry and advance toward leadership positions in the construction industry,
• work on multi-disciplinary teams and effectively communicate with constructors, architects, engineers, the public and public agents, scientists and others to complete construction projects,
• engage in the life-long learning necessary to advance professionally in the construction field;
• contribute to society and the construction industry through involvement in professional related and/or other service activity,
• conduct their affairs in a highly ethical manner holding paramount the safety, health and welfare of the public and striving to comply with the principles of sustainable development.

Some graduates can expect to be able to:

• enter the surveying profession and become licensed to practice surveying;
• earn a Master of Construction Engineering Management degree from MSU or other graduate degrees.

The curriculum provides a well rounded, four-year, specialized university education culminating in a Bachelor of Science degree in Construction Engineering Technology (CET). Knowledge of mathematics and physical sciences along with applied courses in business management, law, and human relations form a background to move design, research or planning ideas to construction applications. The graduate has the training and skills provided by direct hands-on experience and has the additional knowledge and capabilities provided by theory and technological fundamentals. The curriculum prepares the student to be largely responsible for the construction of all types of structures, utilities, transportation facilities, and water and wastewater systems. Emphasis is on current construction applications, surveying, maximizing production, estimating, scheduling, quality control, safety, testing, and field analysis.

Graduates use their skills and abilities to construct transportation systems, utilities, buildings, dams, public health and environmental systems, irrigation, municipal and public works, and also in surveying, mapping, and support of engineering design. Building, industrial, and heavy highway construction are emphasized with particular attention directed toward preparation for employment in management and supervisory positions in both field and office operations.

This curriculum provides the education necessary to work with engineers, architects, contractors, technicians, and owners. The student in this curriculum can be employed as field supervisor, estimator, scheduler, or superinten-
dent; he or she may progress to the highest levels of management in the construction arena such as project and operations managers. Because effective communication is essential in carrying out management responsibilities, students in this curriculum will be required to demonstrate good oral and written communication skills in their undergraduate studies. Other possible positions are employment with consulting engineers and architects in support activities involving plans and planning, acquisition of design data, surveying, construction inspection for quantity and quality control, sales engineering, plant expansion, and maintenance management activities.

Students planning to take the comprehensive examination on surveying fundamentals as the initial step to becoming licensed as a registered land surveyor should review the educational requirements for admission to this examination. Students who desire both the CET degree and land surveyor registration must carefully arrange their elective courses if they plan to graduate in the normal four years.

Students are required to take the Constructor Qualification Examination Level I (CQE) administered by the American Institute of Constructors (AIC) which must be taken the last semester of graduation. Seniors are eligible to take the national comprehensive examination on engineering fundamentals administered by the Computing Accreditation Commission of ABET, 111 Market Street, Suite 500, Baltimore, MD 21202-4012 - telephone: 410-347-7700.

Student Year

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHMY 121IN-Intro to Gen Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 101--Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202--Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>M 151Q--Precalculus</td>
<td>3</td>
</tr>
<tr>
<td>M 165Q--Calculus for Technology I</td>
<td>3</td>
</tr>
<tr>
<td>ME 115--Eng Design Graph</td>
<td>1</td>
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<tr>
<td>PHYS 205--College Physics I</td>
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<td>University Core</td>
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**Sophomore Year**

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<tr>
<td>ARCH 241--Building Construction</td>
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<tr>
<td>BUS 201--Managerial Communications</td>
<td>3</td>
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<tr>
<td>WRIT 201--College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 221--Intermediate Tech Writing</td>
<td>3</td>
</tr>
<tr>
<td>CE 201--Surveying</td>
<td>3</td>
</tr>
<tr>
<td>CE 202--Applied Analysis &amp; Technical Communication</td>
<td>3</td>
</tr>
<tr>
<td>CET 209--Const Surv &amp; Earthwork</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 213-Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>EM 205--Mechanics</td>
<td>3</td>
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<tr>
<td>EM 215-Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>GEO 101N--Intro to Physical Geology</td>
<td>4</td>
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<tr>
<td>M 166Q-Calculus for Technology II</td>
<td>3</td>
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<tr>
<td>ME 116-Eng Design Graphic Lab</td>
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<tr>
<td>PHYS 206--College Phys II</td>
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**Junior Year**

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CE 307--Constr Estimating &amp; Bidding</td>
<td>3</td>
</tr>
<tr>
<td>CET 302--Soils &amp; Foundations</td>
<td>4</td>
</tr>
<tr>
<td>CET 305--Concrete Tech &amp; Struct</td>
<td>3</td>
</tr>
<tr>
<td>CET 308--Construction Practice</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 310--Intro to Engineering Design</td>
<td>3</td>
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<tr>
<td>EM 331--Applied Fluid Mechanic</td>
<td>3</td>
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<tr>
<td>I&amp;M 325--Engineering Economy</td>
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<td>STAT 216Q--Introduction to Statistics</td>
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<td>Take one of the following:</td>
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<tr>
<td>ACTG 220--Principles of Mang Acc</td>
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<tr>
<td>ACTG 201--Principles of Accounting I</td>
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<tr>
<td>I&amp;M 373--Proc Invt Cost Analy</td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>BUS 301--Intro to Law</td>
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<tr>
<td>CE 404-355-Constr Equip &amp; Mths</td>
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<tr>
<td>CE 405--Constr Prj Plan &amp; Sched</td>
<td>3</td>
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<tr>
<td>CEG 408--Constr Proj Mgmt</td>
<td>3</td>
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<tr>
<td>CET 412--Structural Elements</td>
<td>3</td>
</tr>
<tr>
<td>ECE 354-Electric Circuit Appl</td>
<td>3</td>
</tr>
<tr>
<td>MGT 465--Building Systems</td>
<td>3</td>
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<td>University Core and Electives</td>
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<td><strong>Total</strong></td>
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</table>

* Key courses  † Advanced courses  

Electives must include 7 credits of technical-professional courses of which one must be in CE or CET. A maximum of 4 credits total from Individual Problems, Internships (if taking 2 internships, must be from two separate employers), and Undergraduate Research may be counted toward professional electives. Students must successfully complete all key courses prior to taking any professional electives. A maximum of 3 credit-hours may be completed from a completed MSU minor, a prior or concurrent BS/BA degree in another major, or courses in a completed MSU Honors Program. A student may petition to include other senior or graduate level courses consistent with the degree program but not listed here (requires Academic Advisor and Department Head approval).

A minimum of 128 credits is required for graduation: 42 of these credits must be in courses numbered 500 and above.

**Technical-Professional Electives**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARCH 351--Environmental Grl I</td>
<td>4</td>
</tr>
<tr>
<td>ARCH 332--Environmental Grl II</td>
<td>4</td>
</tr>
<tr>
<td>BUS 301--Management &amp; Organztn</td>
<td>3</td>
</tr>
<tr>
<td>BUS 351--Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>BUS 341--Marketing</td>
<td>3</td>
</tr>
<tr>
<td>BUS 351--Finance</td>
<td>3</td>
</tr>
<tr>
<td>CE 350--Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 361--Legal Principle Surveying</td>
<td>3</td>
</tr>
</tbody>
</table>

**Computer Science**

**Department of Computer Science**

[http://www.cs.montana.edu/](http://www.cs.montana.edu/)

A computer science degree is highly marketable. Between 2010 and 2020, one study projects that there will be a shortfall of 32 million technically specialized professionals in the U.S., Europe, Japan, and India.

Our curriculum is designed with considerable flexibility, due to the numerous types of computer science jobs that exist. The bachelor’s degree provides every student with a strong fundamental understanding of the field. Students may then select from exciting computer science electives such as artificial intelligence, computational biology, computer networks, databases, embedded systems, multimedia, operating systems, software engineering, web design and special topics courses. Students who complete a bachelor’s degree will find themselves both highly marketable and well-prepared for graduate school.

The department also offers graduate programs leading to the M.S. and Ph.D. degrees in Computer Science.

The bachelor’s degree is accredited by the Computing Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: 410-347-7700.

**Professional Option**

The professional option allows a student to delve more deeply into both computer science and related technical areas. The compilers course, CS 450, serves as the capstone for this option.
**Interdisciplinary Option**

Many opportunities and challenges lie at the intersection of technology and other fields. The interdisciplinary option allows a student to pursue a minor of choice such as Entrepreneurship or Japanese Studies. During a student’s senior year, the minor area must be connected back to computer science through a senior project. Undergraduate Research/Creative Activity Instruction, CS 489, and Undergraduate Research/Creative Activity, CS 490, serve as the capstone for this option.

**Curriculum in Computer Science**

**PROFESSIONAL OPTION**

<table>
<thead>
<tr>
<th>Component</th>
<th>Credits</th>
<th>Optional</th>
</tr>
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<tbody>
<tr>
<td>Freshman Year</td>
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<tr>
<td>CS 160-Intro to CS</td>
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<tr>
<td>CS 221-Advanced Programming</td>
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<tr>
<td>M 171Q-Calculus I</td>
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<td>WRIT 101W-College Writing I</td>
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<tr>
<td>University Seminar Core</td>
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<td>University Core and Electives</td>
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<td><strong>Total</strong></td>
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<tr>
<td>Sophomore Year</td>
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<tr>
<td>CS 201-Program Design with C</td>
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<tr>
<td>CS 215CS-Social &amp; Ethical Issues</td>
<td>3</td>
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<tr>
<td>CS 222-Discrete Mathematics</td>
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<tr>
<td>CS 223-Data Structures &amp; Algorithms</td>
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<tr>
<td>M 221-Introduction to Linear Algebra</td>
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<td>WRIT 221-Intermediate Tech Writing</td>
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<tr>
<td>Junior Year</td>
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<tr>
<td>CS 330-Computer Organization</td>
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<tr>
<td>CS 350-Theory of Computation</td>
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<tr>
<td>CS 351-Software Engineering</td>
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<tr>
<td>CS 355-Concepts of Prog Languages</td>
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<td>ENGR 310R-Engineering Design</td>
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<tr>
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<td>15</td>
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<tr>
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</tr>
<tr>
<td>CS 49R-Compilers</td>
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<tr>
<td>CS 499-CS Prog Assessment</td>
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<tr>
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<tr>
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<td><strong>Total</strong></td>
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</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**INTERDISCIPLINARY OPTION**

<table>
<thead>
<tr>
<th>Component</th>
<th>Credits</th>
<th>Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 160-Intro to CS</td>
<td>4</td>
<td>S</td>
</tr>
<tr>
<td>CS 221-Advanced Programming</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 171Q-Calculus II</td>
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</tr>
<tr>
<td>WRIT 101W-College Writing I</td>
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<td></td>
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<tr>
<td>University Seminar Core</td>
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<td>University Core and Electives</td>
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<td>Sophomore Year</td>
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<tr>
<td>CS 201-Program Design with C</td>
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<tr>
<td>CS 215CS-Social &amp; Ethical Issues</td>
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<td></td>
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<tr>
<td>CS 222-Discrete Mathematics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CS 223-Data Structures &amp; Algorithms</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 221-Introduction to Linear Algebra</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>WRIT 221-Intermediate Tech Writing</td>
<td>3</td>
<td></td>
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<tr>
<td>Science Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core</td>
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<tr>
<td><strong>Total</strong></td>
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<tr>
<td>Junior Year</td>
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<tr>
<td>CS 330-Computer Organization</td>
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<tr>
<td>CS 350-Theory of Computation</td>
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<td></td>
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<td>CS 351-Software Engineering</td>
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<tr>
<td>CS 355-Concepts of Prog Languages</td>
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<td></td>
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<tr>
<td>ENGR 310R-Engineering Design</td>
<td>3</td>
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<tr>
<td>CS Electives</td>
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<tr>
<td>Minor Electives</td>
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<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td>15</td>
</tr>
</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Minor (Non-Teaching)**

The department offers a minor in computer science for students who wish to receive formal acknowledgement for taking a core of computer science courses. The minor is designed to strengthen the students’ opportunities for industrial employment or for admission to graduate school.

**Credits**

<table>
<thead>
<tr>
<th>Component</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 160-Intro to CS</td>
<td>4</td>
</tr>
<tr>
<td>CS 221-Advanced Programming</td>
<td>4</td>
</tr>
<tr>
<td>CS 223-Data Structures &amp; Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>Upper division CS credits</td>
<td>9</td>
</tr>
<tr>
<td>Additional CS credits at any level</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>27</td>
</tr>
</tbody>
</table>

**Electrical and Computer Engineering**

**Department of Electrical and Computer Engineering**

**http://ece.montana.edu**

The Electrical and Computer Engineering Department (ECE) offers degrees in three areas: a Bachelor of Science and Master of Science in Electrical Engineering, a Ph.D. in Engineering with an ECE option; and a Bachelor of Science in Computer Engineering. The programs leading to the B.S. in Electrical Engineering and B.S. in Computer Engineering are both accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700.

The breadth and quality of each degree program are driven by the goals of the Electrical and Computer Engineering Department.

The mission of the department is to provide an excellent environment for the scholarly pursuits of education, discovery, and dissemination in electrical and computer engineering in support of Montana State University and the state of Montana. We strive to excel in teaching at both the undergraduate and graduate levels. We seek to attract and retain well-qualified undergraduate students and provide them with educational, research, and scholarship opportunities. We strive to train the next generation of academics and researchers by providing opportunities in world class research and experience in teaching. And, we seek to develop a competitive research program of regional, national, and international importance.

The goals of the Department are to:
1. Serve the State of Montana and the nation through education, research, and service to meet the mission of Montana State University and the College of Engineering.
2. Provide ABET accredited undergraduate programs in Electrical Engineering and Computer Engineering.
3. Be recognized by academic and industrial colleagues as delivering excellent undergraduate programs which provide students with a strong
foundation in the contemporary and traditional areas of Electrical and Computer Engineering.

4. Encourage faculty members to maintain professional expertise through continued professional development so they can sustain excellence in teaching and advising and be competitive in research.

5. Provide excellent learning opportunities in lectures and modern laboratory facilities.

6. Provide graduate research opportunities which, coupled with undergraduate excellence, prepare students through advanced studies in current and emerging fields of state, national, and international importance.

7. Develop a competitive research program and disseminate new knowledge while mentoring graduate students completing requirements for advanced degrees.

Educational objectives for the BSEE and BScpE degree programs are broad statements that describe what graduates are expected to attain within a few years after graduation.

In their first few years on the job, graduates of the Programs:

1. Pursue a professional career based on an education in the fundamentals of Electrical and Computer Engineering.

2. Engage in post-graduate education programs.

3. Provide a positive impact to the engineering community and to the community at large.

Internship Opportunities

Internships are encouraged for students seeking engineering experience during summer employment. A wide variety of engineering companies recruit undergraduate interns from MSU. A total of three credits of internship can be applied towards graduation as a professional elective at the rate of one credit per full-time summer engineering employment. An intern experience allows students to gain engineering industrial experience that complements their formal academic education. Students in the Electrical Engineering and the Computer Engineering degree programs are encouraged to investigate the possibilities of an internship experience according to opportunities announced each year. The MSU office of Career Internship & Student Employment Services helps students identify internship opportunities.

Research Opportunities

Students in the Electrical Engineering and the Computer Engineering degree programs are also encouraged to investigate opportunities to work under the supervision of an ECE faculty member in a research lab either during the summer or during the academic year. All members of the ECE faculty have active research programs which regularly involve undergraduate students. Hands-on research experience complements the student’s formal academic education while providing familiarity with career opportunities in the research field. Students in the ECE department have opportunities for paid research positions in addition to receiving credit for conducting research by registering for EE 492 - Independent Study or EE 490R – Undergraduate Research.

Graduate Program

Graduate school can provide an opportunity to gain education and experience in specialty areas that go beyond the scope or depth of the undergraduate curriculum, and offers advanced work in such areas as design, development work, research, and university-level teaching. The Electrical and Computer Engineering Department offers graduate programs leading to the M.S. in Electrical Engineering and Ph.D. in Engineering with an EE option. Exciting leading edge research provides excellent learning opportunities, including participation in interdisciplinary teams. A number of research and teaching assistantships are available for qualified graduate students. Information regarding graduate school at MSU can be found at Division of Graduate Education, and information regarding the ECE graduate program can be found at http://ece.montana.edu/research/eegrad1.htm.

For more information about the department and its programs, see the Electrical and Computer Engineering Department home page at http://ece.montana.edu

Computer Engineering

The Electrical and Computer Engineering Department offers an accredited program for the Bachelor of Science Degree in Computer Engineering (BScpE). The Computer Engineering program is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700.

In the fast-paced field of computers, the computer engineering graduate will be prepared for careers in exciting innovative technologies including embedded systems, programmable logic, hardware/software co-design, and digital signal processing. With increased processor capacity and processing speeds, re-programmable logic devices offer far-reaching opportunities for the computer engineer to create new applications unheard of today. The computer engineer uses knowledge of both electronics hardware and software to achieve state-of-the-art solutions, often involving programmable logic devices and microprocessors. The computer engineering curriculum is designed to prepare students for engineering careers where programming and software skills are blended with the understanding of hardware design.

The computer engineering program at MSU is interdisciplinary and incorporates substantial coursework from both the Electrical and Computer Engineering Department and the Computer Science Department. All students in the Electrical and Computer Engineering Department develop common skills in basic science, mathematics, basic electronics and circuits; however, the computer engineering student diverges from the electrical engineering student by taking more computer science and computer architecture courses, as well as a full complement of courses in microprocessors and programmable devices.

In the senior year each computer engineering student takes part in a capstone design project. This project allows the student to function as part of a team on a real world problem, and the student, in addition to accomplishing the design, must also communicate his or her work in both a written paper and an oral presentation. All projects are intended to bring the student’s aca-
demic training to a logical conclusion and further develop the problem-solving skills and the communication skills of the computer engineering graduate.

The computer engineering program educational outcomes are:

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs.
- An ability to function on multi-disciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- A recognition of the need for, and an ability to engage in lifelong learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
- Knowledge of the principles of project management and design trade-offs.
- An ability to program microcontroller/microcomputer systems using assembly and high-level languages.
- An ability to design digital systems using modern design tools.
- An ability to analyze electrical and electronic systems.
- An ability to implement real-time systems.

Computer Engineering Minor (Non-Teaching)

The Department of Electrical and Computer Engineering offers a non-teaching minor in Computer Engineering that provides a focus in computer programming, digital logic design, and microprocessor hardware/software. The minor requires a minimum of 30 credits: 23 credits in seven specified CS and EE courses and at least 7 credits (2 or 3 courses) of electives selected from among a specified list of upper-division EE courses. This minor is a useful complement to majors in science or engineering for those seeking a cross-disciplinary academic program.

An EE major can complete a minor in Computer Engineering by taking CS 201, 221, and 223 (a total of 11 credits) plus two courses (7 cr min) from the specified elective list for the CpE minor. Completing the Computer Engineering minor requires 3 credits of professional electives beyond the minimum of 16 professional elective credits required for EE majors. Thus, an EE degree with a CpE minor can be completed in 131 credits.

Student Performance and Retention Requirements: Students commencing their academic program in the fall 2005 or later are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the BScpE degree requirements. This minimum grade must be achieved in each prerequisite course prior to taking the follow-on course.

Curriculum in Computer Engineering

Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 206</td>
<td>Circuits I</td>
<td>4</td>
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<tr>
<td>EE 101</td>
<td>Intro to Electr Fund</td>
<td>3</td>
</tr>
<tr>
<td>CS 110</td>
<td>Intro to Programming</td>
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<tr>
<td>ENGR 310</td>
<td>Intro to Engr Design</td>
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</tr>
<tr>
<td>ENGR 320</td>
<td>Intro to Engr Design II</td>
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<tr>
<td>ENGR 410</td>
<td>Intro to Engr Design III</td>
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Sophomore Year

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<tr>
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<tbody>
<tr>
<td>ENGR 221</td>
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</tr>
<tr>
<td>ENGR 222</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 223</td>
<td>Logic Circuits</td>
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</tr>
<tr>
<td>ENGR 224</td>
<td>Sys Design</td>
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</tr>
<tr>
<td>ENGR 225</td>
<td>Digital Design</td>
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<tr>
<td>ENGR 226</td>
<td>Softw Design</td>
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<tr>
<td>ENGR 227</td>
<td>Logic Design</td>
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Junior Year

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<td>ENGR 321</td>
<td>Intro to Engr Design III</td>
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</tr>
<tr>
<td>ENGR 322</td>
<td>Intro to Engr Design IV</td>
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<tr>
<td>ENGR 323</td>
<td>Intro to Engr Design V</td>
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</tr>
<tr>
<td>ENGR 324</td>
<td>Intro to Engr Design VI</td>
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</tr>
<tr>
<td>ENGR 325</td>
<td>Intro to Engr Design VII</td>
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</tr>
<tr>
<td>ENGR 326</td>
<td>Intro to Engr Design VIII</td>
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Senior Year

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<tr>
<td>ENGR 421</td>
<td>Advanced Engr Design II</td>
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<tr>
<td>ENGR 422</td>
<td>Advanced Engr Design III</td>
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<td>ENGR 423</td>
<td>Advanced Engr Design IV</td>
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<td>ENGR 424</td>
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<td>ENGR 425</td>
<td>Advanced Engr Design VI</td>
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<td>ENGR 426</td>
<td>Advanced Engr Design VII</td>
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<td>ENGR 427</td>
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Mathematics and Basic Sciences Electives

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<th>Course Name</th>
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<tbody>
<tr>
<td>MATH 211</td>
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<tr>
<td>MATH 212</td>
<td>Calculus II</td>
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<tr>
<td>MATH 213</td>
<td>Calculus III</td>
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<tr>
<td>MATH 214</td>
<td>Linear Algebra</td>
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<td>MATH 215</td>
<td>Modern Algebra</td>
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<td>MATH 216</td>
<td>Advanced Calculus</td>
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<td>MATH 217</td>
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<td>MATH 218</td>
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Professional Electives

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<tbody>
<tr>
<td>ENGR 320</td>
<td>Intro to Engr Design II</td>
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<tr>
<td>ENGR 321</td>
<td>Intro to Engr Design III</td>
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<tr>
<td>ENGR 322</td>
<td>Intro to Engr Design IV</td>
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<tr>
<td>ENGR 323</td>
<td>Intro to Engr Design V</td>
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</tr>
<tr>
<td>ENGR 324</td>
<td>Intro to Engr Design VI</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 325</td>
<td>Intro to Engr Design VII</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 326</td>
<td>Intro to Engr Design VIII</td>
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</table>

Computer Science Electives

<table>
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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CS 101</td>
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<tr>
<td>CS 102</td>
<td>Intro to CS</td>
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<tr>
<td>CS 103</td>
<td>Intro to CS</td>
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<tr>
<td>CS 104</td>
<td>Intro to CS</td>
<td>3</td>
</tr>
<tr>
<td>CS 105</td>
<td>Intro to CS</td>
<td>3</td>
</tr>
<tr>
<td>CS 106</td>
<td>Intro to CS</td>
<td>3</td>
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<tr>
<td>CS 107</td>
<td>Intro to CS</td>
<td>3</td>
</tr>
<tr>
<td>CS 108</td>
<td>Intro to CS</td>
<td>3</td>
</tr>
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</table>

Computer Engineering Minor (Non-Teaching)
Students must receive a grade of "C-" or better in all EE 475--Hrdwr/Sftwr Eng for Emb Sys ..........................3
EE 466--Computer Arch & Syst Org ..........................4

Transportation systems, manufacturing, medical instrumentation, and computer-controlled systems play key roles in interdisciplinary efforts such as communications, systems, electronic circuits, and telecommunication systems. As an electrical engineer, employment opportunities are wide open in a broad spectrum of opportunities which includes advanced research and development, design and applications engineering, manufacturing engineering, sales, and management.

The undergraduate program is designed to provide the student with the fundamental background in Mathematics, basic science, engineering, and personal communication to allow the graduate to be a contributing member in the engineering community. The electrical engineering curriculum provides the integrated educational experience whereby the student develops the skills to identify and to solve technical problems by applying pertinent electrical engineering knowledge to the solution of practical problems. This breadth of engineering knowledge and the ability to communicate that knowledge requires a broad-based education in various fields as well as professional elective courses. These professional electives enable the student to study in depth one or more of the following areas: logic design, digital signal processing, computer and microprocessor applications, electromagnetic theory, optics and photonics, control systems, electrical power systems, electronic circuits, and telecommunications.

Technical electives available outside the department allow the student to broaden in other engineering and scientific areas. These electives can also be used to allow the student to expand his or her knowledge in business, finance, law, and management.

The electrical engineering program educational outcomes are:

- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- A recognition of the need for, and an ability to engage in lifelong learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
- Knowledge of the principles of project management and design trade-offs.
- An ability to analyze and synthesize electronic devices and electrical systems.

Electrical Engineering Minor (Non-Teaching)

The Department of Electrical and Computer Engineering offers a non-teaching minor in Electrical Engineering that provides interested students with an introductory understanding of electrical circuits, electronics, and properties of signals. Students then choose electives from among a variety of electrical engineering topics, such as telecommunications, optics, electronics, electrical power, and control systems. This minor requires a minimum of 29 credits in electrical engineering subjects, with 9 of those credits selected from a list of upper division elective courses. This minor complements majors in science or engineering for those seeking a cross-disciplinary academic program.

A CpE major can complete a minor in Electrical Engineering by taking three EE classes (9 cr min) from the specified elective list for the EE minor. This can be done within the 128 credits required for the CpE degree alone, which requires a total of 17 professional elective credits.

Student Performance and Retention Requirements: Students commencing their academic program in the fall 2005 or later are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the BSEE degree requirements. This mini-
mum grade must be achieved in each prerequisite course prior to taking the follow-on course.

**Curriculum in Electrical Engineering**

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHMY 141-College Chemistry I</td>
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<tr>
<td>Take one University Seminar course:</td>
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<tr>
<td>Recommended: Com 110-US-Public</td>
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</tr>
<tr>
<td>Communication (or)</td>
<td>3</td>
</tr>
<tr>
<td>CLS 101-US-College Seminar</td>
<td>3</td>
</tr>
<tr>
<td>EE 301-Intro to Electr Fund.</td>
<td>2</td>
</tr>
<tr>
<td>WRIT 101-W-College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q-Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211-Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212-Gen &amp; Mod Phys II</td>
<td>4</td>
</tr>
<tr>
<td>Electives*</td>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 160-Intro to Computer Science</td>
<td>4</td>
</tr>
<tr>
<td>EE 206-Circuits I</td>
<td>4</td>
</tr>
<tr>
<td>EE 207-Circuits II</td>
<td>4</td>
</tr>
<tr>
<td>EE 261-Intro to Logic Cir</td>
<td>3</td>
</tr>
<tr>
<td>EE 302-Logic Circuits Lab</td>
<td>4</td>
</tr>
<tr>
<td>M 574-Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 274-Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 213-Gen &amp; Mod Phys III</td>
<td>4</td>
</tr>
<tr>
<td>EM 251-Statics &amp; Partil Dynam</td>
<td>3</td>
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</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>EE 308-Signal and System Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EE 317-Electronics</td>
<td>4</td>
</tr>
<tr>
<td>EE 324-Control Systems I</td>
<td>3</td>
</tr>
<tr>
<td>EE 334-Electromag Theory I</td>
<td>3</td>
</tr>
<tr>
<td>EE 355-Energy Conversion Devices</td>
<td>4</td>
</tr>
<tr>
<td>EE 371-Micr Hbrw/Silver Syst</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 310R-Intro to Eng Design</td>
<td>3</td>
</tr>
<tr>
<td>EE 435-Telecomm Systems</td>
<td>4</td>
</tr>
<tr>
<td>I&amp;ME 350-Applied Engr Data Analysis</td>
<td>2</td>
</tr>
<tr>
<td>Electives*</td>
<td>3</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 409-Material Science</td>
<td>3</td>
</tr>
<tr>
<td>EE 492-Eng Engr Design II</td>
<td>3</td>
</tr>
<tr>
<td>EE 495-Professionalism, Ethics &amp; Engr Practice</td>
<td>1</td>
</tr>
<tr>
<td>ENGR 499-Engr Prog Assmnt</td>
<td>0</td>
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<tr>
<td>Electives*</td>
<td>10</td>
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</tbody>
</table>

**Electrical Engineering Minor (Non-Teaching Minor)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 101-Intro to Electr Fund</td>
<td>2</td>
</tr>
<tr>
<td>EE 206-Circuits I</td>
<td>4</td>
</tr>
<tr>
<td>EE 207-Circuits II</td>
<td>4</td>
</tr>
<tr>
<td>EE 308-Signal and System Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EE 317-Electronics</td>
<td>4</td>
</tr>
<tr>
<td>EE 334-Electromag Theory I</td>
<td>3</td>
</tr>
<tr>
<td>Take 9 credits minimum from the following</td>
<td></td>
</tr>
<tr>
<td>EE 321-Control Systems I</td>
<td>4</td>
</tr>
<tr>
<td>EE 335-Electromag Theory II</td>
<td>4</td>
</tr>
<tr>
<td>EE 355-Energy Conversion</td>
<td>4</td>
</tr>
<tr>
<td>EE 409-Material Science</td>
<td>3</td>
</tr>
<tr>
<td>EE 411-Adv Analog Electronics</td>
<td>3</td>
</tr>
<tr>
<td>EE 414-Intro to VSLI Design</td>
<td>3</td>
</tr>
<tr>
<td>EE 422-Control Systems II</td>
<td>3</td>
</tr>
<tr>
<td>EE 445-Telecommunications System</td>
<td>4</td>
</tr>
<tr>
<td>EE 447-Adv Telecom/Fiber Optics Sys.</td>
<td>3</td>
</tr>
<tr>
<td>EE 482-Electrooptical Systems</td>
<td>3</td>
</tr>
<tr>
<td>EE 483-Fiber and Integrated Optics</td>
<td>3</td>
</tr>
</tbody>
</table>

* Elective requirements include 12 credits of humanities, social science, diversity, and arts classes as part of university and COE core requirements (these two requirements may be combined), 16 credits of professional electives with a minimum of 8 credits in Electrical Engineering and a minimum of 5 credits outside of Electrical Engineering all from the professional electives list below. There must be a minimum of 5 credits at the 300 level or above in the student’s approved electives package. 3 additional elective credits must be selected from either the approved Professional Electives listed below, or from the list of courses approved by the MSU Core 2.0 committee in the W, A, H, S, D, N, or Contemporary Issues in Science (CS) categories (i.e., all categories except US and Q).

**Professional Electives**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 300 or 400 level courses, excluding EE 354</td>
<td></td>
</tr>
<tr>
<td>BIOL 453R-Biomimetic Intelligent Systems</td>
<td></td>
</tr>
<tr>
<td>ACTG 201-Principles of Fin Acct</td>
<td></td>
</tr>
<tr>
<td>ACTG 202-Principles of Mang Acct</td>
<td></td>
</tr>
<tr>
<td>BUS 341-Marketing</td>
<td></td>
</tr>
<tr>
<td>CS 201-Program Design with C</td>
<td></td>
</tr>
<tr>
<td>CS 204-Multimedia Development Methods</td>
<td></td>
</tr>
<tr>
<td>CS 222-Discrete Mathematics</td>
<td></td>
</tr>
<tr>
<td>CS 223-Adv Data Structures &amp; Algorithms</td>
<td></td>
</tr>
<tr>
<td>CS 309-Systems Administration</td>
<td></td>
</tr>
<tr>
<td>CS 324-Programming Techniques</td>
<td></td>
</tr>
<tr>
<td>CS 330-Comp Org &amp; Architecture</td>
<td></td>
</tr>
<tr>
<td>CS 350-Theory of Computation</td>
<td></td>
</tr>
<tr>
<td>CS 351-Software Engineering</td>
<td></td>
</tr>
<tr>
<td>CS 355-Concepts of Programming Languages</td>
<td></td>
</tr>
<tr>
<td>CS 392-Numerical Computation</td>
<td></td>
</tr>
<tr>
<td>CS 418-Optical Engineering</td>
<td></td>
</tr>
<tr>
<td>CS 422-Intro to Simulation</td>
<td></td>
</tr>
<tr>
<td>CS 425-Computer Graphics</td>
<td></td>
</tr>
<tr>
<td>CS 430-Image Processing</td>
<td></td>
</tr>
<tr>
<td>CS 432-Computational Biology</td>
<td></td>
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<tr>
<td>CS 435-Database Systems</td>
<td></td>
</tr>
<tr>
<td>CS 436-Artificial Intelligece</td>
<td></td>
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<tr>
<td>CS 440-Computer Networks</td>
<td></td>
</tr>
<tr>
<td>CS 450-Compilers</td>
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</tr>
<tr>
<td>CS 451-Software Engineering</td>
<td></td>
</tr>
<tr>
<td>ECNS 309-Managerial Economics</td>
<td></td>
</tr>
<tr>
<td>EM 252-Rigid Body Mechanics</td>
<td></td>
</tr>
<tr>
<td>EM 253-Mechanics of Materials</td>
<td></td>
</tr>
<tr>
<td>EM 335-Mechanics of Fluids I</td>
<td></td>
</tr>
<tr>
<td>WRIT 221-Intermediate Tech Writing</td>
<td></td>
</tr>
<tr>
<td>I&amp;ME 325-Engineering Economy</td>
<td></td>
</tr>
<tr>
<td>I&amp;ME 344-Concurrent Engineering</td>
<td></td>
</tr>
<tr>
<td>I&amp;ME 364-Prin of Oper Resch I</td>
<td></td>
</tr>
<tr>
<td>I&amp;ME 344-Eng Por &amp; Mgmt</td>
<td></td>
</tr>
<tr>
<td>I&amp;ME 354-Eng Engr &amp; Statistics II</td>
<td></td>
</tr>
<tr>
<td>M 221-Introduction to Linear Algebra</td>
<td></td>
</tr>
<tr>
<td>M 300 and 400 level courses, excluding M 330, 394, 400 and 428</td>
<td></td>
</tr>
<tr>
<td>ME 300 or 400 level courses, excluding ME 451</td>
<td></td>
</tr>
<tr>
<td>PHYS 301-Classical Mechanics</td>
<td></td>
</tr>
<tr>
<td>PHYS 311-Solar System Astronomy</td>
<td></td>
</tr>
<tr>
<td>PHYS 312-Stars, Galaxies, and the Universe</td>
<td></td>
</tr>
<tr>
<td>PHYS 400-Seminar (limited to 1 cr)</td>
<td></td>
</tr>
<tr>
<td>PHYS 411 or above</td>
<td></td>
</tr>
</tbody>
</table>

**Grade Policies**

The Montana Board of Regents grade policy requires C- or higher marks in all courses required for a degree. (This policy affects students who entered or were readmitted to the system starting in Fall, 2005.) Students who enrolled prior to Fall, 2005, and have not had a break in attendance of one year or more, are exempt from the Board of Regents C- policy.

The complete policy is presented in the on-line catalog under Academic Policies - Courses, Credits, and Grades - Minimum Competency Requirements.
Prerequisite Policy
The Mechanical and Industrial Engineering Department enforces prerequisites. A prerequisite course is one which must be successfully completed before a student may enroll in the follow-on course. By Board of Regents policy, in order for a course to serve as a prerequisite, a grade of "C-" or higher must be earned. M&IE students who earn below a "C-" in a course will be instructed to repeat the course during its next offering. They will also be instructed to drop any follow-on course that is affected by the unsatisfactory prerequisite grade.

D- Grade
For students exempt from the Board of Regents C- policy requirements, D+, D, and D- grades must be addressed. The M&IE Department does not consider D- to be a passing grade. A course in which a D-grade is earned must be repeated, and a grade of D or higher earned, for it to apply to degree requirements. By M&IE Department policy, in order for a course to serve as a prerequisite, a grade of D or higher must be earned. M&IE students who earn below a D in a course will be instructed to repeat the course during its next offering. They will also be instructed to drop any follow-on course that is affected by the unsatisfactory grade. It is important to note that students exempt from the BOR policy are, however, required to earn C- or higher grades in all Core 2.0 courses.

Industrial Engineering
The mission of the undergraduate program in Industrial Engineering (IE) is to produce graduates well grounded in both classical and current industrial engineering knowledge and skills consistent with the land-grant mission of MSU. Graduates will be prepared to be productive citizens and contributors to the economic well-being of employers. The IE undergraduate program is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410)347-7700. The educational objectives for the IE program follow.

Industrial Engineering graduates will:
- Undertake professional careers in industrial engineering;
- Employ effective communication;
- Work in multidisciplinary professional teams;
- Engage in life-long learning, including post-graduate education for some graduates;
- Contribute to industry and society, in Montana or elsewhere, including involvement in professional and other service activities;
- Participate in ethical leadership in design and operational activities that contribute to the success of the organization and the community.

The undergraduate curriculum in Industrial Engineering (IE) includes Mathematics, basic sciences, humanities, social sciences, engineering sciences, design, and communication courses distributed over a four-year period. An important feature of the program is to teach students to foster the ability to comprehend, define, and analyze problems; synthesize alternatives; and rationally choose appropriate solutions. This requires a broad technical education that motivates life-long learning to keep pace with technological and social changes.

Industrial Engineering is a broad engineering discipline. Since IEs are employed in every facet of American business and industry, they are usually "people-oriented problem solvers" who enjoy diversity in their assignments and careers. For example, IE alumni include plant managers, manufacturing engineers, teachers, hospital administrators, consultants, quality assurance managers and engineers, technical sales engineers, production supervisors, and department heads. Today IEs are active in all kinds of manufacturing, as well as in service operations such as hospitals, banks, airlines, transportation and distribution companies, retailers, utilities, and local, state, and federal governments.

IEs are qualified for this wide variety of careers because their education is unique. First of all they are people-oriented, but they are also technically trained. IEs take the standard core of engineering courses, including two years of calculus, to provide a background for understanding production, fabrication, assembly processes, etc., required to design systems for business and industry. All engineering curricula require graduates to meet accreditation standards in Mathematics, basic science, engineering science, engineering design, as well as in humanities and social sciences. However, IEs are more knowledgeable of management functions in companies than are other engineering majors. A technically trained, management-oriented man or woman who can solve problems by working with people—that’s an IE graduate.

The IE is an "integrator" of resources, people, material, and equipment. This is accomplished by "designing systems" so that the right people with the proper mix of skills, combined with the right quantities of equipment and materials, are available at the right time to produce a product or provide a service at a cost that will allow a profit to be made. Since these professionals frequently work on problem solving teams, the ability to communicate, coordinate, and work with others is essential. Because IEs design systems for producing products, specifying processes, or providing services, their expertise is applicable to many businesses and industries. Frequently, they become supervisors and managers of the same systems they design.

Today much is written about "re-engineering companies." IE graduates are uniquely qualified to analyze a company’s customer needs, relate those to products or services, and examine the flow of materials, processes, documentation, information, etc., that result in "re-engineering" the company to compete more effectively. World class companies must have "systems" that consistently provide on-time delivery of defect-free products (or services) that delight the customers—and for a competitive price that allows the company to make a reasonable profit. Industrial Engineers are actively involved in designing these systems, integrating the resources required to make them function, and quite often managing them.
**Graduate Program**

Students who have graduated from a four-year degree program which has sharpened their Mathematical and communication skills will greatly benefit by completing the Master of Science degree in Industrial & Management Engineering or the Doctor of Philosophy in Engineering with Industrial Engineering option. Emphases in Manufacturing, Human Factors/Ergonomics, Manufacturing Automation, Operations Research/Computer Applications, Quality Management, and Systems Analysis and Modeling are available. Flexible guidelines permit broadening or customizing to meet career objectives. Further details may be found in the Graduate Catalog.

**Student Performance and Retention Requirements**

No further requirements apply in order to advance in the Industrial Engineering program.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLS 101U</td>
<td>101U-College Seminar</td>
<td>3</td>
</tr>
<tr>
<td>COM 110U</td>
<td>110U-Public Communication</td>
<td>3</td>
</tr>
<tr>
<td>CS 160</td>
<td>Intro to CS</td>
<td>4</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 101I</td>
<td>Intro to IE</td>
<td>1</td>
</tr>
<tr>
<td>I&amp;ME 142I</td>
<td>Intro to Production</td>
<td>2</td>
</tr>
<tr>
<td>M 17Q</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 17Q</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>ME 117E</td>
<td>ME Design Graphics</td>
<td>1</td>
</tr>
<tr>
<td>ME 116E</td>
<td>Eng Design Graphics</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 211E</td>
<td>Gen &amp; Mod Phys I</td>
<td>4</td>
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**Sophomore Year**

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHBE 213</td>
<td>Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>EE 250</td>
<td>Circuits, Devices, and Motors</td>
<td>4</td>
</tr>
<tr>
<td>EM 251</td>
<td>Statics &amp; Particle Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 264I</td>
<td>Intro Models, Computers</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 313I</td>
<td>Work Design &amp; Analysis</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 271I</td>
<td>Microcomputers in Industry</td>
<td>3</td>
</tr>
<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 274I</td>
<td>Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212E</td>
<td>Gen &amp; Mod Phys II</td>
<td>4</td>
</tr>
<tr>
<td>University Core Elective</td>
<td></td>
<td>3</td>
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<tr>
<td></td>
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<td>18</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM 253I</td>
<td>Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 308I</td>
<td>Professional Practice &amp; Responsibility</td>
<td>2</td>
</tr>
<tr>
<td>I&amp;ME 325I</td>
<td>Engineering Economy</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 354I</td>
<td>Engineering Probability &amp; Stats II</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 355I</td>
<td>Engineer Statistics Lab</td>
<td>1</td>
</tr>
<tr>
<td>I&amp;ME 361I</td>
<td>Principles of Operations Research I</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 454I</td>
<td>Engineering Probability</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 456I</td>
<td>Production &amp; Engr Management</td>
<td>3</td>
</tr>
<tr>
<td>ME 253I</td>
<td>Manufacturing Processes</td>
<td>3</td>
</tr>
<tr>
<td>University Core Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&amp;ME 422I</td>
<td>Intro to Simulation</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 434I</td>
<td>Project &amp; Engr Management</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 442I</td>
<td>Facility/Material Handling Design</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 444I</td>
<td>Senior Design Project</td>
<td>2</td>
</tr>
<tr>
<td>I&amp;ME 445I</td>
<td>Independent Senior Design</td>
<td>1</td>
</tr>
<tr>
<td>I&amp;ME 477I</td>
<td>Quality Assurance</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 499I</td>
<td>Engr Prog Asmt</td>
<td>0</td>
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<tr>
<td>Professional Electives</td>
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<tr>
<td>University Core Elective</td>
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<td>3</td>
</tr>
<tr>
<td></td>
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<td>15</td>
</tr>
</tbody>
</table>

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

**Mechanical Engineering**

The specific mission of the undergraduate Mechanical Engineering (ME) program is to prepare students for successful mechanical engineering careers, responsible citizenship, and continued intellectual growth. The goal of the program is to produce graduates strong in fundamentals, applications, design, communication, and professional responsibility. The ME undergraduate program is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone: (410) 347-7700. The educational objectives for the ME program follow.

Mechanical Engineering graduates will:
- Undertake professional careers;
- Assume leadership roles by advancing in the engineering profession;
- Employ effective communication;
- Work in multidisciplinary professional teams;
- Engage in life-long learning, including post-graduate education for some graduates;
- Contribute to industry and society, in Montana or elsewhere, including involvement in professional and other service activities; and
- Solve technical problems in design, analysis, manufacturing, project management, or testing.

The undergraduate Mechanical Engineering program is principally oriented toward career preparation, providing students with the engineering and technical education appropriate to the challenges presented by today’s technologically complex and difficult problems. The coursework in mechanical engineering provides four years of study in mathematics, basic sciences, university core subjects, and engineering topics. The overall curriculum provides an integrated educational experience directed toward the development of an ability to apply pertinent knowledge to the identification and solution of practical problems in mechanical engineering.

The profession of mechanical engineering is very broad, with practitioners employed in most areas of technological and industrial management endeavor. Examples of industrial employers which require mechanical engineering background are: process industries including pulp and paper, steel, aluminum, food, petroleum, chemicals and others; manufacturing industries including highway vehicles, instruments, airplanes, rockets and engines, toys, agricultural machinery, and many others; power plants including steam, nuclear, and hydroelectric plants; federal laboratories performing a wide variety of defense and non-defense related engineering design, analysis, and experimental work; and a wide variety of consulting work including heating, ventilating, and air conditioning system design, and forensic engineering. This brief sample gives a view of the wide spectrum of employment possibilities in mechanical engineering. It is the mechanical engineer’s responsibility and challenge to conceive, plan, design, and perform analysis and testing related to devices, machines, and systems used by or manufactured by the employer. This work may include liaison with other engineers, engineering technologists, technicians, outside vendors, and departments within the company. Areas of responsibility following design and prototype testing may include direction of a manufacturing line.

It should be evident that career opportunities abound within this very wide array of employers and engineering activities. The job market for engineers often follows the nation’s economy in general. In spite of these natural fluctuations, however, it is expected that our nation will always depend on uses of technology for creating an
improved standard of living and a more efficient industrial base to maintain and enhance international competitiveness. Therefore, we can expect that mechanical engineering graduates will have excellent employment opportunities.

Course requirements include mathematics, basic sciences (physics and chemistry), engineering design; arts, diversity, humanities and social sciences; and at least one year of engineering science. The program also includes engineering graphics, statistics, computer application, solid mechanics, materials science, manufacturing processes, thermodynamics, heat transfer, fluid mechanics, electronics, and design of structural, mechanical, and energy systems. Computing and computer applications are stressed throughout the curriculum. The program culminates with a capstone design experience in which the student is involved in a team that must create a solution to a real-world engineering design problem, and develop a working prototype. Often times these teams are multidisciplinary.

Graduate Program

Students who have completed a Bachelor of Science degree in engineering or closely related discipline may take graduate work leading to the Master of Science in Mechanical Engineering or Doctor of Philosophy in Engineering with Mechanical Engineering or Engineering Mechanics options typical. Advanced degrees are necessary for university teaching and are increasingly important in industry, particularly in the areas of new product development and research. Further details may be found in the Graduate Catalog.

Student Performance and Retention Requirements

No further requirements apply in order to advance in the Mechanical Engineering program.

Freshman Year  F  S
CIMV 141-College Chemistry I................................. 4
Take one of the following:
CLS 101US-College Seminar................................. 3
COM 110US-Communication .......................... 3
WRIT 101W-College Writing I................................. 3
M 171Q-Calculus I ............................................. 4
M 172Q-Calculus II ............................................. 4
ME 101-Intro to Mech Engr................................. 1
ME 117-Mech Engr Design Graphics...................... 1
ME 118-ME Design Graphics Lab............................ 1
PHYS 211-Gen & Mod Phys................................. 4
University Core Electives.................................. 6....3
16 18
Sophomore Year  F  S
CHE 213-Materials Science................................. 3
EM 251-Statistics & Particle Dynamics.................. 3
EM 252-Rigid Body Mechanics.......................... 3
EM 253-Mechanics of Materials........................ 3
M 273Q-Multivariable Calculus.......................... 4
M 274-Intro to Differential Equations................ 4
ME 202-Enger Computer Applications.................. 1
ME 251-ME Material Sci Lab............................... 1
ME 255-Manufacturing Processes......................... 3
ME 257-Manufacturing Processes Lab.................... 1
PHYS 212-Gen & Mod Phys II.............................. 4
EE 250-Circuits, Devices, & Motors....................... 4
16 18
Junior Year  F  S
EM 335-Mechanics of Fluids I............................ 3
ME 315-Engineering Analysis............................ 4
ME 320-Thermodynamics I................................ 3
ME 321-Thermodynamics II................................ 3
ME 326-Fund of Heat Transfer............................ 4
ME 341-Intro Machine Design........................... 4
ME 342-Mech Component Design.......................... 4
ME 360-Measurement & Instrument........................ 4
ENGR 310-Intro to Engineering Design............... 3
I&ME 350-Applied Engr Data Analysis................... 2
16 18
Senior Year  F  S
ME 404R-Mech Engr Design II......................... 2
ME 405R-Mech Engr Design III.......................... 3
ME 450-Thermal System Design......................... 3
ME 445-Mechanical Vibrations........................... 3
ME 461-ME Senior Laboratory........................... 2
ENGR 499-Engr Prog Assistant............................ 0
Professional Electives........................................ 6....6
University Core Electives.................................. 5
14 14

Effective Spring, 2011, ME 461 will no longer be offered.

Students cannot enroll in any course without successfully completing prerequisites and the co-requirement of those prerequisite courses.

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

Mechanical Engineering Technology

The mission of the Mechanical Engineering Technology (M.E.T.) program is to prepare students for successful Mechanical Engineering Technology careers, responsible citizenship, and continued professional growth. The M.E.T program seeks to produce graduates with a good foundation in engineering fundamentals as well as one strong in applications, design, problem recognition and resolution, project management, communication, and professional and ethical responsibility. The M.E.T. undergraduate program is accredited by the Technology Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone: (410)347-7700. The educational objectives of the M.E.T program follow:

• Mechanical Engineering Technology graduates employed in the field will:
  • Undertake professional careers in engineering technology;
  • Employ effective communication;
  • Work effectively in multidisciplinary professional teams;
  • Engage in life-long learning, including post-graduate education for some graduates;
  • Contribute to industry and society, through service activities and/or professional organization;
  • Engage in professional problem-solving activities using applied methods;
  • Fulfill their responsibilities ethically;
  • Advance in the profession.

The undergraduate Mechanical Engineering Technology program is designed with an applications-oriented structure. Many of the technical science courses have an accompanying laboratory component providing hands-on activities, as well as emphasizing measurement, data collection and analysis, documentation, and written/oral report preparation/presentation. The program aims to develop core competencies in engineering fundamentals (statics, strengths of materials, materials science, fluid dynamics, and electrical circuits), manufacturing applications (manufacturing processes, machining, welding, design for manufacturing and tooling, and quality assurance), mechanical design (computer-aided design, mechanisms, machine design, fluid power technology, measurement and test, etc.), and thermal sciences (thermodynamics, heat transfer, and heating, ventilation, and air conditioning). Extensive course work in the physical sciences and Mathematics is included. Technical elective courses are chosen by the student in consultation with an academic advisor. Courses in the humanities and social sciences are also included. The overall curriculum is designed to provide the student with an ability to apply scientific and engineering knowledge and methods combined with technical skills in support of engineering activities.
Mechanical engineering technology (MET) is concerned with the application of scientific and engineering knowledge in support of engineering activities. Specifically, the mechanical engineering technologist provides the professional services needed in transforming the results of scientific endeavors into useful products and services. Students who choose a career in mechanical engineering technology may pursue any number of career paths including, but not limited to: machine and product design, product and system evaluation, research laboratory experimental support, prototype evaluation, plant operation and management, quality assurance, technical sales, manufacturing methods improvement, HVAC systems design and installation, project management, and energy exploration. The mechanical engineering technologist’s mission is to make necessary analysis and plans to convert design drawings into finished products in the most efficient and safe manner. He or she is the professional who produces design drawings and sets up and operates manufacturing equipment, handles inspections, analyzes production problems, and manages the implementation of improvement activities and/or projects. The demand for the engineering technologist in general, and mechanical engineering technologists in particular, has been strong for the past several years, and average starting salaries are very competitive. Indications are that this trend will continue. MSU Mechanical Engineering Technology graduates are actively recruited, and many of our alumni hold positions of considerable responsibility in industry and government.

Student Performance and Retention Requirements

No further requirements apply in order to advance in the Mechanical Engineering Technology program.

### Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 121N</td>
<td>Intro to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CLS 101US</td>
<td>College Seminar</td>
<td>3</td>
</tr>
<tr>
<td>COM 110US</td>
<td>Public Communication</td>
<td>3</td>
</tr>
<tr>
<td>US 101US</td>
<td>First Year Seminar</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101N</td>
<td>College Writing</td>
<td>3</td>
</tr>
<tr>
<td>M 165Q</td>
<td>Calculus for Technology I</td>
<td>3</td>
</tr>
<tr>
<td>M 166Q</td>
<td>Calculus for Technology II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 205</td>
<td>College Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Credits: 17

### Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS-Elective*</td>
<td></td>
<td>F S</td>
</tr>
<tr>
<td>CHBE 213</td>
<td>Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>EM 205</td>
<td>Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>EM 215</td>
<td>Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>ME 255</td>
<td>Manufacturing Processes</td>
<td>3</td>
</tr>
<tr>
<td>ME 324</td>
<td>Engr Thermodynamics</td>
<td>3</td>
</tr>
</tbody>
</table>

Take one of the following:

- MET 201-MET Comput Applications | 1
- MET 202-MET Comput Applications | 1
- MET 211-Graphs for Design | 3
- MET 251-Materials Science Lab | 1
- MET 256-Manufactur Process Lab | 1
- EE 250-Circuits Devices Motors | 4
- PHYS 206-College Physics II | 4

Total Credits: 15

### Junior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM 331</td>
<td>Applied Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 310</td>
<td>Intro to Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>I&amp;ME 350</td>
<td>Appl Engr Data Analy</td>
<td>2</td>
</tr>
<tr>
<td>MET 305</td>
<td>CAE Tools in Mech Design</td>
<td>3</td>
</tr>
<tr>
<td>MET 314</td>
<td>Machining and Safety</td>
<td>3</td>
</tr>
<tr>
<td>MET 325</td>
<td>Heat Transfer Tech</td>
<td>3</td>
</tr>
<tr>
<td>MET 315</td>
<td>Welding Tech I</td>
<td>2</td>
</tr>
<tr>
<td>MET 340</td>
<td>Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MET 345</td>
<td>Machine Design</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Credits: 14

### Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&amp;ME 325</td>
<td>Engr Economy</td>
<td>3</td>
</tr>
<tr>
<td>MET 449</td>
<td>Design for Mfg &amp; Tooling</td>
<td>3</td>
</tr>
<tr>
<td>MET 454</td>
<td>Refrig and HVAC</td>
<td>3</td>
</tr>
<tr>
<td>MET 301</td>
<td>MET Senior Seminar</td>
<td>1</td>
</tr>
<tr>
<td>MET 456</td>
<td>MET Capstone I</td>
<td>2</td>
</tr>
<tr>
<td>MET 457</td>
<td>MET Capstone II</td>
<td>3</td>
</tr>
<tr>
<td>MET 466</td>
<td>Thermal Process Lab</td>
<td>1</td>
</tr>
<tr>
<td>ENGR 499</td>
<td>Engr Prog Assmnt</td>
<td>0</td>
</tr>
<tr>
<td>Professional Electives</td>
<td></td>
<td>6-6</td>
</tr>
<tr>
<td>University Core Electives</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits: 15

*From approved elective list. A minimum of 126 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

### Aerospace Minor

Montana State University, Bozeman offers a minor (minor for which there is no major) in aerospace called the Aerospace Minor. This minor provides a suite of courses from a wide variety of disciplines which are relevant to aerospace. The minor requires a minimum of 28 credits. Required courses comprise 16 credits in four (4) specified courses, which are common to Mechanical Engineering, Electrical Engineering, Physics, Civil Engineering, Chemical Engineering, Chemistry, and Industrial Engineering at MSU Bozeman. An additional 12 elective credits (minimum of four courses) are required from a specified list which comprises the Aerospace Elective Courses. This minor is a useful complement to majors in science or engineering for those seeking a cross-disciplinary academic program with topics in aerospace. The required courses are carefully selected to ensure that students seeking the Aerospace Minor at MSU have the requisite math and science background to engage in specific applications to aerospace. The Aerospace Elective Courses were developed to provide students with the minimum background of specific topics applicable to aerospace. These are Materials and Structures (needed for development of aerospace systems; structures, hardware, sensors, system packages, etc.), Thermo/Fluids (needed for an understanding of aeronaautical systems, momentum equations relevant to propulsion systems, environmental needs, etc.), and Focused Topics (a series of focused and advanced topics applicable to aerospace. These courses include design, dynamics and control, Computer Aided Design (CAD), space science, etc.).

The Certifying Officer for the Aerospace Minor is the current MSU Lysle A. Wood Distinguished Professor, and students with questions are encouraged to seek him/her out by contacting the MSU Mechanical & Industrial Engineering Department.

### AEROSPACE MINOR COURSE OF STUDY

#### Required Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 171Q</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>M 172Q</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Total Credits: 16

#### Aerospace Minor Courses

<table>
<thead>
<tr>
<th>Course Category</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials and Structures</td>
<td>3-4</td>
</tr>
<tr>
<td>Thermo/Fluids</td>
<td>3-4</td>
</tr>
<tr>
<td>Focused Topics</td>
<td>3-4</td>
</tr>
<tr>
<td>Additional Aerospace Minor Elective</td>
<td>3-4</td>
</tr>
</tbody>
</table>

Additional Aerospace Minor Elective: At least 12 credits. The MSU Aerospace Minor = 16 required credits + 12 minimum elective credits = 28 minimum course credits for the Aerospace Minor; In some cases, this may be accomplished within the maximum 128 credits for certain B.S. degrees at MSU (with the Aerospace Minor inclusive).
Aerospace Minor Courses

Materials and Structures
(Students take at least one of the following):  
- ME 404 Mechanical Behavior of Materials; advanced structural materials in class  
- ME 463 Composite Materials; advanced materials, very important to aerospace structures  
- ME 458 Aircraft Structures; unique MSU course developed in conjunction with practicing aerospace engineers  
- ME 465 Finite Elements; basic analysis technique for aerospace systems  
- PHYS 442 Novel Materials; specialty materials courses  
- ME 350 Engineering Materials; specialty materials engineering courses

Thermo/Fluids
(Students take at least one of the following):  
- EM 315 Mechanics of Fluids; fluid mechanics, applicable to aerospace and momentum equations related to aerospace systems  
- EM 425 Fluid Dynamics; steady and unsteady flow; computer applications  
- ME 324 Engineering Thermodynamics; engineering thermodynamics  
- ME 326 Fundamentals of Heat Transfer; heat transfer in mechanical and electrical aerospace systems  
- ME 426 Dynamics of Fluids; fluid mechanics with topics applicable to aerospace  
- ME 454 HVAC; applicable to aerospace systems environmental control  
- ME 435 Fluid Power Technology; applicable to aerospace mechanical control systems

Focused Topics
(Students take at least one of the following):  
- ME 448 Manufacturing & Tooling; tooling for aerospace manufacturing and structures  
- ME 411 Computer Aided Design; advanced CAD principles  
- I&ME 422 Introduction to Simulation; modeling methodologies, data sampling and analysis  
- EE 308 Signal Analysis; analysis of system data  
- EE 321 Controls; aerospace control systems  
- EE 422 Modern Control; additional controls course  
- EE 465 Microcontroller Hardware; control of aerospace systems with microcomputers  
- EE 482 Electro-Optics; advanced aerospace sensor systems  
- ENGR 310 Introduction to Engineering Design; design process of aerospace structures and systems  
- ME 422 MEMS, Micro-Electro-Mechanical Systems  
- PHYS 426 Modern Optics; aerospace optical systems  
- PHYS 427 Laser Applications; aerospace instrumentation, guidance and control  
- PHYS 455 Astro-Physics; basic problems in astrophysics

An appeal to include additional classes for the Aerospace Minor can be made if the student/instructor can make a cogent argument as to how the course is relevant to aerospace.

Military Science - Army ROTC

Army Reserve Officers’ Training Corps (ROTC) is a unique course of study that complements an existing degree-producing program. By taking the Military Science courses, in addition to their regular major, MSU students are offered the opportunity to receive a Presidential Commission as an officer in the U.S. Army. A graduate of the program may elect to serve as an officer in either the active Army or in the National Guard/Army Reserve as a part-time soldier (one weekend a month and two weeks in the summer).

ROTC enhances a student’s education by providing unique leadership and management training. The experiences provided by Army ROTC have proven to make a significant impact in the graduate’s endeavors with many large businesses and corporations actively seeking this qualification for potential professional employees. Army ROTC provides leadership experience.

The Four-Year Program

The four-year Army ROTC Program is divided into two parts called the Basic Course and the Advanced Course. The Basic Course is usually taken during the first two years and covers such subjects as management principles, national defense, military history, and leadership development. In addition, a variety of outside social and professional enrichment activities are available. All necessary ROTC uniforms and other essential materials are furnished at no cost. After completing the Basic Course, students who have demonstrated the potential to become an officer and who have met the physical, medical, and scholastic standards are eligible to enroll in the Advanced Course.

The Advanced Course is taken during the final two years of college. It includes instruction in organization and management, tactics, ethics, professionalism, and advanced leadership development.

During the summer between the junior and senior years of college, Advanced Course students attend a fully-paid five-week training ses-

Notes:
- IF A COURSE (or redundant equivalent) IS A SPECIFICALLY REQUIRED COURSE FOR THE STUDENT’S MAJOR DEGREE PROGRAM, IT WILL NOT BE ACCEPTED AS AN AEROSPACE MINOR ELECTIVE.
- Additional Clarification: Elective courses in a student’s major degree program are not considered as required courses and can, therefore, be used as Aerospace Minor electives. Pre-requisites for courses will be enforced.

Additional Clarification: Elective courses in a student’s major degree program are not considered as required courses and can, therefore, be used as Aerospace Minor electives. Pre-requisites for courses will be enforced.
High Technology in Today's Army

Today's Army offers students the opportunity to learn valuable cutting-edge technology skills. Army careers in such fields as aviation, advanced electronics, laser technology, and computer programming are available to students who can accept the challenge of working within a rapidly changing technological environment. In the Army, students learn from experts and gain first-hand experience working with some of the most sophisticated equipment available.

Students who complete ROTC training and receive a degree in a high-tech area can look forward to an important career experience in the Army and a solid future in the world of rapidly expanding technology.

Minor in Military Studies

The minor in Military Studies is offered to any student completing the courses of study listed below. The minor not only prepares cadets for active duty service but also provides them the opportunity to study one of our country's major instruments of power, the United States Military. In addition to studying Air Force & Army organization, missions, and operations, the student will gain a broader perspective of the military in general by completing a course in American Military History & a cross-service curriculum emphasizing our country’s focus on ‘Joint’ military operations.

Take five of the following:

- MAS 310-Air Force Leadership and Management I.............................................3
- MAS 311-Air Force Leadership and Management II..............................................3
- MAS 410-National Security Affairs/Prep for Active Duty I........................................3
- MAS 411-National Security Affairs/Prep for Active Duty II.......................................3
- MSG 301-Small Unit Tactics & Methods of Instruction.............................................3
- MSG 302-Preparation for Ldr Dev & Assessment Course........................................3
- MSG 401-Senior Seminar I......................................................................................3
- MSG 402-Senior Seminar II......................................................................................3

Take four of the following:

- MSG 203-American Military History........................................................................5
- MSG 309-Field Training, 4 week..............................................................................2
- MSG 305-Military Science
- Ldr Dev & Assessment Course..............................................................................3

Take one of the following:

- B.S. in Economics
- B.A. in English
- B.A. in History
- B.S. in Mathematics
- B.S. in Microbiology
- B.A. in Modern Languages and Literatures
- B.A. in Philosophy
- B.S. in Physics
- B.A. in Political Science
- B.S. in Psychology
- B.S. in Sociology
- Pre-Medical/Pre-Health Professions

In addition to various options within each degree, and minors in most of the areas listed above, the College administers the following minors:

- Minor in Anthropology
- Minor in Native American Studies
- Minor in Museum Studies
- Minor in Japan Studies
- Minor in Sociology
- Minor in Women’s Studies
- Minor in Water Resources

The selection of a minor provides students the opportunity to have a recognized second area of concentration.

Anthropology

Department of Sociology & Anthropology

http://socanth.msu.montana.edu/~dept/

Students earning a B.S. in anthropology obtain a broad, anthropological perspective on the study of humankind. As part of the curriculum, students are expected to become familiar with and understand the interrelationships among the diverse aspects of our humanity – both present and past. These include the biological evolution of our species, the adaptive advantage of human symbolic capacities and technological abilities, and the development of culture from earliest recognizable traces through the emergence of complex civilizations. Historical concerns include investigations of the diversity of human languages, the relationship between language and world view, the ethnography of communicated practices, the cultural construction of the social and physical world, and the social and structural relationships that make sense out of people’s daily activities. These concepts
are introduced and applied through course offerings in the four subfields of anthropology: social/cultural anthropology, archaeological, evolutionary/biological anthropology, and linguistic anthropology. Students work closely with faculty to gain a well-grounded knowledge of anthropological theories and methods that allows them to pursue research in one or more subfields of study.

Anthropology is a diverse field that provides students with a solidly-grounded liberal arts education. At the same time it is a cornerstone for understanding issues of diversity in an increasingly global world. In order to gain the skills needed to pursue research, students will learn how to think critically, read in a discerning manner, formulate logical arguments, and write in a coherent fashion. The B.S. degree in Anthropology prepares students for graduate work in this discipline. Graduate degrees are typically required for professional participation in this field. In addition to professional employment as research scientists or college-level professors, anthropologists often find positions as consultants, teachers, museum curators, or as specialists in historic preservation. Equally, domestic and foreign assignments with international, federal, or state agencies and institutions, and jobs in private industry, are available. Anthropologists are also found in public service organizations, medical and public health programs, environmental organizations, non-governmental organizations, and in positions that require community organizing abilities or ethnographic and social survey research skills.

While students are not required to apply for formal admission to the anthropology program, students must obtain a grade of C- or better in all Anthropology courses in order to receive credit toward graduation. Before enrolling in 300 and 400 level ANTH courses, Anthropology majors must have completed the following university core courses: WRIT 101W, University Seminar, Math Core. Students who enroll in anthropology courses without the required core or anthropology prerequisite(s) must obtain the permission of the instructor. Otherwise, those students will be required to withdraw from the course.

Academic advisors in anthropology work closely with each student to establish a viable educational plan. Ongoing interactions between students and advisors ensure that a student’s educational objectives are being met as she or he moves toward a degree.

**Anthropology Minor (non-teaching)**

The Anthropology Minor is a non-teaching minor designed to encourage students from any discipline to explore the cross-cultural study of humankind in order to complement or supplement course work in their respective majors. The minor introduces students to the four subfields of anthropological study (evolutionary/biological anthropology, social/cultural anthropology, archaeology, and linguistics); it also allows students within the minor the flexibility to select among a range of advanced courses in prehistory, ethnography, theory, and topical domains relative to their particular interests. The curriculum stresses critical thinking, awareness of culture-specific meanings and values, consideration of the potential sustainability of various cultural adaptations, student involvement in the learning process, and opportunities for research. For graduation, students must have a C- or higher in all required and elective courses in the minor.

**Curriculum in Anthropology**

**Freshman**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 101D—Anthropology and the Human Experience</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 101HS-Sociological Inquiry or SOCI 150D or SOCI 201D</td>
<td>3</td>
</tr>
<tr>
<td>University Core Seminar</td>
<td>3</td>
</tr>
<tr>
<td>Math Core</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>15</td>
</tr>
</tbody>
</table>

**Sophomore**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 201S-Human Prehistory</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 201S—Culture &amp; Society</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 251-Introduction to Logic</td>
<td>21</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>30</td>
</tr>
</tbody>
</table>

**Junior**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 303—Biological Anthropology</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 326—Language &amp; Culture</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 313—Descriptive Linguistics</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 300—Archaeology elective</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 202—Quantitative Techniques</td>
<td>3</td>
</tr>
<tr>
<td>STAT 209Q-Statistics</td>
<td>3</td>
</tr>
<tr>
<td>One of the following three courses:</td>
<td></td>
</tr>
<tr>
<td>PHIL 378—Philosophy of Science</td>
<td></td>
</tr>
<tr>
<td>HISTR 417-Sci, Tech, Soc 1500-1890</td>
<td></td>
</tr>
<tr>
<td>HISTR 419-Modern Science</td>
<td></td>
</tr>
<tr>
<td>ANTH 300—Archaeology elective</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 300—Archaeology elective</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12</td>
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**Senior**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 422—Anthropological Theory</td>
<td></td>
</tr>
<tr>
<td>ANTH 425R—Social Organization</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 300—Archaeology elective</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
</tbody>
</table>

**Anthropology Majors must complete one of the following sequences of courses.**

**Sequence A**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A minor approved by the student’s advisor</td>
<td>Min 18</td>
</tr>
</tbody>
</table>

**Sequence B**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design an array of supporting coursework to complement your course of study in Anthropology</td>
<td>18</td>
</tr>
</tbody>
</table>

Departmental Honors: Students may graduate with Departmental Honors if they meet the following requirements: GPA of 3.5 or higher and complete an undergraduate thesis in Anthropology.

**ANTHROPOLGY MINOR (NON-TEACHING)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 201S—Human Prehistory</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 221S—Mysteries of the Past</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 225S-Bones, Apes, and Ancestors</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 201S—Cultural and Society</td>
<td>3</td>
</tr>
<tr>
<td>Anthropology Electives</td>
<td>3</td>
</tr>
<tr>
<td>At least 12 of the 15 electives must be from upper division courses numbered 300 and above</td>
<td>15</td>
</tr>
<tr>
<td>The maximum number of Anthropology transfer credits that may be applied toward the minor is 9; additional transfer credits may be accepted as negotiated with your advisor.</td>
<td></td>
</tr>
</tbody>
</table>

For Anthropology majors, the maximum number of Anthropology transfer credits accepted is 18. Major requirements include 21 elective Anthropology credits of which 18 must be upper division (300 and above) and no more than 3 credits of ANTH 489, 490, and 492 combined can count toward fulfillment of the elective credits.

For graduation in Anthropology students must have a grade of C- or higher in all Anthropology courses. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.
### Curricula in Biological Sciences

#### ECOLOGY AND EVOLUTION OPTION

The option in Ecology and Evolution combines (1) a basic sequence of courses in ecology, (2) a broad background in the sciences and Mathematics, and (3) a flexible curriculum of upper-division courses in biology and related disciplines. The program requires students to develop skill in one supporting science or in Mathematics and statistics. Because most professional positions in ecology and evolution require an M.S. or Ph.D., this program is designed to prepare students for graduate study, while allowing the flexibility to develop an area of specialization, or to study a broad range of disciplines related to ecology.

There are two possible biology sequences for Ecology and Evolution: BIOL 101N and BIOL 102 or BIOL 214 & BIOL 215. The choice of sequence depends on prerequisites and influences both the freshman and sophomore year. If you prefer to begin biology immediately, or you will not complete STAT 216Q and CHMY 141 during your freshman year, you should take the BIOL 101N and BIOL 102 sequence. If you will take CHMY 141 and STAT 216Q during your freshman year, you intend to complete the B Chemistry sequence (see below), you may prefer to take the BIOL 214 and BIOL 215 sequence your sophomore year.

Students pursuing the Ecology and Evolution Option should begin each of the two supporting sequences in their freshman year. As the two supporting sequences are completed, students should shift their effort toward satisfying the requirements for upper division courses in BIOL and related disciplines.

<table>
<thead>
<tr>
<th>BIOL 101 &amp; BIOL 102 Sequence</th>
<th>Freshman Year</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 101N-Organismal Biology</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 102-Molecular and Cellular Biology</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Begin the Support Courses</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>(Section I) below</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*WRIT 101W-College Writing I (or)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Required Courses** and University Core</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BIOL 214 &amp; 215 Sequence</th>
<th>Sophomore Year</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 216Q-Introduction to Statistics</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 161Q-Survey of Calculus</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*WRIT 101W-College Writing I (or)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Required Courses** and University Core</td>
<td>5</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BIOL 214 &amp; 215 Sequence</th>
<th>Junior Year</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 211-Elements of Organic Chemistry</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCHM 340-Gen Biochemistry</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 214-Intro Biology: Molecules to Cells</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 215-Intro Biology: Organisms to Populations</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRIT 201-College Writing II</td>
<td>[Recommended]</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Other Required Courses** and University Core</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BIOL 214 &amp; 215 Sequence</th>
<th>Senior Year</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 403-Evolution</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 443-Current Topics in Biology</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Required Courses** and University Core</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Depending on first letter of your last name.

Students are told at Orientation when to take WRIT 101W.

**Other Required Courses from (I) Supporting Courses and (II) Biology Electives

(I) Supporting Courses: Students must take one sequence in each of the following three categories. Sequence B or C must be selected in at least one of the three categories. Students taking the BIOL 214 & 215 Sequence must take the Sequence B in the chemistry category below.

### Chemistry category

**Sequence A**

| CHMY 121N-Intro to Gen Chemistry | 4 |   |   |
| CHMY 123-Intro to Organic & Biochemistry | 4 |   |   |
| **total chemistry credits. Sequence A** | 8 |   |   |

**Sequence B**

| CHMY 141-College Chemistry I | 4 |   |   |
| CHMY 143-College Chemistry II | 4 |   |   |
| CHMY 211-Elements of Organic Chemistry | 5 |   |   |
| BCHM 340-Gen Biochemistry | 5 |   |   |
| **total chemistry credits. Sequence B** | 18 |   |   |
Mathematics and Statistics Category

Sequence A

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 161Q-Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>PSP 318-Biometry</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>

Sequence B

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 161Q-Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>STAT 216Q-Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q-Intermed Statistical Concepts</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>

Sequence C

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q-Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>STAT 312-Stats for Scientists &amp; Engineers</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

(II) Biology Electives: A minimum of 23 elective credits must be completed. Of these 23 credits at least 15 must be upper division; no more than 6 total credits of BIOL 470, 489, 490 and no more than 2 credits of BIOL 401 can be applied toward these 25 elective credits. Elective credits are typically from courses in biology (BIOL) and fish and wildlife management (F&WLM) rubrics. Certain courses in other rubrics (PSPP, LRES, BCHM (UD only), MB (except 407), VTMB, ARNR, ENTO, ERTH, GEO, MATH, and STAT) can be applied toward the 23 elective credits, with the prior approval of both your advisor and the certifying officer for the Ecology and Evolution option before the course is taken. If BIOL 214 and BIOL 215 are taken, then BIOL 213 is a highly recommended elective.

University requirements for graduation also must be completed, including university core requirements and a minimum of 120 total credits of which at least 42 credits must be in courses numbered 300 and above. Depending on supporting and biology elective courses selected, the curriculum requires 27 to 42 credits from courses numbered 300 and above. From 0 to 15 additional credits must be taken from courses numbered 300 and above to satisfy the university requirement for 42 credits.

**FISH AND WILDLIFE MANAGEMENT OPTION**

The option in Fish and Wildlife Management is a professional degree program offered for those students who have an interest in employment in these fields. Study leading toward a bachelor’s degree emphasizes basic principles of animal ecology, with considerable work in related fields. Students graduating with a bachelor’s degree will be qualified for entry-level positions in natural resource management. However, the four-year option primarily provides prospective fish and wildlife biologists an adequate background for graduate work, which is required for most professional positions in natural resource agencies.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>F&amp;WLM 201-Intro to Fish &amp; Wildlife</td>
<td>F</td>
</tr>
<tr>
<td>F&amp;WLM 211-Intro to Gen Chemistry</td>
<td>F</td>
</tr>
<tr>
<td>COM 110--US-Public Communication</td>
<td>S</td>
</tr>
<tr>
<td>(or) CLS 101US--University Seminar</td>
<td></td>
</tr>
<tr>
<td><em>WRIT 101W-College Writing I</em></td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>F&amp;WLM 301-Principles of F&amp;WLM Mgmt</td>
<td>F</td>
</tr>
<tr>
<td>BIOL 301-Principles of Genetics</td>
<td>S</td>
</tr>
<tr>
<td>BIOL 303-Principles of Ecology</td>
<td>S</td>
</tr>
<tr>
<td>BIOL 405-Evolution</td>
<td>S</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>GPHY 111CS-Intro to Physical Geography</td>
<td></td>
</tr>
<tr>
<td>LRES 201IN-Soil Resource</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>F&amp;WLM 401-Fish &amp; Wildlife Topics</td>
<td>F</td>
</tr>
<tr>
<td>BIOL 411-Animal Physiology</td>
<td>F</td>
</tr>
<tr>
<td>BIOL 424-Freshwater Ecology</td>
<td>S</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>BIOL 406-Rocky Mountain Vegetation</td>
<td></td>
</tr>
<tr>
<td>BIOL 427-Aquatic Field Ecology</td>
<td></td>
</tr>
<tr>
<td>Take two of the following:</td>
<td></td>
</tr>
<tr>
<td>BIOL 415-Ichthyology</td>
<td></td>
</tr>
<tr>
<td>BIOL 418-Mammalogy</td>
<td></td>
</tr>
<tr>
<td>BIOL 419-Oriithology</td>
<td></td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>BIOL 455-Advanced Animal Ecology</td>
<td></td>
</tr>
<tr>
<td>BIOL 447-Conservation Biology</td>
<td></td>
</tr>
<tr>
<td>BIOL 448-Conservation Genetics</td>
<td></td>
</tr>
<tr>
<td>BIOL 430-Plant Ecology</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>F&amp;WLM 301-Principles of F&amp;WLM Mgmt</td>
<td>S</td>
</tr>
<tr>
<td>CHMY 301-Principles of Biochem</td>
<td></td>
</tr>
<tr>
<td>CHMY 403-Evolution</td>
<td></td>
</tr>
<tr>
<td>BIOL 406-Rocky Mountain Vegetation</td>
<td></td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>BIOL 406-Rocky Mountain Vegetation</td>
<td></td>
</tr>
<tr>
<td>BIOL 427-Aquatic Field Ecology</td>
<td></td>
</tr>
<tr>
<td>Take two of the following:</td>
<td></td>
</tr>
<tr>
<td>BIOL 415-Ichthyology</td>
<td></td>
</tr>
<tr>
<td>BIOL 418-Mammalogy</td>
<td></td>
</tr>
<tr>
<td>BIOL 419-Oriithology</td>
<td></td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>BIOL 455-Advanced Animal Ecology</td>
<td></td>
</tr>
<tr>
<td>BIOL 447-Conservation Biology</td>
<td></td>
</tr>
<tr>
<td>BIOL 448-Conservation Genetics</td>
<td></td>
</tr>
<tr>
<td>BIOL 430-Plant Ecology</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

*(Depending on first letter of your last name.)* Students are told at Orientation when to take WRIT 101W.

A minimum of 120 credits is required for graduation; at least 42 of these credits must be in courses numbered 300 and above. The curriculum includes 35-39 credits numbered 300 and above, so an additional three to five credits must be selected. Additional upper division electives must be taken in biology, fish and wildlife, or a related field ( ARNR, ENTO, ERTH, GEO, LRES, PSPP, and STAT). You should consult with your advisor about the appropriateness of potential upper division electives taken outside the BIOL or F&WLM rubrics. This curriculum satisfies all but about 12-15 credits of the University Core Requirements depending on which core courses are taken to meet the Diversity and Humanities core requirement. Students are expected to be aware of all requirements for graduation and to ensure that they meet these requirements.

**ORGANISMAL BIOLOGY OPTION**

The Organismal Biology option provides a rigorous program of study in plant or animal biology at the whole-organism, species, population, and community levels, while allowing students flexibility in selecting those biology courses that best meet their interests and objectives. It accomplishes this by requiring students to select 20 required credits in biology in consultation with their advisor to achieve a personal curriculum. In addition, students can use the elective credits to develop strength in a second area which may enhance their prospects of gaining employment with a bachelor’s degree or their prospects of acceptance into specialized graduate programs. Most professional positions in biology require completion of one or more graduate degrees, and the Organismal Biology option is excellent preparation for graduate studies.

There are two possible biology sequences for Organismal Biology: BIOL 101 & BIOL 102 or BIOL 213 & BIOL 214. The recommended sequence depends on prerequisites and influences both the freshman and sophomore year.

**BIOL 101 & 102 Sequence**

If you prefer to begin biology immediately, have not had high school chemistry, or will not take M 161 or STAT 216 during Fall semester of your freshman year:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>F&amp;WLM 101-Organismal Biology</td>
<td>F</td>
</tr>
<tr>
<td>F&amp;WLM 102-Molec &amp; Cellular Biol</td>
<td>S</td>
</tr>
<tr>
<td>CHMY 141-College Chemistry</td>
<td></td>
</tr>
<tr>
<td>COM 110US-Public Communication</td>
<td></td>
</tr>
<tr>
<td>(or) CLS 101US-University Seminar</td>
<td></td>
</tr>
<tr>
<td><em>WRIT 101W-College Writing</em></td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

*(Depending or when you take WRIT 101W)*

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>F&amp;WLM 201-Intro to Fish &amp; Wildlife</td>
<td>F</td>
</tr>
<tr>
<td>F&amp;WLM 211-Intro to Gen Chemistry</td>
<td>F</td>
</tr>
<tr>
<td>COM 110US-Public Communication</td>
<td>S</td>
</tr>
<tr>
<td>(or) CLS 101US-University Seminar</td>
<td></td>
</tr>
<tr>
<td><em>WRIT 101W-College Writing</em></td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 211-Elements of Organic Chemistry</td>
<td>F</td>
</tr>
<tr>
<td>BCHM 349-General Biochemistry</td>
<td></td>
</tr>
<tr>
<td>M 161Q-Survey of Calculus</td>
<td></td>
</tr>
<tr>
<td>PHYS 205-College Physics I</td>
<td></td>
</tr>
<tr>
<td>PHYS 206-College Physics II</td>
<td></td>
</tr>
<tr>
<td>PSPP 318-Biometry</td>
<td></td>
</tr>
<tr>
<td>(or) STAT 216Q-Introduction to Statistics</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>
**PROGRAMS OF INSTRUCTION – LETTERS AND SCIENCE**

*Depending on first letter of your last name. Students are told at Orientation when to take WRIT 101W.

**BIOL 213 & BIOL 214 Sequence**
If you had high school chemistry and will take either M 161 or STAT 216 during Fall Semester of your freshman year:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 143-College Cells to Organisms</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 145-College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>COM 110US-Public Communication</td>
<td>3</td>
</tr>
<tr>
<td>(or) CLS 101US-University Seminar</td>
<td></td>
</tr>
</tbody>
</table>

*Depending on when you take WRIT 101W.*

**Biology Teaching Option**

The Biology Teaching Option certifies graduates to be qualified to teach secondary school biology. It is similar to the Organismal Biology Option, but includes professional preparation courses required for state teacher certification. Since the Biology Teaching Option includes 40 credits of biology courses, it is an extended major and the State of Montana does not require a teaching minor. However, employment opportunities will be enhanced by obtaining a second area of certification, usually a teaching minor (listed under College of Education, Health and Human Development). Obtaining a Biology Teaching major, a teaching minor, and certification will require more than eight semesters.

The Biology Teaching Option includes 40 credits of Biology (24 to 25 credits of basic biology courses, plus MB 101 or MB 301, and 12 Biology elective credits); supporting chemistry, Physics, and Mathematics courses; 32 credits in the university core; and 32 credits of professional preparation. Biology electives must include 7 to 8 credits of advisor-approved upper division credits in biological sciences.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 301-Principles of Genetics</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>BIOL 305-Principles of Ecology (or)</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 213-Organisms to Populations</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12-12</td>
</tr>
<tr>
<td></td>
<td>15 15</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 450-Adv Cell &amp; Molec Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 411-Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 450-Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12-15 7-10</td>
</tr>
<tr>
<td></td>
<td>15 15</td>
</tr>
</tbody>
</table>

**.tag**

*Depending on first letter of your last name. Students are told at Orientation when to take WRIT 101W.*

**Additional Required Biology Electives**

A minimum of 20 credits of Biology electives also must be completed, from courses in BIOL, F&WL, ARNR, PSIP, BCHM (upper division only), VTMB or MB (except MB 407). At least 16 of these credits must be in upper division courses numbered 300 and above. Credits must be for regularly scheduled courses, except that up to 4 total credits of undergraduate research in Biology (BIOL 470, 489, 490) and up to 2 credits of Biology Teaching (BIOL 401) may be included. Up to 6 credits of certain courses in basic biological sciences from departments other than these may be included, with the prior approval of the advisor and Organismal Biology Certifying Officer before the course is taken.

University requirements for graduation also must be completed, including university core requirements and a minimum of 120 total credits of which at least 42 credits must be in courses numbered 300 and above. Depending on courses selected, the curriculum includes 39 to 42 credits numbered 300 and above, so an additional three credits may need to be selected.

**Cell Biology and Neurosciences**

**Department of Cell Biology and Neurosciences**

http://cbn.montana.edu/

*Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.*

Two options are available in the Department of Cell Biology and Neuroscience which lead to the B.S. in Cell Biology and Neurosciences with options in Biomedical Sciences and in Cell Biology and Neurosciences.

- **Biomedical Sciences Option**
- **Cell Biology and Neuroscience Option**
**Programs of Instruction – Letters and Science**

**Premedicine, Predentistry, and Preoptometry**

Students may prepare for admission to medical, dental, or optometry school by following the option in Biomedical Sciences in the Department of Cell Biology and Neuroscience. The Department of Cell Biology and Neuroscience provides advising on matters pertaining to the biomedical sciences curriculum; advising on matters pertaining to admission to professional schools is provided by the Pre-Health Professions advisor in the Division of Health Sciences.

**Requirements for Admission to Upper Division Courses in Biology**

For admission to upper division (numbered 300 and above) courses taught in the Department of Cell Biology and Neuroscience, students must have completed at least 30 total university credits with a cumulative GPA of at least 2.5 for all courses.

**Grade Requirements for Fulfillment of Degree Options**

In order to graduate with a B.S. in Cell Biology and Neuroscience, students must complete at least 2.5 for all courses, have completed at least 30 total university credits with a cumulative GPA of at least 2.5 for all courses.

**Graduation in Absentia**

Some professional programs accept students before their degree requirements are completed. It is often possible to transfer credits from the first year of professional school to MSU to graduate in absentia. The mechanics involve sending an official copy of the year one professional school transcript to the MSU academic advisor; he/she then writes a letter to the MSU Registrar explaining which credits transfer and how they fulfill the degree requirements. The student then registers in absentia at MSU for the semester in which the B.S. degree will be awarded.

**Curricula in the Cell Biology and Neuroscience Department**

**Biomedical Sciences Option**

The curriculum of the biomedical sciences option provides a strong background for students who are interested in a career in research or teaching, or (2) plan on a career in medicine or other health professions. The curriculum has sufficient breadth to introduce the student to a wide range of disciplines, but is flexible enough so that students can focus in their last two years on areas of specific interest. Students interested in a career in a health science profession should consult the Pre-Health Professions Advisor for information regarding admission to professional schools while those interested in veterinary medicine should consult the Pre-Veterinary Advisor in the Department of Veterinary Molecular Biology.

Employment opportunities, especially at the technical level, are available with a B.S. in Cell Biology and Neuroscience with a biomedical sciences option. However, this curriculum is designed to better prepare students for professional or graduate training.

The biomedical sciences curriculum is designed to allow the students to take basic courses in physical sciences while tailoring the courses in life sciences to meet their personal objectives and interests. This is done by allowing 24 of the required 44 credits in Biology to be elective credits in life sciences; biology, biochemistry, microbiology, or other appropriate fields. Advanced students are strongly encouraged to enroll in Biol 470, Individual Problems and, or Biol 490, Undergraduate Research. These courses provide an opportunity to gain valuable experience in biomedically research.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>F</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOL 115-21st Century Biology</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 214-Intro Bio: Cells to Orgs</td>
<td>4</td>
<td></td>
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<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
<td></td>
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<tr>
<td>CHMY 145-College Chemistry II</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
<td></td>
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<tr>
<td>M 161Q-Survey of Calculus</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 216Q-Introduction to Statistics</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Verbal</td>
<td>3</td>
<td></td>
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<tr>
<td>University Core and Electives</td>
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**Sophomore Year**

<table>
<thead>
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<th>Course Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOL 214-Intro Bio: Mols to Cells</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 215-Intro Bio: Orgs to Pops</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMY 321-Organic Chemistry I</td>
<td>4</td>
<td></td>
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</tr>
<tr>
<td>CHMY 325-Organic Chemistry II</td>
<td>4</td>
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<tr>
<td>PHYS 205-College Physics I</td>
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<td></td>
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</tr>
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<td>PHYS 206-College Physics II</td>
<td>4</td>
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<td>University Core and Electives</td>
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**Junior Year**

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>BCHM 540-Gen Biochemistry</td>
<td>5</td>
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<tr>
<td>BIOL 301-Genetics</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 392-Adv Cell Molec Biol</td>
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<td></td>
<td></td>
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<tr>
<td>WRIT 221-Intermediate Tech Writing</td>
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<tr>
<td>(or) WRIT 201-College Writing II</td>
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<td>University Core and Electives</td>
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**Senior Year**

<table>
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</thead>
<tbody>
<tr>
<td>BIOL 451-Senior Seminar</td>
<td>2</td>
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<tr>
<td>University Core and Electives</td>
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<td></td>
</tr>
</tbody>
</table>

**Additional Requirements**

A minimum of 24 additional elective credits of courses in the life sciences must be completed, most typically from courses in Cell Biology & Neuroscience, Microbiology, and Biochemistry. Of these 24 credits, at least 18 must be upper division; no more than 6 credits of Biol 470, 489, 490 and no more than 2 credits of Biol 491 can be applied toward these 24 elective credits. See the department office for a full list of electives.

**Examples of elective courses include, but are not limited to:**

- BIOL 297-Human Anatomy and Physiol I
- BIOL 298-Human Anatomy and Physiol II
- BIOL 310-Comparative Vertebrate Anatomy
- BIOL 311-Developmental Biology
- BIOL 312-Histology
- BIOL 313-Neurophysiology
- BIOL 395-Adv Human Physiology
- BIOL 401-Biology Instructing
- BIOL 410-Advanced Human Anatomy
- BIOL 411-Animal Physiology
- BIOL 422-Genes and Cancer
- BIOL 425-Sensory Neurophysiology
- BIOL 426-Neuroethology
- BIOL 438-Developmental Mechanisms
- BIOL 445-Cognitive Neuroscience
- BIOL 453R-Biomimetic Systems
- BIOL 466R-Gene Construction
- BIOL 467-Molecular Medicine
- BIOL 470-Individual Problems
- BIOL 489-Undergraduate Research
- BIOL 490-Undergraduate Research

**Cell Biology and Neuroscience Option**

The curriculum in the cell biology and neuroscience option provides a strong background for students who are interested in a career in research or teaching in cell biology, molecular biology, developmental biology, or neuroscience. The curriculum provides the opportunity to take the courses necessary to make a competitive application to graduate school or to obtain a technical position. There is a possibility to focus the curriculum in one of the three areas listed by using elective credits in specific disciplines. Advisor approved substitutions are possible for upper division courses to tailor the degree to the student’s interests. Advanced students are strongly encouraged to enroll in BIOL 470 Individual Problems and/or BIOL 490 Undergraduate Research. These courses provide an opportunity to gain valuable experience in biomedical research. Such experiences are useful for
both an appreciation of the research effort required in graduate school and for gaining experience in technical methods for a technical position.

Freshman Year  
F  S  
BIOL 213-Intro Bio: Cells to Orgs  
Biol 215-Intro Bio: Orgs to Pops  
CHMY 141-College Chemistry I  
CHMY 143-College Chemistry II  
STAT 216Q-Introduction to Statistics  
M 17Q-Calculus I  
M 17Q-Calculus II  
WRIT 101W-College Writing I  
Core Verbal  
15 15

Sophomore Year  
F  S  
BIOL 214-Intro Bio: Mols to Cells  
BIOL 215-Intro Bio: Orgs to Pops  
CHMY 321-Organic Chemistry I  
CHMY 211-Elements of Organic Chemistry  
CHMY 323-Organic Chemistry II  
PHYS 205-College Physics I  
PHYS 206-College Physics II  
University Core and Electives  
0 or 3 0 or 4  
15 15

Junior Year  
F  S  
BIOL 301-Principles of Genetics  
BIOL 313-Neurophysiology  
BIOL 317-Neurophysiology  
BCHEM 340-Gen Biochem  
CHMY 361-Elements of Physical Chemistry  
University Core and Electives  
0 or 4 0 or 12  
15 15

Senior Year  
F  S  
BIOL 451-Biomed Sci Sr Sem  
University Core and Electives  
15 15

* Students should take either CHMY 312 or 321 or CHMY 211 and 301

Additional Requirements
For a focus in Cell, Molecular, or Developmental Biology any 3 of the following courses must be taken plus any 3 elective credits in life sciences.
A minimum of 15 additional upper division elective credits in the life sciences must be completed from Cell Biology & Neuroscience, Microbiology or Biochemistry courses. Of these 15, at least 6 must be from 400 level courses. No more than 6 credits of BIOL 470, 489, 490 and no more than 2 credits of BIOL 401 can be applied toward the 15 elective credits.

Following is a list of suggested courses that students can choose as electives to focus their major on a particular area of interest.

Cell/Developmental Biology:
- BIOL 311-Developmental Biology
- BIOL 312-Histology
- BIOL 438-Developmental Mechanisms
- BIOL 489R/490R-Independent Study

Neuroscience:
- BIOL 426-Neuroethology
- BIOL 438-Developmental Mechanisms
- BIOL 415-Cognitive Neuroscience
- BIOL 489R/490R-Independent Study

Anatomy and Physiology:
- BIOL 411-Animal Physiology
- BIOL 489R/490R-Independent Study

Chemistry and Biochemistry Department of Chemistry and Biochemistry
http://chemistry.montana.edu/

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.

The Department of Chemistry and Biochemistry offers approved programs emphasizing modern areas in Chemistry and biochemistry at both the undergraduate and graduate levels. The curriculum for the Bachelor of Science degree in chemistry provides basic education in chemistry with sufficient breadth and flexibility to allow students to enter a variety of chemistry-related careers. Several curricular options are available, each of which is career- and employment-directed. Employment opportunities are extensive. For example, at least 36 percent of the research and development workforce in the United States have degrees in chemistry. More than any other discipline. The different options allow the student to emphasize his or her personal choices in course selection.

All of the options emphasize current aspects of chemistry and biochemistry with particular attention given to instrumentation, modern concepts and methods, and use of computers to help solve chemical problems. Participation in undergraduate research within an active research group in the department is an important and rewarding part of the overall program. A wide range of fundamental research programs are ongoing in all major areas of chemistry: organic, analytical, inorganic, physical, and biochemistry.

The Department of Chemistry and Biochemistry participates in several instructional and research programs of an interdisciplinary nature. These include nanomaterials, optical technology, thermal biology, biofilm engineering, computer modeling of proteins and nucleic acids, and the WWAMI medical education program. The department has active graduate programs leading to the degrees of Master of Science and Doctor of Philosophy. These degrees may be obtained in either chemistry or biochemistry.

The department encourages majors in allied fields to consider either a chemistry or a biochemistry minor.

Chemistry (Professional) Option

This option includes a core of chemistry courses that, together with technical electives, allows the students to prepare for careers in chemistry or related fields such as medicine, patent law, chemical business, or science writing. Students interested in the more quantitative and physical aspects of chemistry may wish to include additional Mathematics and/or physics courses. Students electing this option will be well prepared both for advanced study and for immediate employment in industry, government, or business.

Biochemistry Option

This option includes a core of chemistry, biochemistry, and biology courses for the student interested in the molecular nature of biochemical materials and life processes. A broad choice of biological science electives will allow the students to prepare for careers in human, animal, plant, or microbial biochemistry. Trained biochemical scientists are in demand for research and teaching in universities and for research and development work in chemical, pharmaceutical, and biotechnical industries, in medical laboratories, and in state and federal governments. Students who complete the curriculum satisfactorily will be prepared to assume responsible professional positions or undertake graduate level work in the life sciences. The curriculum also provides an excellent preparation for medical, dental, or veterinary school.

Teaching Option

This option is designed to prepare prospective teachers of chemistry at the secondary level. It provides a thorough background in the basic fields of chemistry and an acquaintance with aspects of chemistry in society that are essential to the practicing teacher of chemistry.
The chemistry Teaching option certifies graduates to be qualified to teach secondary school chemistry. Opportunities will be enhanced by obtaining a second area of certification, usually a teaching minor. Obtaining a teaching major, a teaching minor, and certification will require more than 120 credits.

**Chemistry/Biochemistry Minors (Non-teaching)**

A minor in either chemistry or biochemistry is offered for students with other majors who wish to receive formal acknowledgment for taking a core of intermediate-level chemistry and/or biochemistry courses. The minor is designed to strengthen the students’ opportunities for admission to graduate school or for industrial employment.

### Curricula in Chemistry and Biochemistry

#### CHEMISTRY

**PROFESSIONAL OPTION**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 151-Honors College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 153-Honors College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q-Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>PHYS 205-College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211-Gen &amp; Mod Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 221-Honors Gen &amp; Mod Physics</td>
<td>4</td>
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<tr>
<td>University Core and Electives</td>
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<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 214-Intro BioMolecules to Cells</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 294-Seminar/Workshop</td>
<td>1</td>
</tr>
<tr>
<td>CHMY 421-Adv Instrument Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 422-Adv Instrument Analysis Lab</td>
<td>2</td>
</tr>
<tr>
<td><strong>CHMY 499-Senior Thesis/Capstone</strong></td>
<td>1</td>
</tr>
<tr>
<td><em>CHMY 490R-Undergraduate Research</em>*</td>
<td>3</td>
</tr>
<tr>
<td>Physical Science Electives</td>
<td>6</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11</td>
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</tbody>
</table>

*Six (6) credits of chemistry 490 are tabulated. It is expected that substantially more than this minimum will be taken by prospective graduates.*

**CHMY 499 (Senior year) is required for majors who are writing a thesis for Departmental Honors consideration.**

**BIOL 214 is strongly recommended, because it is a pre-requisite to BCHM 340.**

A computer science (CS) course is highly recommended. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. All students are encouraged to take a 200 level English writing course. Please note that this course would be in addition to the WRIT 101W core requirement.

#### Acceptable Physical Science Electives Include

- BCHM 411-Biochem of Macromolecules
- BCHM 412-Biochem Metabolic Regulation
- BCHM 444-Biochem Methods Molecular Biol
- CHMY 515-Struct & Bonding Inorg Chem
- CHMY 516-Mech & Dynamics Inorg Chem
- CHMY 523-Organic Rxn Mech
- CHMY 524-Mass Spec
- CHMY 526-Advanced Protein NMR
- CHMY 533-Physical Organic Chemistry
- CHMY 535-Reagent Chemistry
- CHMY 540-Organic Synth
- CHMY 551-Organic Structure Elucidation
- CHMY 554-Organometallic Chemistry
- CHMY 557-Quantum Mechanics
- CHMY 558-Classic & Statistical Therm
- CHMY 559-Kinetics & Dynamics
- M 221-Introduction to Linear Algebra
- M 274-Intro to Differential Equations
- M 333-Linear Algebra
- PHYS 215-Gen & Modern Physics III
- PHYS 301-Classical Physics Mechanics
- PHYS 317-Electricity & Magnetism I

### BIOCHEMISTRY OPTION

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 213-Intro BioCells to Organisms</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
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<tr>
<td>CHMY 151-Honors College Chemistry I</td>
<td>4</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>CHMY 143-College Chemistry II</td>
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<td>CHMY 153-Honors College Chemistry II</td>
<td>4</td>
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<td>BCHM 100-Undergrad Seminar I</td>
<td>1</td>
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<td>Take one of the following:</td>
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<tr>
<td>M 161Q-Survey of Calculus</td>
<td>4</td>
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<tr>
<td>M 162Q-Calculus for Technology I &amp;II</td>
<td>6</td>
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<tr>
<td>M 172Q-Calculus II &amp;II</td>
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<td>STAT 216Q-Introduction to Statistics</td>
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<tr>
<td>University Core and Electives</td>
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<table>
<thead>
<tr>
<th>Sophomore Year</th>
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<tbody>
<tr>
<td>BCHM 201-Undergrad Seminar II</td>
<td>1</td>
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<tr>
<td>BIOL 214-Intro BioMolecules to Cells</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>CHMY 311-Analytical Chem-Quant Analysis</td>
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<tr>
<td>CHMY 401-Advanced Inorganic Chemistry (Junior Year)</td>
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<td>Take one of the following:</td>
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<td>CHMY 521-Organic Chemistry I</td>
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<td>CHMY 531-Honors Organic Chemistry I</td>
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<td>PHYS 305-College Physics I</td>
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<td>PHYS 211-Gen &amp; Mod Phys I</td>
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<td>PHYS 206-College Physics II</td>
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<td>PHYS 212-Gen &amp; Mod Phys II</td>
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<td>University Core and Electives</td>
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<thead>
<tr>
<th>Junior Year</th>
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<tbody>
<tr>
<td>BCHM 300-Undergrad Seminar III</td>
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<tr>
<td>BCHM 340-General Biochemistry*</td>
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<td>BCHM 412-Metabolic Regulation</td>
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<tr>
<td>BCHM 490R-Undergraduate Research</td>
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<td>Take these two:</td>
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<tr>
<td>CHMY 361-Elements of Physical Chemistry</td>
<td>4</td>
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<tr>
<td>CHMY 362-Elements of Physical Chem Lab</td>
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<td>or these three:</td>
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<td>CHMY 571-Phys-Chem-Qum Cnm &amp; Spec</td>
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<tr>
<td>CHMY 575-Phys-Chem-Ktns &amp; Thrmodynamics</td>
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<td>CHMY 372-Physical Chemistry Lab I</td>
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<td>University Core and Electives</td>
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<thead>
<tr>
<th>Senior Year</th>
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<tr>
<td>BCHM 401-Capstone Seminar</td>
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<tr>
<td>BCHM 411-Biochem of Macromolecules</td>
<td>3</td>
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<tr>
<td>BCHM 444-Biochem Methods Molecular Biol</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 490R-Undergraduate Research</td>
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<td>CHMY 499-Senior Thesis/Capstone</td>
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<tr>
<td>Biological Sciences Elect (300+)</td>
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<tr>
<td>University Core and Electives</td>
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</table>

*Students with a B or better in CHMY 321/325 or 331/333 may take BCHM 441 in place of BCHM 340 in their junior year.*
**CHMY 499 (Senior Year) is required for majors who are writing a thesis for Departmental Honors consideration.**

All students are encouraged to take a 200 level English writing course. Please note that this course would be in addition to the WRIT 101W core requirement.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

### Acceptable Biological Science

<table>
<thead>
<tr>
<th>Electives Include</th>
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<tbody>
<tr>
<td>BIOL 301-Principles of Genetics</td>
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</tr>
<tr>
<td>BIOL 302-Adv Cell &amp; Molecular Biol</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 310-Comparative Vertebrate Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 311-Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 312-Histology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 313-Neuropathology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 315-The Visual System &amp; Its Discovery</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 403-Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 410-Advanced Human Anatomy</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 411-Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 422-Genes and Cancer</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 425-Sensory Neurophysiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 426-Neuroendocrinology</td>
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<tr>
<td>BIOL 430-Plant Physiology</td>
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<tr>
<td>BIOL 437-Plant Development</td>
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<tr>
<td>BIOL 438-Developmental Mechanisms</td>
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<tr>
<td>BIOL 466-Genie Construction</td>
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<tr>
<td>BIOL 467-Molecular Medicine</td>
<td>3</td>
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<tr>
<td>CHBE 438-Bioprocess Engineering</td>
<td>3</td>
</tr>
<tr>
<td>HDFN 421-Macronutrient Metabolism</td>
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<tr>
<td>HDFN 422-Micronutrient Metabolism</td>
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<tr>
<td>LRES 355-Soil &amp; Environmental Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>LRES 412-Microbial Diversity, Ecology &amp; Evolution</td>
<td>4</td>
</tr>
<tr>
<td>LRES 452-Soil and Environmental Microbiology</td>
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<tr>
<td>MB 301-Genel Microbiology</td>
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<tr>
<td>MB 401-Immunology</td>
<td>3</td>
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<tr>
<td>MB 402-Immune System Lab</td>
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<tr>
<td>MB 403-Virology</td>
<td>3</td>
</tr>
<tr>
<td>MB 405-Hematology</td>
<td>3</td>
</tr>
<tr>
<td>MB 406-Hematology Lab</td>
<td>1</td>
</tr>
<tr>
<td>MB 409-General Pathology</td>
<td>3</td>
</tr>
<tr>
<td>MB 415-Micro Diversity,Ecol,Evol</td>
<td>3</td>
</tr>
<tr>
<td>MB 420-Micro Physiology</td>
<td>3</td>
</tr>
<tr>
<td>MB 430-Medical Bacteriology</td>
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</tr>
<tr>
<td>MB 431-Medical Bacteriology Lab</td>
<td>2</td>
</tr>
<tr>
<td>MB 432-Indust Microbio &amp; Biotech</td>
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<tr>
<td>MB 433-Applied and Envi Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>MB 437-Molecular Evolution</td>
<td>4</td>
</tr>
<tr>
<td>MB 441-Eukaryotic Pathogens</td>
<td>4</td>
</tr>
<tr>
<td>MB 449-Micro Genetics</td>
<td>3</td>
</tr>
<tr>
<td>MB 450-Research Methods in Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>PSPP 426-Plant Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>PSPP 450-Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>PSPP 457-Plant Development</td>
<td>3</td>
</tr>
<tr>
<td>PSPP 458-Plant Cell Physiology</td>
<td>3</td>
</tr>
<tr>
<td>PSPP 460-Plant Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>VTMB 406-Infectious Diseases</td>
<td>3</td>
</tr>
<tr>
<td>VTMB 411-Hybridomas</td>
<td>2</td>
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<tr>
<td>VTMB 412-Advanced Immunology</td>
<td>1</td>
</tr>
<tr>
<td>VTMB 413-Flow Cytometry</td>
<td>1</td>
</tr>
<tr>
<td>VTMB 414-Advanced Microscope</td>
<td>1</td>
</tr>
<tr>
<td>VTMB 421-Genecne Science</td>
<td>2</td>
</tr>
<tr>
<td>VTMB 422-Functional Gene Expression</td>
<td>2</td>
</tr>
</tbody>
</table>

### TEACHING OPTION

#### Freshman Year

**Take one of the following:**
- CHMY 141-College Chemistry I ... 4
- CHMY 151-Honors College Chemistry I ... 4

**Take one of the following:**
- CHMY 143-College Chemistry II ... 4
- CHMY 153-Honors College Chemistry II ... 4
- CHMY 194-Seminar/Workshop ... 1
- EDCI 102-In-School Experience ... 1
- HDFC 150SB-Lifespan Human DevlPmt ... 3
- M 151-Precalculus ... 3
- M 161-Q-Survey of Calculus ... 4
- University Core and Electives ... 10

#### Sophomore Year

**Take one of the following:**
- CHMY 214 Intro Bio: Molecules to Cells ... 4
- CHMY 294-Seminar/Workshop ... 1
- CHMY 311-Analytical Chem-Quant Analysis ... 4

**Take one of the following:**
- CHMY 321-Organic Chemistry I ... 4
- CHMY 331-Honors Organic Chemistry I ... 4

**Take one of the following:**
- CHMY 323-Organic Chemistry II ... 4
- CHMY 333-Honors Organic Chemistry II ... 4
- EDCI 209-Ed by Abd Dev ... 3
- EDCI 320-Found of Instr Computing ... 2
- EDCI 405-Multicultural Education ... 3
- HDFC 106-Drug Hlth Issue for Ed ... 1
- PHYS 205-College Physics I ... 4
- PHYS 206-College Physics II ... 4

#### Junior Year

**Take one of the following:**
- BCHM 340-General Biochemistry ... 5
- CHMY 394-Seminar/Workshop ... 1
- CHMY 351-Elements of Physical Chemistry ... 4
- CHMY 352-Elements of Physical Chem Lab ... 4
- CHMY 490R-Undergraduate Research ... 4

**Take one of the following:**
- EDCI 360-Found of Asmnt ... 2
- ESD 466-Method Teach Sci Sec ... 3
- ESD 501-Paraprofessional Experience ... 1
- HDFC 356-Exceptional Needs ... 3
- Adv BCHM/CHMY courses ... 6

#### Senior Year

**CHMY 499-Senior Thesis/ Capstone**
- CHMY 494-Capstone Seminar ... 1

**Student teaching semester:**
- ESD 410-Student Teaching ... 10
- ESD 415-Professional Issues ... 2

**University Core and Electives** ... 16

#### Credits

**Any BCHM or CHEM class 301 or higher (except 494, 492 & 499).**

**BIOL 214 is strongly recommended, because it is a prerequisite to BCHM 340.**

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. The chemistry teaching option certifies graduates to be qualified to teach secondary school chemistry. Employment opportunities will be enhanced by obtaining a second area of certification, usually a teaching minor. Obtaining a teaching major, a teaching minor, and certification will require more than 120 credits.

**CHMY 499 (Senior Year) is required for majors who are writing a thesis for Departmental Honors consideration. Twelve credits (14 weeks) of ESDS 410 is optional.**

### BIOCHEMISTRY MINOR

#### (NON-TEACHING)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 441-Biochm of Macronolce</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 442-Metabolic Regulation</td>
<td>3</td>
</tr>
<tr>
<td>BCHM 444-Biochem Mbls Molec Biol</td>
<td>3</td>
</tr>
</tbody>
</table>

**Take one of the following:**
- CHMY 141-College Chemistry I ... 4
- CHMY 151-Honors College Chemistry I ... 4

**Take one of the following:**
- CHMY 143-College Chemistry II ... 4
- CHMY 153-Honors College Chemistry II ... 4

**Take one of the following:**
- CHMY 321-Organic Chemistry I ... 4
- CHMY 331-Honors Organic Chemistry I ... 4

**Take one of the following:**
- CHMY 323-Organic Chemistry II ... 4
- CHMY 333-Honors Organic Chemistry II ... 4

**Any BCHM/CHMY course 301 or higher, except CHMY/BCHM 490, 492 & 499.**

#### Credits

**28**

**CHEMISTRY MINOR (NON-TEACHING)

#### Required Course

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 394-Seminar/Workshop</td>
<td>1</td>
</tr>
<tr>
<td>CHMY 351-Elements of Physical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 352-Elements of Physical Chem Lab</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 490R-Undergraduate Research</td>
<td>4</td>
</tr>
</tbody>
</table>

**Take one of the following:**
- CHMY 353-Honors Organic Chemistry I ... 4
- CHMY 353-Honors Organic Chemistry II ... 4

**Take one of these two:**
- CHMY 361-Elements of Physical Chemistry ... 4
- CHMY 362-Elements of Physical Chem Lab ... 1

**or these three:**
- CHM 371-Phys Chem-Qtms
- CHM & Spectrocyp
- CHM 373-Phys Chem-Ktcs & Thrdynmcs
- CHM 372-Physical Chemistry Lab ... 1

**Any BCHM/CHMY courses 301 or higher, except CHMY/BCHM 490, 492, & 499.**

#### Credits

**20**

### Earth Sciences

**Department of Earth Sciences**

http://www.montana.edu/wwwes/

[The department offers the Bachelor of Science degree in Earth Sciences which may be earned in any one of six options (Geography, Geographic Information Science/Planning, Geology, Geohydrology, Paleontology, and Snow science). Each option tabulated below requires courses from within the Department of Earth Sciences and]
courses outside the department. Some of the courses fulfill both department requirements and University Core Curriculum requirements. Academic minors are offered in Spatial Analysis/GIS and Earth Science Teaching (link to http://www.montana.edu/wwwcat/programs/minors.html#ESCI”, and Water Resources.

The Department also offers a Master of Science Degree and Doctor of Philosophy in Earth Sciences. Thesis and course work for these graduate degrees usually emphasize some aspect of geology, geography, or geobiology with specific course and research plans approved by a graduate committee.

The department collaborates with the interdisciplinary Master of Science in Land Rehabilitation, the Ph.D Program in Ecology and Environmental Science http://www.montana.edu/eces/ and with the Big Sky Institute.

Geography Option

The Geography Option offers students a liberal university education with an emphasis in geography. The Geography option provides a general education as well as the more specialized knowledge and skills necessary to pursue many career objectives. Geographers find professional opportunities in urban and land use planning as well as spatial analysis in the public and private sectors, analysis of regions, resource and environmental management, as well as the application of geographical skills in map making (cartography), remote sensing, and geographic information science (GIS). Geography also offers an outstanding background for more advanced education in environmental law, international business, resource planning, and other specialized graduate school opportunities. Students may enhance their employment opportunities with a Master’s degree, or a Ph.D if college teaching or advanced research positions are of interest.

The student, in consultation with an adviser, is given the opportunity to develop a program to meet his or her own particular interests and needs through a series of core geography courses and an emphasis in physical or human geography or an approved minor. The Geography Option introduces students to lower division course work in world regional, physical, and human geography. These courses emphasize the importance of spatial relationships, the global distributions of physical and cultural phenomena, the complex interplay between natural and human systems, and the factors contributing to the evolution of the earth’s varied landscapes. In addition, advanced skills courses and a capstone course prepare the student to apply their training in a variety of jobs and/or graduate school.

Geology Option

The Geology Option is a degree program designed for students who are motivated to apply the principles of chemistry, physics, and mathematics to the study of the Earth’s surface and interior. There are growing opportunities for employment in the public and private sectors in fields such as petroleum geology, mining geology, seismology (including earthquake and volcanic risk assessment), hydrology (surface and ground water) natural-hazard geology, environmental clean-up and containment of environmental hazards, mitigation of future environmental problems related to development, preservation of water resources (both surface and ground water), and the study of the processes of climate change. The optimal degree for employment and advancement in the geological sciences in the private sector is the Master’s Degree, and the undergraduate Geology Option is an excellent preparatory degree for graduate study. Students interested in college teaching or advanced research may require a Ph.D degree.

In the Geology Option, students are given the opportunity to learn in the tremendous natural laboratory that surrounds Bozeman. Course work progresses from core courses which all students must take (introductory geology, mineralogy, igneous petrology, metamorphic petrology, sedimentary petrology, historical geology, sedimentation and stratigraphy, structural geology, tectonics, geomorphology, two geographic information science courses and field geology (a summer capstone course)) to a variety of elective courses in geology, paleontology, hydrology, and remote sensing. These courses prepare the student for a variety of jobs and/or graduate school.

Geohydrology Option

The Geohydrology option is designed for students interested in the relationships between water, people, and Earth. A graduate in this option is prepared for a career emphasizing pollution mitigation, hazardous waste disposal, environmental impact assessment, water resource development, stream channel restoration and morphology, and fundamental research in surface or ground water hydrology. Prospective employers include local, state, and federal research or regulatory agencies; consulting firms; and hydrologic or environmental divisions of major corporations. Because the geohydrology program deals with fluids and geology, the energy industry is also sometimes a source of employment (petroleum geology, coal-bed-methane extraction and mitigation, geothermal energy resources). Most students find it to their advantage to undertake graduate work prior to permanent employment. The optimal degree for employment and advancement in the geological sciences in the private sector is the Master’s Degree, and the undergraduate Geology Option is an excellent preparatory degree for graduate study. Some students interested in college teaching or advanced research may require a Ph.D degree.

The core courses in the Geohydrology option are similar to that in geology but more Mathematics is required. Elective courses use water courses from across campus. Selection of elective courses from disciplines outside Earth Sciences develops additional expertise in an area of water resource investigations of interest to the student. These courses prepare the student for a variety of jobs and/or graduate school.

GIS/Planning Option

The GIS (Geographic Information Science)/Planning Option in the Department of Earth Sciences is designed to offer students a mix of technical skills and academic training that prepares them for careers in local, state, and federal planning as well as opportunities in private consulting firms that are involved in the planning process. The GIS/Planning Option recognizes the growing importance of Geographic Information Systems and Science in our society and how these analytic tools are
applied in a wide variety of settings. The GIS/Planning Option takes advantage of excellent GIS facilities, lab space, expertise, and software available on campus and allows students to learn in an active hands-on environment. Students are prepared as map makers (cartographers) spatial analysts, and planners. The Department of Earth Sciences has connections with various local, state, and federal planning agencies within Montana and throughout the West. As part of their training, students may also be able to take advantage of internship opportunities as a way to further prepare for a wide variety of professional careers within the fields of planning and resource management.

The optimal degree for employment and advancement in the in GIS/Planning area is the Master’s Degree, and this undergraduate option is an excellent preparatory degree for graduate study. Some students interested in college teaching or advanced research may require a Ph.D. degree.

At the Freshman and Sophomore level, students take basic courses in physical and human geography as well as introductory skills classes in GIS and cartography, statistics, intermediate technical writing, and design graphics. In addition, courses in economics and political science lay the foundation for understanding the broader context of the planning process. As juniors and seniors, students complete an advanced 2-course sequence in GIS/Spatial Analysis (GPHY 384/411) and take skills-related coursework in Aerial Photo/Remote Sensing and in GPS technologies. Students also take courses in geographical planning, tourism and recreational planning, and in the politics of state and local government. All students also complete basic coursework in soils and geomorphology because these variables are critical in the planning process. Electives in advanced classes in urban and economic geography, public/urban policy and political science, water resources, and/or ecology allow students to specialize in areas of particular interest and develop their own emphases in subjects related to the planning process. All students take the Geography Capstone course (GPHY 425) which emphasizes the broad integrative skills of Geography.

**Paleontology Option**

The paleontology option focuses on understanding fossils within their geologic context, while Montana’s geology provides the opportunity for hands-on fieldwork. The paleontology option in the Department of Earth Sciences is designed for those students who have a strong interest in either invertebrate or vertebrate fossils (evolution, biology of ancient organisms, the environment in which the organism lived, and the changes the fossil has undergone since death). Students who study paleontology find employment with natural history museums (e.g. fossil preparation, collection, curation, exhibit design, education), as scientific illustrators, writers, paleontology consultants for energy resource companies, and resource specialists for local, state, and federal land-management agencies or parks. Because students who study this option are trained in core geology courses, employment may be found in areas outside paleontology that require geologic expertise. Graduate training beyond the bachelor’s degree desirable for those seeking careers in the paleontology (normally a master’s degree) or in teaching and/or research (typically a doctorate).

This option combines training in geology, and paleontology. The paleontology option builds on courses that form the core of the traditional geology option, while providing strong background in paleontology through four required courses (including the paleontology field course) and two elective courses. All of the paleontology courses offered through the department provide upper division credits. Internships and summer field research experience is available to some students. These courses prepare the student for a variety of jobs and/or graduate school.

**Snow Science Option**

The snow program in the Department of Earth Sciences provides a foundation for understanding the distribution of snow (geography), mechanics of snow (physics, engineering), composition of snow (chemistry), variability of snow (statistics) and ecological effects of snow (ecology, hydrology). It is also one of the best preprofessional programs in the world for those who want to carry their interests in snow into a professional career. Employment ranges from ski patrol, director of snow safety, avalanche-center employee, snow scientist with a federal agency, to work in consulting in the area of land use planning, transportation engineering or avalanche protection. The optimal degree for employment and advancement in snow science is the Master’s Degree. Some students interested in college teaching or advanced research may require a Ph.D. degree. The snow science option is an excellent preparatory degree both for employment and for advanced graduate studies.

In the Snow Science Option, students progress through a broad-based core of courses that includes introductory geology and geography, calculus, chemistry, physics, weather and climate, geomorphology, glaciation, and mountain geography. In addition to the core of snow science courses, students focus on snow geography or snow mechanics. Snow geography examines biogeography, ecology and spatial analysis of factors important to snow distribution, the interaction between snow plants and animals, snow melt, and the analysis of factors which influence the spatial distribution of snow or snow avalanche factors. Snow mechanics prepares the student to study the mechanics of snow as it relates to transportation, avalanche release, and the impact of snow on buildings (loading and avalanche impact forces), as well as snow metamorphism and snow strength. The snow statistics emphasis prepares the student to apply statistical techniques to questions about spatial and temporal variability of snow properties such as strength, depth, grain size, grain type, water content, and fracture initiation. The capstone course is snow dynamics and accumulation. Students are strongly encouraged to consider a graduate degree in snow science to prepare for professional jobs, but such training is not always required.

**Undergraduate Research Participation**

Research opportunities are available to undergraduate students who demonstrate interest and ability. Senior-level students may enroll in ERTH 490 (Undergraduate Research), which provides the opportunity to participate in a research project under the guidance of a faculty member. Successful comple-
of ERTH 490 credits requires that the student write a senior thesis report and orally present and defend the results in a public forum, such as an annual conference of a professional society. Collaborative opportunities exist with the university’s Undergraduate Scholars Program.

Departmental Honors in Earth Sciences

The Department of Earth Sciences awards Departmental Honors at graduation to students who demonstrate exceptional undergraduate performance through the following criteria: 1) a minimum 3.5 grade-point average (GPA) in the major; 2) a minimum 3.0 GPA overall; 3) completion of at least 4 credits of undergraduate research with a grade of “B” or better; and 4) completion of a Senior Thesis (ERTH 490) written, bound, and orally presented and defended by the last day of classes prior to graduation.

GEOGRAPHY OPTION

Some courses listed below are offered alternate years. A student’s course sequence may differ from that shown depending upon the date the student enters the program and the availability of courses.

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>GEO 101IN-Intro to Physical Geology</td>
<td>4</td>
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<tr>
<td>GPHY 1141D-Human Geography</td>
<td>3</td>
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<tr>
<td>University Core and Electives</td>
<td>19</td>
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</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 284-Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q-Intermediate to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 321-Urban Geography</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>10</td>
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</table>

<table>
<thead>
<tr>
<th>Junior and Senior Years</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 384-Adv GIS and Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following: **</td>
<td></td>
</tr>
<tr>
<td>ERTH 307-Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 432R-Surface Water Resource</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 411-Biogeography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 321-Urban Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 352-Cultural Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 322-Economic Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 431-Historical Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 461-Environmental Planning</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 414-R-Mountain Geography</td>
<td>4</td>
</tr>
<tr>
<td>GPHY 446-East Asia in the Global System</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 445-Regional Geography</td>
<td>3</td>
</tr>
<tr>
<td>Methods Courses</td>
<td></td>
</tr>
<tr>
<td>GPHY 425-Geographic Thought</td>
<td>3</td>
</tr>
<tr>
<td>STAT 410-Intermediate to Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>LRES 357-GPS Fund &amp; Appl in Mapping</td>
<td>3</td>
</tr>
<tr>
<td>STAT 410-Intermediate to Mult Regression</td>
<td>3</td>
</tr>
</tbody>
</table>

**Students may take both ERTH 305 and GPHY 365 and count the second class towards their upper division geography thematic courses.

Take 5 courses from the following and 1 methods course OR 4 courses from the following and 2 methods courses:

| ERTH 307-Principles of Geomorphology | 4 |
| ERTH 432R-Surface Water Resource | 3 |
| GPHY 411-Biogeography | 3 |
| GPHY 321-Urban Geography | 3 |
| GPHY 352-Cultural Geography | 3 |
| GPHY 322-Economic Geography | 3 |
| GPHY 431-Historical Geography | 3 |
| GPHY 461-Environmental Planning | 3 |
| GPHY 414-R-Mountain Geography | 4 |
| GPHY 446-East Asia in the Global System | 3 |
| GPHY 445-Regional Geography | 3 |
| Methods Courses | |
| GPHY 425-Geographic Thought | 3 |
| STAT 410-Intermediate to Spatial Analysis | 3 |
| LRES 357-GPS Fund & Appl in Mapping | 3 |
| STAT 410-Intermediate to Mult Regression | 3 |

GEOHYDROLOGY OPTION

Some courses listed below are offered in alternate years. A student’s course sequence may differ from that shown depending upon the date the student enters.

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>GEO 101IN-Intro to Physical Geology</td>
<td>4</td>
</tr>
<tr>
<td>GPHY 111CS-Intro to Physical Geography</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q-Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 205R-Mineralogy</td>
<td>4</td>
</tr>
<tr>
<td>GEO 211-Early History and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>LRES 201IN-Soil Research</td>
<td>3</td>
</tr>
<tr>
<td>M 273Q-Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 274Q-Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211-Gen &amp; Mod Phys I</td>
<td>4</td>
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<tr>
<td>PHYS 212-Gen &amp; Mod Phys II</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 307-Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 305-Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>GEO 306 or 308-Igneous Petrology (or) Metamorphic Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 307-Sedimentary Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 309-Sedimentation and Stratigraphy</td>
<td>3</td>
</tr>
<tr>
<td>GEO 315-Structural Geology</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>6</td>
</tr>
</tbody>
</table>

Summer of Junior or Senior year:

| GEO 429-Field Geology | 3 |

Senior Year

| BIOL 101CS-Biology of Organisms | 4 |
| ERTH 432R-Surface Water Resource | 3 |
| ERTH 440-Hydrogeology | 3 |
| Select Two of the four courses below: | |
| ERTH 450R-Snow Dynamic & Accumulation | 3 |
| LRES 444-Watershed Hydrology | 3 |
| LRES 453-Soil & Environmental Physics | 3 |
| University Core and Electives | 8 |

NOTE: A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

GEOLGY OPTION

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>GEO 101IN-Intro to Physical Geology</td>
<td>4</td>
</tr>
<tr>
<td>GPHY 111CS-Intro to Physical Geography</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q-Calculus II</td>
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<td>University Core and Electives</td>
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</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 205R-Mineralogy</td>
<td>4</td>
</tr>
<tr>
<td>GEO 211-Early History and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>LRES 201IN-Soil Research</td>
<td>3</td>
</tr>
<tr>
<td>M 273Q-Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 274Q-Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211-Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212-Gen &amp; Mod Phys II</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 307-Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 305-Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>GEO 306 or 308-Igneous Petrology (or) Metamorphic Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 307-Sedimentary Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 309-Sedimentation and Stratigraphy</td>
<td>3</td>
</tr>
<tr>
<td>GEO 315-Structural Geology</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>6</td>
</tr>
</tbody>
</table>

| Summer of Junior or Senior year: | |
| GEO 429-Field Geology | 3 |

Senior Year

| BIOL 101CS-Biology of Organisms | 4 |
| ERTH 432R-Surface Water Resource | 3 |
| ERTH 440-Hydrogeology | 3 |
| Select Two of the four courses below: | |
| ERTH 450R-Snow Dynamic & Accumulation | 3 |
| LRES 444-Watershed Hydrology | 3 |
| LRES 453-Soil & Environmental Physics | 3 |
| University Core and Electives | 8 |

NOTE: A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.
Sophomore Year  
F  S  
BIOI 101IN-Biology of Organisms.............4  
ERTH 307-Principles of Geomorphology....4  
GPHY 284-Intro to GIS Science & Cartog....3  
GPHY 384-Adv GIS and Spatial Analysis....3  
GEO 205-Mineralogy ..............................4  
PHYS 205-College Physics I.................4  
PHYS 206-College Physics II..............4  
University Core and Electives ..........5  

15 15  

Either GPHY 111 or GPHY 384 may be taken; if GPHY 111 is taken, GPHY 384 may be taken as an elective.

Junior Year  
F  S  
GEO 306-Igneous Petrology..................3  
GEO 307-Sedimentary Petrology ..........3  
GEO 308-Metamorphic Petrology ..........3  
GEO 309-Sedimentation and Stratigraphy...4  
GEO 313-Structural Geology .................4  
STAT 352-Stat Scientist & Engr............3  
University Core and Electives ..........3  

3 7  

Summer of Junior or Senior Year  
GEO 429-Field Geology.........................6  

Senior Year  
F  S  
GEO 435-Global Tectonics ..................3  
University Core and Electives ...........12 12  

12 12  

Geology Electives  
Credits  Take 5 courses from the following three blocks, at least three of which must come from the Geology block.  

Geology Block  
Take 3 to 5 courses from the following block:  

ERTH 455-Physo of the U.S. .................3  
ERTH 300-Vertebrate Paleontology .......3  
ERTH 412-Invertebrate Paleontology ....3  
ERTH 417-Taphonomy-Fossil Record .......3  
GEO 440-Volcanology ..........................3  
GEO 445-Geologic Time .......................3  
GEO 492-Individual Problems**...........3  
GEO 491-Special Topics ........................3  
ERTH 490R-Undergraduate Research......1 8  

**NOTE: Can be repeated, but can only be counted once (each) as a Geology elective.

Hydrology Block  
1 course from the following can be counted as an elective  

ERTH 432R-Surface Water Resource .......3  
ERTH 440-Hydrogeology .......................3  
ERTH 450R-Snow Dynamic & Accumulation 3  

Remote Sensing/GIS Block  
1 course from the following can be counted as an elective  

GPHY 384-Adv GIS and Spatial Analysis#3  
GPHY 485R-App GIS & Spatial Analysis...3  
LRES 426-Rem Sens & Digit Image ..........3  

#NOTE: Can be counted as an elective if not already used as a departmental requirement.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

Students may choose one emphasis within the Geology Option, but are not required to do so. The two optional emphases are: 1) the Active Geologic Processes and Hazards Emphasis and 2) the Crystallography, Mineralogy and Earth Materials Emphasis.

Students taking either emphasis must fulfill all the requirements of the Geology Option. Students in the Active Geologic Processes and Hazards Emphasis must take the following five courses. The four upper level courses may be used for their upper level electives requirement in the Geology Option.

Active Geologic Processes and Hazards Emphasis  
Credits  GEO 105C-Intro to Environmt Geology ..............4  
GEO 439-Geophysics ...........................3  
GEO 440-Volcanology ..........................3  
ERTH 490R-Undergraduate Research......3  

Take One of the following:  

GPHY 384-Adv GIS and Spatial Analysis....3  
ERTH 307-Principles of Geomorphology ....4  

Take One of the following:  

GEO 308-Mineralogy ..............................4  
ERTH 450-Active Geologic Processes .......3  

Students in the Crystallography, Mineralogy and Earth Materials emphasis must take the following courses in addition to those required in the Geology Option.

Crystallography, Mineralogy and Earth Materials Emphasis  
Credits  CHMY 211-Elements of Organic Chemistry .......5  
M 273Q-Multivariable Calculus ..............4  
M 274R-Intro to Differential Equations ....4  

Sophomore Year  

CHMY 311-Analytical Chem-Quant Analysis ...3  
CHMY 361-Elements of Physical Chemistry ....4  
CHMY 362-Elements of Physical Chem Lab ......3  
 
Junior Year  

GPHY 491-Special Topics ........................3  
GPHY 490R-Undergraduate Research .......3  
LRES 355-Environ Chemistry ..................3  

University Core and Electives ..........3  

**NOTE: A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

SNOW SCIENCE OPTION

Freshman Year  

Credits  GPHY 111C-Intro to Physical Geography ....4  
GPHY 111D-Geography of World Regions ....3  
M 171Q-Calculus I .................................4  
University Core and Electives*.............6  

*Snow Geography concentration take BIOL 101 ....  

30  

Sophomore Year  

Credits  CHMY 141-College Chemistry I ...............4  
CHMY 143-College Chemistry II ..........4  
PHYS 211-College Physics I .................4  
PHYS 212-College Physics II ...............4  
ERTH 305-Weather and Climate ..............3  
University Core and Electives** ...........11  

**Snow Geography concentration take GPHY 284, GPHY 121  

Snow Mechanics concentration take M 273 and M 274, EM 251  

30  

Junior  

Credits  ERTH 307-Principles of Geomorphology ....4  
University Core and Electives*** .......17  

***Snow Geography concentration take GPHY 411 and GPHY 384  

Snow Mechanics concentration take EM 325 and CE 312 ..........  

30  

Senior  

Credits  ERTH 150-Snow Dynamics & Accumulation ...3  
GPHY 414R-Mountain Geography ..........4  
GEO 445-Glacial Geology .......................5  
University Core and Electives**** .......17  

****Snow Geography concentration take GPHY 325 or GPHY 365, GPHY 484, ERTH 432  

Snow Mechanics concentration take EM 415 and CE 320 and CE 331  

30
Select one of the following two emphases

SNOW GEOGRAPHY

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 101N-Biology of Organisms</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 121D-Human Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 284-I Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 411-Biogeography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 384-Ad GIS &amp; Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 484R-App GIS &amp; Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>STAT 332-Stat for Scientists &amp; Engineers</td>
<td>3</td>
</tr>
<tr>
<td>STAT 446-Sampling</td>
<td>3</td>
</tr>
<tr>
<td>STAT 410-Methods for Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 325 315 or GPHY 365</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 432R or LRES 444</td>
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</table>

Students may find that M 221 Introduction to Linear Algebra will help with STAT 410

Additional 2 credits of upper division credits needed to graduate

SNOW MECHANICS

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>I&amp;M 350-App Engineering Data Analysis</td>
<td>2</td>
</tr>
<tr>
<td>M 273Q-Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 274-I Intro to Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>EM 251-Statics and Particle Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>EM 252-Rigid Body Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>EM 253-Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>EM 355-Mechanics of Fluids</td>
<td>3</td>
</tr>
<tr>
<td>CE 312-Structures I</td>
<td>3</td>
</tr>
<tr>
<td>CE 320-Geotechnical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 351-Engineering Hydrology</td>
<td>2</td>
</tr>
<tr>
<td>CE 332-Engineering Hydraulics</td>
<td>2</td>
</tr>
<tr>
<td>EM 415-Adv Mechanics of Solids</td>
<td>3</td>
</tr>
</tbody>
</table>

PALEONTOLOGY OPTION

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141-College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>GEO 101N-I Intro to Physical Geology</td>
<td>4</td>
</tr>
<tr>
<td>GPHY 111CS-I Intro to Physical Geography</td>
<td>4</td>
</tr>
<tr>
<td>GEO 211-Early History and Evolution</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q-Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q-Calculus II</td>
<td>4</td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 101N-Biology of Organisms</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 507-Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>GPHY 284-I Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 384-Adv GIS &amp; Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GEO 205R-Mineralogy</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 206-College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>4</td>
</tr>
</tbody>
</table>

NOTE: Either GPHY 111 or GPHY 384 may be taken; if GPHY 111 is taken, GPHY 384 may be taken as an elective

Junior

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 306-Igneous Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 307-Sedimentary Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 308-Metamorphic Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 309-Sedimentation and Stratigraphy</td>
<td>3</td>
</tr>
<tr>
<td>GEO 315-Structural Geology</td>
<td>4</td>
</tr>
<tr>
<td>STAT 320-Stat for Scientist &amp; Engin</td>
<td>4</td>
</tr>
</tbody>
</table>

Winter Division Paleontology course electives

In order to complete the Paleontology Option, students complete the following course requirements, in addition to those listed above.

Required courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 310- Invertebrate Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 330-Paleontology Lab Techniques</td>
<td>2</td>
</tr>
<tr>
<td>GEO 411-Vertebrate Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 417- Taphonomy:Fossil Preservation</td>
<td>3</td>
</tr>
<tr>
<td>GEO 419* -Field Paleontology</td>
<td>2</td>
</tr>
</tbody>
</table>

Taken during summer of Sophomore or Junior year

Geographic Information Science (GIS)

PETROLOGY OPTION

Minor (NON-TEACHING)

Not available to Geography majors

Required courses (minimum grade C required)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 284-I Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 384-Adv GIS &amp; Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 484R-App GIS &amp; Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>LRES 575-GPS Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>LRES 426-Remote Sensing &amp; Digital Image</td>
<td>3</td>
</tr>
</tbody>
</table>

Minimum Credits 15

Minimum Total Credits 25

WATER RESOURCES MINOR

NON-TEACHING

The Water Resources Minor is designed to encourage a student from any discipline to explore water resources beyond course work in their major. As a result, the minor includes courses from the College of Agriculture, the College of Engineering, and the College of Letters and Science. The minor is administered by a board with the following representatives: Brian McGlynn (Agriculture and Outreach), Michael Brody (Education), Otto Stein (Engineering), Jerry Johnson (Letters and Science), and Steve Custer (Letters and Science). Any board member may serve as an advisor for the minor. The chair of the board serves as the curriculum review officer and signs the Application for a Nonteaching Minor form approved and forwarded by the other advisors.

The minor is composed of water policy and water science courses. Each student must take a minimum of two courses from the Water Management and Policy Group, two courses from the Water Science and Technology Group, and three additional courses from either list. Up to six credits of 470, 476, or 490 from any rubric, which are related to water science or policy in the judgment of the minor advisor may be used as part of the minor. No more than twelve credits may be used to simultaneously fulfill both Water Resources Minor requirements and University Core or requirements for the student’s major. Course substitutions are allowed only by appeal to and approval by the Water Resources Minor Administrative Board and should be sent to the Chair of the Board (Steve Custer, Earth Sciences) after review by one of the advisors. The written appeal should identify the substitution and present a brief rationale.

The Water Resources Minor requires a minimum of 21 credits.

Water Management and Policy

<table>
<thead>
<tr>
<th>Course List</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take Two of the following:</td>
<td></td>
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<tr>
<td>ECNS 332-Econ of Natural Resources</td>
<td>3</td>
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<tr>
<td>ECNS 432R-Benefit-Cost Analysis</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 470-American Environmental History</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 470-Sociology of Environmental Sociology</td>
<td>3</td>
</tr>
</tbody>
</table>

Minimum of two courses related to water management/policy 15

Water Science and Technology

<table>
<thead>
<tr>
<th>Course List</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take Two of the following:</td>
<td></td>
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<tr>
<td>AOT 425-Water Management</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 545-Riparian Ecol &amp; Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 394-Limnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 433-Phycoregion</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 459-Stream Ecology</td>
<td>3</td>
</tr>
<tr>
<td>CE 331-Engineering Hydrology</td>
<td>2</td>
</tr>
<tr>
<td>CE 340-Principles of Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 448-Environmental Science</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 110-Intro to Physical Geography</td>
<td>4</td>
</tr>
</tbody>
</table>

Minimum of two courses related to water science 12

Minimum of two courses related to water management/policy 15

Minimum Total Credits 25


Agricultural Economics & Economics

recite the subject matter. The courses
tools rather than simply memorize and
their thoughts in order to solve prob-

overall program that is both cohesive
interests. With this freedom, however,
his or her own particular needs and
portunity to develop a program to meet

subject areas rather than designation
specified largely in terms of broad
university education with particular
these time-honored abilities
problems is timeless. Economics hones
people who can think, learn and solve
ments change over time. The need for
ware package). However, skill require-
ity to think critically and carefully, the
employers value most highly are the abil-

widespread application. The skills that

The Bachelor of Science degree in

The objective of the program is
to provide the student with a liberal
university education with particular
emphasis on economics. In keeping with
this objective, requirements are
specifed largely in terms of broad
subject areas rather than designation
of particular courses. The student, with
the help of the advisor, is given the op-
portunity to develop a program to meet
his or her own particular needs and
interests. With this freedom, however,
comes the responsibility of building an
overall program that is both cohesive
and academically sound. The program
focuses on teaching students to think,
to use logic and reason, and to organize
their thoughts in order to solve prob-
lems rather than simply memorize and
recite the subject matter. The courses
also focus on instilling in students a
desire to learn, so that they will leave
our courses prepared and eager for
lifelong learning.

The economics program, with its
flexibility, offers the opportunity to
acquire a general university education
and the necessary background and
preparation for many career objectives.
Economics majors pursue a wide variety
of careers after graduation. Students
with a bachelor’s degree in economics
are often employed in the financial,
retailing, and industrial sectors of
the economy. Economics majors also
work in such diverse fields as actuarial
science, elementary and secondary
education, journalism, investment
banking, securities analysis, corporate
finance, insurance, law, politics, and
environmental regulation, as well as in
government and academia. Graduate
schools regard a degree in economics
as excellent preparation for advanced
work toward a degree in law as well as a
Ph.D. in a number of social science
disciplines such as economics, international
relations, public policy, and political
science. Economics is also an excellent
undergraduate major for students seek-
ing an MBA. What can you do with an
education in economics is unlimited!

Curriculum in Economics

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>COM 110US--Public Communication</td>
<td>3</td>
</tr>
<tr>
<td>CAPP 120--Introduction to Computers</td>
<td></td>
</tr>
<tr>
<td>ECNS 101IS--Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202--Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W--College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>M 161Q--Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q--Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td>Total</td>
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Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ACTG 201--Principles of Financial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204IS--Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201--College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q--Introduction to Statistics</td>
<td>3</td>
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Junior And Senior Years

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 301--Intermediate Micro with Calculus</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 303--Intermediate Macro with Calculus</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 412R--Benefit-Cost Analysis</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217--Interim Statistical Concepts</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
</tr>
</tbody>
</table>

NOTE: ECNS 251IS (Honors Economics, 4 cred-
ts) may be substituted for the 3 course sequence
ECNS101IS, ECNS 202, and ECNS 204IS.

Electives Must Include:

One of the following:

- AGEC 357--Agricultural Law
- BUS 361 Intro to Law

One of the following:

- BUS 201--Managerial Communication
- WRIT 221--Intermediate Tech Writing
- WRIT 326--Advanced Composition
- ENGL 429--Professional Writing

Social Sciences

(excluding AGEC/ECNS; the 6 credits
must be from one or more of the
following disciplines: anthropology,
geography, political science, psychology,
sociology, or history)

Upper division selected courses
in ECNS/AGEC

*At least two ECNS/AGEC courses (6 credits) at
the 400 level or higher are required, excluding semi-
nars, 490s/492s.

Students completing a double major with economics
as one of the majors are only required to meet their
University Core or Social Science requirements.

Students completing a double major with finance
and economics as the two majors may use ECNS 313-
-Money & Banking as an elective in the economic
major.

Entrance to the

General Economics Program:

Program entrance requirements are
that a student must (1) have a cumula-
tive GPA of at least 2.50 and received
a grade of C or better in each of the
following courses: ECNS 101IS, ECNS
202, ECNS 204IS, and M 161Q or M
171Q (or their equivalents), OR (2)
be an incoming transfer student or of
freshman standing.

Graduation Requirements

General Economics students must
receive a grade of C or better in ECNS
101IS, ECNS 202, ECNS 204IS, ECNS
301, ECNS 303, and M 161Q or M
171Q (or their equivalents) to meet depart-
mental graduation requirements. All
other courses counting toward depart-
mental requirements must be graded
C- or better.

A minimum of 120 credits is re-
quired for graduation; 42 credits must
be in courses numbered 300 and above.

ECONOMICS MINOR

(NON-TEACHING)

A student must receive a grade of C or better in all
courses required for the minor.

Economics Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 101IS--Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202--Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204IS--Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 301--Intermediate Micro with Calculus</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 303--Intermediate Macro with Calculus</td>
<td>3</td>
</tr>
</tbody>
</table>
Programs of Instruction – Letters and Science

English
Department of English
http://www1.english.montana.edu/

The curriculum leading to the Bachelor of Arts in English provides the student two options: 1) the literature option for students who wish to specialize in the study of literature, especially those preparing for a broad range of careers including graduate study in English or related fields, and 2) the English teaching option for students wishing to specialize in the study of literature, language, and composition as preparation for certification for secondary school teaching.

There are many professional opportunities open to English graduates. In addition to teaching, professional schools (law and business, for example) consider the B.A. in English to be excellent preparation. The study of literature and effective writing is also useful in the areas of corporate management, personnel work, finance, consulting, journalism and public relations, Intermediate Tech Writing and editing, and many other fields, as various industries continue to seek people who are literate and articulate.

In addition to these programs for its majors, the Department of English offers many courses that satisfy University core requirements.

Curriculum in English
Students desiring to obtain the B.A. in English will choose one of the following options. Those seeking endorsement as teaching majors will follow the teaching option. Endorsement with a teaching minor in English may be obtained by completing the appropriate courses listed under the Department of Education. In order to graduate, students must earn a grade of C- or better in every course required for the English major.

Literature Option
This option is designed for students wishing to specialize in the study of literature as preparation for graduate work or for general education.

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>LIT 201-Intro to Lit Studies</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>LIT 249- Bible as Lit</td>
<td>3</td>
</tr>
<tr>
<td>LIT 233-Classical Traditions of Lit</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
</tbody>
</table>

Sophomore and Junior Years

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 238--Struct &amp; Func of Lang</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 236IH--Thry and Mthds in Linguist</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 335--Women &amp; Lit</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 382-Lit for Children/Adolescents</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 440-Studies in World Lit</td>
<td>3</td>
</tr>
<tr>
<td>Take two of the following:</td>
<td></td>
</tr>
<tr>
<td>LIT 325-Brtn/Brtn Lit</td>
<td>3</td>
</tr>
<tr>
<td>LIT 326-19th Century Brit Lit</td>
<td>3</td>
</tr>
<tr>
<td>LIT 310-Early American Lit</td>
<td>3</td>
</tr>
<tr>
<td>Take two of the following:</td>
<td></td>
</tr>
<tr>
<td>LIT 311-19th Century Amer Lit</td>
<td>3</td>
</tr>
<tr>
<td>LIT 320-19th Century Brit Lit</td>
<td>3</td>
</tr>
<tr>
<td>LIT 371-20th Ctry Brit/Amer Lit</td>
<td>3</td>
</tr>
<tr>
<td>LIT 372-Contemp Brit/Amer Lit</td>
<td>3</td>
</tr>
<tr>
<td>Take two of the following:</td>
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</tr>
<tr>
<td>LIT 214D-Regional Lit</td>
<td>3</td>
</tr>
<tr>
<td>LIT 337--Oral Traditions</td>
<td>3</td>
</tr>
<tr>
<td>LIT 431R-Studies in Major Author/s</td>
<td>3</td>
</tr>
<tr>
<td>LIT 437--Studies in Genres</td>
<td>3</td>
</tr>
<tr>
<td>LIT 438--Studies in Literary Topics</td>
<td>3</td>
</tr>
<tr>
<td>LIT 473R-Studies in Shakespeare</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td>WRIT 201-College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 221-Intermediate Tech Writing</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 326-Advanced Composition</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 385-Hist of English Language</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 428-Creative Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 429-Professional Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 450-Hist Thry of Rhetoric/Comp</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>28</td>
</tr>
<tr>
<td>Take one of the following:</td>
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</tr>
<tr>
<td>LIT 233--World Traditions</td>
<td>3</td>
</tr>
<tr>
<td>LIT 335--Women &amp; Lit</td>
<td>3</td>
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<tr>
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<tr>
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<td>WRIT 101W-College Writing I</td>
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</tbody>
</table>

Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIT 494H-Rhetoric: Research Issues</td>
<td>3</td>
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<tr>
<td>Two English electives</td>
<td>6</td>
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<tr>
<td>University Core and Electives</td>
<td>32</td>
</tr>
</tbody>
</table>

WRIT 101W credits count for the Core Foundations written requirement. These credits are not counted as part of the total English Major, Literature Option.

English Teaching Option
This option is designed for students wishing to prepare for secondary school teaching. Employment opportunities may be enhanced if students also obtain a second area of certification, usually a teaching minor. Obtaining a minor in addition to the English major will require more than eight semesters.

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>EDSD 413--Methods Teach Engl</td>
<td>3</td>
</tr>
<tr>
<td>LIT 325-Brtn/Brtn Lit</td>
<td>3</td>
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</tbody>
</table>

Senior

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIT 494H-Rhetoric: Research Issues</td>
<td>3</td>
</tr>
<tr>
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<td>University Core and Electives</td>
<td>32</td>
</tr>
</tbody>
</table>

WRIT 101W credits count for the Core Foundations written requirement. These credits are not counted as part of the total English Major, Literature Option.
A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

ENGLISH MINOR: WRITING (NON-TEACHING)

ENGLISH MINOR: LITERATURE (NON-TEACHING)

The curriculum leading to the Bachelor of Arts in history allows students to specialize in the study of the American west, U.S. history, environmental history, and the history of science and technology. The history degree also provides an analytical gateway to areas beyond the United States, with courses of advanced study related to South Asia, East Asia, Latin America, Europe, and the ancient world. Internships at historical societies, museums, and Yellowstone National Park are also an important part of the educational experience and are strongly encouraged by the department.

A degree in history prepares students for teaching, graduates studies, public resource management, government service, law school, journalism, and other career opportunities that require critical thinking and clarity of communication. Students participate in original research projects and student-centered learning activities; they learn to read and analyze primary texts, as well as secondary literature, and write thoughtful about them. Students learn to create knowledge by thinking critically and basing their ideas in the empirical authority inherent in careful examination of historical documents.

At all levels of the curriculum, the history degree provides students with the tools to think rigorously, to research and thereby generate knowledge empirically, and to articulate their thoughts coherently. In consultation with an advisor, students may select from a range of fields of Concentration that are consistent with his or her interests and educational objectives.

The department encourages students to engage in independent study through the Yellowstone Internship Program and Departmental Honors Option. This option has the following requirements:

Students must have a minimum 3.5 grade-point average in their major and a 3.0 GPA overall.

Students must present an acceptable, bound senior thesis, and an oral defense of the thesis.

Students may attain 34-graduate independent study credits while working for the thesis. These credits will fulfill part, or all, of the UNRESTRICTED upper division history elective requirement. Qualified students may enroll in the honors option through their departmental advisers.

Curricula in History

HISTORY OPTION

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CLS 101US-Freshman Seminar</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
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<tr>
<td>Math Core</td>
<td>3</td>
</tr>
<tr>
<td>HIST 101W-Western Civilization I</td>
<td>4</td>
</tr>
<tr>
<td>HIST 102W-Western Civilization II</td>
<td>4</td>
</tr>
<tr>
<td>HIST 252C-Darwinian Revolution</td>
<td>3</td>
</tr>
<tr>
<td>HIST 101H-American History I</td>
<td>4</td>
</tr>
<tr>
<td>HIST 102H-American History II</td>
<td>4</td>
</tr>
<tr>
<td>HIST 160D-Introduction to the American West</td>
<td>4</td>
</tr>
<tr>
<td>One 300-Level Modern Lang.</td>
<td>8</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

The student may elect to take an additional nine credits of upper-division history courses instead of the one year of modern language.

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>HIST 130D-Latin American History</td>
<td>4</td>
</tr>
<tr>
<td>HIST 140D-Modern Asia</td>
<td>4</td>
</tr>
<tr>
<td>HIST 145D-History of Japan</td>
<td>4</td>
</tr>
<tr>
<td>HIST 160D-Modern World History</td>
<td>4</td>
</tr>
<tr>
<td>RELS 110D-Religion and Conflict</td>
<td>4</td>
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</tbody>
</table>

Take one of the following for U.S. Region:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>HISTA 311-Early America</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 316-American Civil War Era</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 318-Gilded Age to 1945</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 322-American History of WWII to Present</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 406-McCarthy,Re/Truman</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 407-Gender in US &amp; Canadian West</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 408-Gender in America</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 412-American Thought &amp; Culture</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 416-Race &amp; Class in America</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 450-History of American Indians</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 460-Montana and the West</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 461-Trans-Mississippi West</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 470-American Environmental History</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 482-History of American Technology</td>
<td>3</td>
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</table>

Take one of the following for European Region:

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>HISTA 392-Ancient Greece</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 394-Ancient Rome</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 392-American History of WWII to Present</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 394-20TH Century Europe</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 350-Modern Britain</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 355-Modern France</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 359-Russia to 1917</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 362-Modern Germany</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 362-The World at War</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 376-Twentieth Century War</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 410-Family. Gender &amp; Law in Ancient Greece/Rome</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 423-European Intellectual History</td>
<td>3</td>
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<tr>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>HISTA 330-History of Mexico</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 349-Age of the Moguls</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 392-Japan’s Long 19TH Century</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 355-Modern China</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 356-Modern India, Pakistan, &amp; Bangladesh</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 356-Middle East, 20TH Century</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 450-Latin Amer Soc History</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 431-Race in Latin America</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 432-Colonial Latin America</td>
<td>3</td>
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<tr>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

Take two of the following for Asia/Latin America/Islamic World Region:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HISTA 300-History of Mexico</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 349-Age of the Moguls</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 392-Japan’s Long 19TH Century</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 355-Modern China</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 356-Modern India, Pakistan, &amp; Bangladesh</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 356-Middle East, 20TH Century</td>
<td>3</td>
</tr>
<tr>
<td>HISTA 450-Latin Amer Soc History</td>
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</tr>
<tr>
<td>HISTA 431-Race in Latin America</td>
<td>3</td>
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<tr>
<td>HISTA 432-Colonial Latin America</td>
<td>3</td>
</tr>
</tbody>
</table>

History

Department of History

http://www.montana.edu/history/
### HISTORY TEACHING OPTION

Candidates seeking a teaching career in Montana’s public schools with a major in history may follow the teaching option as listed below. Students must be careful to complete their core requirements in their first three years as their senior year will be almost completely filled with required courses.

**Freshman Year**
- CJS 101U1-Freshman Seminar.........................3
- WRIT 101W-College Writing ............................3
- EDSD 102-Ir-School Experience .......................1
- HSTR 101H-Western Civilization ....................4
- HSTR 102H-Western Civilization ........................4
- HSTR 282(CS-Darwinian Revolution .................3
- Take two of the following: ....................................................2
  - HSTR 101H-Western Civilization ..........................4
  - HSTR 102H-Western Civilization ..........................4
- HSTA 499R-Sen Capstone: Hist Methodology ........3

**Sophomore Year**
- EDCC 209-Ed Psy Adol Dev ............................3
- EDCC 260-Foundations of Assesment ....................3
- EDCC 593-Multiparacultural Education ................1
- HDFC 1508-Lifespan Human Development .............3
- Take two of the following: ....................................................2
  - HSTR 130D-Latin American History .................3
  - HSTR 140D-Middle Asia ..................................3
  - HSTR 145D-History of Japan ............................3
  - HSTR 160D-Middle World History ....................4
  - RELS 110D-Religion and Conflict ......................3
- Take one of the following for U.S. Region:
  - HSTA 311--Early America ........................................3
  - HSTA 316--American Civil War Era ....................3
  - HSTR 409--Age of the Shoguns ........................3
  - HSTR 432--Colonial Latin America ....................3
  - HSTR 430--Latin Amer Soc History ...................3
  - HSTR 450--History of Mexico ........................3
  - HSTR 432--19TH Century Europe ......................3
  - HSTR 431--Race in Latin America .....................3

**Junior Year**
- EDSD 301-Paraprofessional Experience ................3
- EDCC 302-Found of Instr Computing ....................3
- GPHY 141D-Geography of World Regions ..............3
- HDFC 356-Exceptional Need ..................6
- Take one of the following for European Region:
  - HSTR 301--Ancient Greece ..............................3
  - HSTR 302--Ancient Rome ..................................3
  - HSTR 322-19TH Century Europe ......................3
  - HSTR 324-20TH Century Europe ......................3
  - HSTR 350--Modern Britain ..............................3
  - HSTR 353--Modern France ................................3
  - HSTR 359--Russia to 1917 ..............................3
  - HSTR 362-Middle East/20TH Century ..................3
  - HSTR 362--Modern India,Pakistan, & Bangladesh ..........3
  - HSTR 362--20TH Century Europe ......................3

**Senior Year**
- EDSD 410-Student Teaching ...........................10-12
- EDCC 413-Professional Issues .........................2
- HSTR 499R-Sen Capstone: Hist Methodology .........3
- Take four of the following, excluding courses that were taken to fulfill the Required World Regions above:
  - HSTR 311--Early America ......................................3
  - HSTR 316--American Civil War Era ....................3
  - HSTR 318-Gilded Age to 1940 ............................3
  - HSTR 322--American History: WW II to Present ....3
  - HSTR 324-19TH Century Europe ......................3
  - HSTR 330--History of Mexico ........................3
  - HSTR 340--Age of the Shogun ........................3
  - HSTR 342-Japan's Long 19TH Century ..................3
  - HSTR 345--Gender Sexuality & Social Change in Latin America ..................3
  - HSTR 346--Modern India,Pakistan, & Bangladesh ..........3
  - HSTR 347--20TH Century Europe ......................3
  - HSTR 359--Russia to 1917 ..............................3
  - HSTR 362--Modern Germany .............................3
  - HSTR 362--Modern India,Pakistan, & Bangladesh ..........3
  - HSTR 366--Middle East/20TH Century ..................3
  - HSTR 372--Modern Germany .............................3
  - HSTR 376--Twentieth Century War ......................3

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C- or better in all required courses.

### PROGRAMS OF INSTRUCTION – LETTERS AND SCIENCE

**HSTR/SPS 433-Latin American Perspectives**

**HSTR 434-Gender Sexuality & Social Change in Latin America**

**HSTR 435--Gender in Asia**

**HSTR 436--European Intellectual History**

**Take two of the following Asia/Latin America/Islamic World Region:**
- HSTR 330--History of Mexico ........................3
- HSTR 340--Age of the Shogun ........................3
- HSTR 342--19TH Century Europe ......................3
- HSTR 345--Gender Sexuality & Social Change in Latin America ..................3
- HSTR 346--Modern India,Pakistan, & Bangladesh ..........3
- HSTR 347--20TH Century Europe ......................3
- HSTR 359--Russia to 1917 ..............................3
- HSTR 362--Modern Germany .............................3
- HSTR 362--Modern India,Pakistan, & Bangladesh ..........3
- HSTR 366--Middle East/20TH Century ..................3
- HSTR 372--The World at War ........................3
- HSTR 376--Twentieth Century War ......................3

**HSTR 437--The World at War .........................3
- HSTR 438--Twentieth Century War ....................3
- HSTR 439--African Amer History ......................3
- HSTR 440--Race in Latin America .....................3
- HSTR 431--Race in Latin America .....................3
- HSTR 432--Colonial Latin America ....................3
- HSTR 433--Latin American Perspectives ..............3
- HSTR 434-Gender Sexuality & Social Change in Latin America ..................3
- HSTR 435--Gender in Asia**
The History Teaching option does not require a teaching minor, but students who are considering a public school career are strongly urged to acquire a teaching minor. If you choose a teaching minor, you should expect to require more than 120 credits to complete your program.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C- or better in all required courses.

**Science, The Environment, Technology, And Society (Sets)**

The SETS major offers students a multi-disciplinary course of study that analyzes science, technology, and the environment within their broader cultural contexts, including intellectual and social history, environmental history, religious studies, and philosophy. Students will choose one of several specialties as a focus for their coursework, such as Philosophy of Science, History of Science and Technology, Science and Technology Policy, Environmental History. Moreover, students are required to become knowledgeable about one or more areas of science, technology, environmental studies, or public policy, as the Department believes that such literacy is an important part of a liberal arts education in a land-grant institution. Students will therefore be required to take at least 12 credits in an appropriate science, social science or engineering discipline. Finally, a capstone is required for all students; each will complete an original research paper synthesizing their scientific, technological, and humanistic knowledge.

**SETS OPTION**

<table>
<thead>
<tr>
<th>SETS OPTION</th>
<th>Credits</th>
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<tr>
<td>Freshman Year</td>
<td>Credits</td>
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<tr>
<td>CSL 101US-Freshman Seminar</td>
<td>3</td>
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<tr>
<td>WRIT 101-Writing</td>
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<td>Math Core</td>
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<td>Total (3-5)</td>
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<tr>
<td>Sophomore Year</td>
<td>Credits</td>
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<tr>
<td>HSTR 101IH-American History I</td>
<td>4</td>
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<td>HSTR 101IH-Western Civilization I</td>
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<tr>
<td>HST 470-American Environmental History</td>
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<td>HSTR 482-History of American Technology</td>
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<td>HSTR 482-Animal Histories</td>
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<td>HSTR 482-Animal Histories</td>
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<td>HSTR 484-World Environmental History</td>
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<tr>
<td>HSTR 486-Museum History</td>
<td>3</td>
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<tr>
<td>University Core and Electives</td>
<td>27-30</td>
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</tbody>
</table>

**Approved Science, Technology, and Social Sciences Courses for SETS Option:**

In addition to satisfying the university core science requirements, students, only after consultation with their academic advisor, are required to take 12 credits of science in one science or engineering or social science or public policy discipline from the approved courses listed below. One of these courses must be at the 300 and above.

**Programs of Instruction – Letters and Science**

**PHYS 101, Mysteries of the Sky:** PHYS 103, Our Physical World; PHYS 201, Physics by Inquiry; PHYS 205, College Physics I; PHYS 206, College Physics II; PHYS 211, General and Modern Physics I; PHYS 311, Introduction to Astronomy; PHYS 341, Special Relativity; BIOC 101, Biology of Organisms; BIOC 103, Environmental Issues and Society; BIOC 503, Principles of Ecology; BIOC 405, Advanced Animal Ecology; BIOC 406, Rocky Mountain Ecosystems; BIOC 407, Alpine Ecology; BIOC 421, Yellowstone Wildlife Ecology; CHMY 121; Intro to General Chemistry; CE 442, Environmental Science; GPHY 411, Intro to Physical Geography; ERTH 307, Principles of Geomorphology; ERTH 455, Physiography of the U.S.; F&W 261, Introduction to Fish and Wildlife; and a course in Fish and Wildlife Management; GPHY 141, Geography of World Regions; Biogeography; GPHY 411R, Mountain Geography; GEO 105, Intro to Environmental Geology; LRES 110, Land Resources and Environmental Sciences; LRES 201, Soil Resources; LRES 552, Watershed Management; LRES 421, Holistic Thought & Management; LRES 461, Restoration Ecology; PSPP 102, Plant Science, Resources and the Environment; ECSN 101, Economic Ways of Thinking; ECSN 317, Economic Development; ECSN 332, Economics of Natural Resources; LIT 411, Literature of Place; GPHY 365, Geographical Planning; MGMT 473, Management of Western Resources; PSCI 365, Pub Policy Issues and Analysis; SOCI 308 Problems; SOCI 470, Environmental Sociology.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C- or better in all required courses.

**Japan Studies Option**

The Japan Studies major offers students a curriculum that investigates Japanese history, culture, and language in an interdisciplinary setting and that encourages students to study abroad in Japan at partner universities. Areas of coursework include Japanese spoken and written language, pre-modern and modern Japanese literature, conventional and animated film studies, early modern and modern Japanese history, Japanese anthropology and the history of Japanese science, technology, and environment.

Students may choose an area of specialization during their coursework, such as in literature or history, but all students will be required to take three years or 22 credits of Japanese language. Japanese language skills are at the heart of meaningful exchange and interaction with Japanese people. Through this demanding curriculum,
students will acquire the highly specialized skills needed to succeed in Japan or in Japanese contexts, whether pursuing careers in business, academia, or science. The Japan Studies major also trains students in useful liberal arts methodologies, such as critical thinking, stylistically sound writing, and the clear public articulation of complex ideas. During their senior year, students are required to complete a “capstone” research project, which focuses on student designed and executed projects. The “capstone” project may be a significant research assignment in an upper-division Japan Studies course or it may be independent study with a Japan Studies faculty member.

JAPAN STUDIES OPTION

Freshman Year

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<th>Credits</th>
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Sophomore Year

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<th>Credits</th>
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Junior Year

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Religious Studies Option

The History Major with Religious Studies Option introduces students to the methods of history and religious studies, exploring how these research strategies can be compatible or held in tension, in a multi-disciplinary course of study that analyzes what religion is or does within various cultural contexts. As such, in addition to the core course requirements, students will be required to take a broad base of courses in history and religious studies. Each disciplinary approach and subject-matter emphasis opens up possibilities for students to hone their analytical skills, create research topics, and develop a focused reading and writing plan.

RELIGIOUS STUDIES OPTION

Freshman Year

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<th>Credits</th>
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Take one of the following:

- JPSN 361--Japanese Text & Cinema
- JPSN 353--Japanese Portrayals of WWII
- JPSN 325--Women in Japanese Lit & Culture
- JPSN 321--Modern Japanese Literature
- JPSN 320--Classical Japanese Literature

Take one of the following:

- JPNS 450R-Sem: Japanese Literature & Culture
- JPNS 490R-Undergraduate Research
- JPNS 492-Independent Study
- HSTR/HSTA 492-Independent Study
- ANTH 490R-Undergraduate Research
- ANTH 492-Independent Study

Take two of the following:

- ANTH 347-Gender and Sexuality-Japan
- ANTH 353-Popular Culture-Japan
- HSTR 340-Age of the Shoguns
- HSTR 342-Japan’s Long 19TH Century
- HSTR 444-Japanese Women’s History
- HSTR 445-Sci, Tech, and Environment in Japan
- JPNS 320--Classical Japanese Literature
- JPNS 321--Modern Japanese Literature
- JPNS 325--Women in Japanese Lit & Culture
- JPNS 350--Japanese Cult & Civilization
- JPNS 352--Japanese Portraittals of WWII
- JPNS 361--Japanese Text & Cinema
- JPNS 371--Japanese Film and Anime

University Core and Electives

Sophomore Year

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<th>Credits</th>
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Take one of the following:

- JPSN 201D-Intermediate Japanese I
- JPSN 202D-Intermediate Japanese II

Take one of the following:

- ANTH 252-Contemporary Japan
- JPSN 313-Introduction to Japanese Literature

Take one of the following:

- HSTR 140D--Modern Asia
- RELS 203D-Asian Relc from Taoism to Zen
- PHIL 220-Philosophies of Asia
- ART 320A-Survey of Asian Art
- HSTR 345-Modernd India, Pakistan, & Bangladesh
- HSTR 453-Gender in Asia
- HSTR 456-Science & Medicine in China

University Core and Electives

Junior Year

<table>
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<th>Credits</th>
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<td>30</td>
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Take one of the following:

- HSTR 140D-Modern Asia
- HSTR 145D--History of Japan
- HSTR 160D-Modern World History

Take one of the following:

- RELS 204H-Introduction to Hebrew Bible
- RELS 205H-Introduction to New Testament
- RELS 207H-Myth, Metaphor, and Metamorphosis

Take two of the following:

- RELS 15D-Introduction to the Theory of Religion
- RELS 206H-Origins of God
- RELS 217H-Religion and Science
- RELS 220H-Interpretation of American Religion

One Year Modern Language

University Core and Electives

Take one of the following for European Region:

- HSTR 392-Ancient Greece
- HSTR 394-Ancient Rome
- HSTR 392-19TH Century Europe
- HSTR 324-20TH Century Europe
- HSTR 350-Modernd Britain
- HSTR 353-Modernd France
- HSTR 359-Russia to 1917
- HSTR 362-Modernd Germany
- HSTR 372-The World at War
- HSTR 376-Twentieth Century War
- HSTR 410-Family, Gender & Law in Ancient Greece/Rome
- HSTR 423-European Intellectual History

Take one of the following for Asia/Latin America/Islamic World Region:

- HSTR 330-History of Mexico
- HSTR 340-Age of the Shoguns
- HSTR 342-Japan’s Long 19TH Century
- HSTR 355-Modernd China
- HSTR 366-Middle East/20TH Century
PROGRAMS OF INSTRUCTION – LETTERS AND SCIENCE

HSTR 375-Modern India, Pakistan, and Bangladesh ........................................3
HSTA 408-Gender in America .........................................................3
HSTR 439-Latin Amer Soc History ..............................................3
HSTA 430-90th Latin American Perspectives ..................................................3
HSTR 431-Race in Latin America ....................................................3
HSTR 432-Colonial Latin America ....................................................3
HSTR 433-Gender and Sexuality and Social Change in Latin America ..........3
HSTR 434-Gender in Asia .................................................................3
HSTR 444-Japanese Women’s History .............................................3
HSTR 446-Science & Medicine in China ..........................................3
HSTR 482-World Environmental History ........................................3

Take one of the following for upper-division history elective, excluding courses taken to fulfill above requirements:

HSTR 302-Ancient Greece ...............................................................3
HSTR 304-Ancient Rome .................................................................3
HSTA 311-Early America .................................................................3
HSTA 316-American Civil War Era ................................................3
HSTR 322-American History/WWII to Present ...............................3
HSTR 322-19th Century Europe .....................................................3
HSTR 324-20th Century Europe .....................................................3
HSTR 323-History of Mexico ..........................................................3
HSTR 340-Age of the Shoguns .......................................................3
HSTR 342-Japan’s Long 19th Century ............................................3
HSTR 345-Modern China ...............................................................3
HSTR 346-Modern India, Pakistan, & Bangladesh .................................3
HSTR 350-Modern Britain ...............................................................3
HSTR 359-Russia to 1917 .................................................................3
HSTR 362-Modern Germany ..........................................................3
HSTR 366-Middle East/20th Century ............................................3
HSTR 372-The World at War ............................................................3
HSTR 376-Twentieth Century War ................................................3
HSTA 406-McCarthy/Ike/Truman ....................................................3
HSTA 407-Gender in US & Canadian West .......................................3
HSTA 408-Gender in America ........................................................3
HSTA 410-Family, Gender, Law in Ancient Greece/ Rome ......................3
HSTA 411-History of American Constitution ..................................3
HSTA 412-American Thought & Culture ........................................3
HSTA 416-Race & Class in America ................................................3
HSTA 419-Modern Science ............................................................3
HSTA 423-European Intellectual History ........................................3
HSTA 430-Latin Amer Soc History ................................................3
HSTA 431-Race in Latin America ....................................................3
HSTA 432-Colonial Latin America ....................................................3
HSTA/SPNS 430-Latin American Studies ........................................3
HSTA 433-Gender, Sexuality & Social Change in Latin America ..........3
HSTA 434-Gender, Sexuality & Social Change in Latin America ..........3
HSTA 435-Modern Latin America ..................................................3
HSTA 436-Modern Latin American History ....................................3
HSTA/SPNS 435-Latin America Perspectives ....................................3
HSTA 437-Gender in Asia ...............................................................3
HSTA 444-Japanese Women’s History .............................................3
HSTA 445-Sci, Technology, and Environment in Japan ......................3
HSTA 446-Science and Medicine in China ......................................3
HSTA 450-History of North American Indian ....................................3
HSTA 460-Montana and the West ....................................................3
HSTA 464-Trans-Mississippi West ....................................................3
HSTA 468-History of Yellowstone ....................................................3
HSTA 470-American Environmental History ....................................3
HSTA 482-History of American Technology .....................................3
HSTA 482-Animal Histories ..........................................................3
HSTA 484-World Environmental History ......................................3
HSTA 486-Museum History ..........................................................3
University Core and Electives .........................................................18

Senior Year Credits

Take one of the following:

HSTA/HSTR 490R-Undergraduate Research ..................................3
HSTA/HSTR 492-Independent Study .............................................3
HSTR 499R & HSTA 499R-Sen Capstone/Host Methodology ..........3

REL 492-Independent Study .........................................................3
REL 490R-Undergraduate Research .............................................3
Take two of the following:.................................................................

REL 321-Gender and Religion .......................................................3
REL 322-Literature to Japanese Literature ..................................3
REL 326-Mystics, Founders, Reformers ..................................3
REL 330-Religion and Society in Ancient Egypt ..........................3
REL 332-Biblical Archaeology .....................................................3
REL 492-Natural, Unnatural & Supernatural ................................3
REL 405-Text & Image .................................................................3
REL 407-Religious Background ...................................................3
REL 410-Psyche & the Sacred ......................................................3
University Core and Electives .........................................................21

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses 300 and above. Students must receive a grade of C- or better in all required courses.

Japan Studies Minor (Non-Teaching)

The Japan Studies Program offers a non-teaching, interdisciplinary minor in Japan Studies through the Department of History and Philosophy and the Department of Modern Languages and Literatures. The Program’s mission is to provide students with the skills and understanding they need to succeed in Japanese contexts. The minor requires basic Japanese language proficiency and a broad knowledge of Japanese history, literature, and civilization. It includes 8 credits in Japanese language training, 12 credits in elective course work, and a 3-credit capstone course, for a total of 23 credits.

Those wishing to declare a minor in Japan Studies must submit an “Application for a Non-teaching Minor” to the Registrar’s Office by the end of the semester one year prior to the semester of completion. In order to receive the minor, students must successfully complete the following course work:

JAPAN STUDIES MINOR (NON-TEACHING)

Credits

JPNS 301-Japanese Culture & Civilization ................................3
JPNS 306-Japanese Portrayals of WWII ..................4
JPNS 320-Classical Japanese Literature ..................3
JPNS 321-Modern Japanese Literature ..................3
JPNS 343-Women in Japanese Lit & Culture ........3
JPNS 361-Text & Cinema .........................................................3
JPNS 371-Japanese Film and Animation ................3
Take one of the following Capstone Courses:

JPNS 490R-Undergraduate Research ..................3
JPNS 492-Independent Study .................................................3
JPNS 450R-Sem: Japanese Literature & Culture ........3
HSTA/HSTR 490R-Undergraduate Research ........3
HSTA/HSTR 492-Independent Study .........................3
ANTH 490R-Undergraduate Research Activity ........3
ANTH 492-Independent Study .................................................3

Not all courses may be taken in the same department. At least six credits must be upper division (numbered 300 or above). Other appropriate courses, including those taken abroad, may be substituted with the approval of the Director of Japan Studies.

HISTORY MINOR (NON-TEACHING)

Credits

Take one of the following:

HIST 101 R-Western Civilization I .................4
HIST 102 R-Western Civilization II .................4
HIST 160-D-Medieval World History .................4
Take two of the following:

HIST 1300-Latin American History ..................4
HIST 140-D-Medieval Asia .................................................4
HIST 145-D-History of Japan ..............................................4
Take one of the following:

HIST 302-Ancient Greece .................................................3
HIST 304-Ancient Rome ........................................................3
HIST 311-Early America ........................................................3
HIST 316-American Civil War Era .......................3
HIST 318-Gilded Age to 1940 ..............................................3
HIST 322-American History/WWII to Present .......3
HIST 322-19th Century Europe ...........................................3
HIST 330-History of Mexico .................................................3
HIST 350-Medieval Britain ....................................................3
HIST 353-Modern France ......................................................3
HIST 359-Russia to 1917 .......................................................3
HIST 362-Modern Germany ...................................................3
HIST 372-The World at War ....................................................3
HIST 376-Twentieth Century War ............................3
Take one of the following:

HIST 340-Age of Shoguns ....................................................3
HIST 342-Japan’s Long 19th Century ....................3
HIST 345-Medieval China .......................................................3
HIST 346-Modern India, Pakistan, & Bangladesh ....3

Take one of the following:

HIST 406-McCarthy/Ike/Truman ...........................................3
HIST 407-Gender in US & Canadian West ..........3
HIST 408-Gender in America .................................................3
HIST 409-Family, Gender, Law in Ancient Greece/Rome ........3
HIST 412-American Thought & Culture ..............3
HIST 416-Race & Class in America .......................3
HIST 417-Sci Tech Soc 1500-1800 .................3
HIST 419-Modern Science .....................................................3
HIST 423-European Intellectual History ...............3
HIST 430-Latin Amer Soc History .........................3
HIST 431-Race in Latin America .................................3
HIST 434-Gender, Sex, & Soc Chge in Lat Am ....3
HIST 443-Gender in Asia .........................................................3
HIST 444-Japanese Women’s History ....................3
Museum Studies Minor (Non-Teaching)

To understand the cultural significance of museums and to explore contemporary museum practices, Montana State University-Bozeman offers an interdisciplinary minor in Museum Studies that is administered through the Department of History and Philosophy. The Museum Studies minor offers students in many disciplines the opportunity to learn about the role of museums in advancing public education and academic research, to deepen students’ understanding of museums, and to better position them to learn about possible employment in the museum field.

In consultation with a Museum Studies Minor advisor in the Department of History and Philosophy, students in the minor select 12 credits from a secondary field outside of their major and appropriate to museum topics. Half of these credits must be at the 300 or 400 level. The goal of this secondary field is for students to develop expertise beyond their major that would be of use to them in a museum career. Generally, all 12 credits should be in one area, though interdisciplinary secondary fields may be considered where intellectually warranted. The minimum number of credits for a non-teaching minor is twenty-one, with nine of those being upper-division credits.

Other appropriate fields may be considered in consultation with an advisor.

- Anthropology
- Art History
- Biology
- Business Administration
- Education
- English Literature
- English Writing
- Geography
- Geology
- History
- Native American Studies
- Sociology

In addition, all students must take the following Museum Studies (MOR) courses:

- MOR 301--Museum Practices ........................................3
- HSTR 486--Museum History ...........................................3

In consultation with the Museum Studies minor advisor in the Department of History and Philosophy, students select 6 credits of Museum Experience work, either through an internship alone or a combination of internship and undergraduate research. All students must do at least 3 credits of internship (476) at a museum or other similar institution. Students may earn the remaining 3 credits either by continuing their internship or through an undergraduate research program (489/490). The 3 credits of undergraduate research may be done in either their major or secondary fields. Each student’s specific Museum Experience program will be determined in consultation with an advisor in the Department of History and Philosophy, and when appropriate, an advisor in the student’s secondary field.

Latin American And Latino Studies Minor (Non-Teaching)

A Latin American and Latino Studies minor (LALS) is available to provide students interested in Latin American and Latino history and language with valuable interdisciplinary skills. Because this is an interdisciplinary program, students will enroll in courses in History and Philosophy and Modern Languages. Courses in Sociology and Anthropology, as well as other departments with relevant course content, will also be allowed for credit subject to approval by the program coordinator. This minor will complement majors for students pursuing graduate school and professional programs in agriculture, engineering, history, literature, political science, sociology, international business, and more. The minor will also strengthen the skill-sets of students who wish to become more competitive in the Spanish speaking job market, either abroad or in the United States. A minor in LALS will prepare students for the close relationship developing between Latin American and the United States in trade agreements, the growing immigrant laborers, and the expansion of Latin American and Latino communities in the United States with significant political and economic power.

Those wishing to declare a minor in Latin American and Latino Studies must submit an “Application for a Non-teaching Minor” to the Registrar’s Office by the end of the semester one year prior to the semester of completion.

The equivalent of four semesters of Spanish language is required. Students with prior experience in Spanish language may have some requirements waived. Students interested in the LALS minor should consult with the Modern Language Department immediately upon their decision to fulfill the minor so that they can ascertain the language requirements that are appropriate for them.

Required Courses

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<th>Course Code</th>
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<tbody>
<tr>
<td>SPNS 101D--Elementary Spanish I</td>
<td>4</td>
</tr>
<tr>
<td>SPNS 102D--Elementary Spanish II</td>
<td>4</td>
</tr>
<tr>
<td>SPNS 201D--Intermediate Spanish I</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 220D--Spanish Language &amp; Culture</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 330D--Latin American History</td>
<td>4</td>
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</tbody>
</table>

Elective Courses

Select 12 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTR 330--History of Mexico</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 430--Latin Amer Soc History</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 431--Race in Latin America</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 434--Gender in Latin America</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 335--Latin American Cult &amp; Civ</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 332--Contemp Latin Amer Literature</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 335H--Travel in Latin American Lit &amp; Film</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 361--Hispanic Texts &amp; Cinema</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 410--Culture and Revolution</td>
<td>3</td>
</tr>
</tbody>
</table>

Not all elective courses may be taken in the same department. A total of 9 credits must be at the 300 or 400 level. This list may expand as other disciplines develop courses that contain a substantial Latin American or Latino component.
Mathematical Sciences
Department of Mathematical Sciences
http://www.math.montana.edu/

The Department of Mathematical Sciences has programs leading to the Bachelor of Science, the Master of Science, and the Doctor of Philosophy degrees. The B.S. options in mathematics, applied mathematics, statistics, and teaching are listed below.

Many undergraduate courses are sufficiently basic to be of general interest. Detailed and current information on undergraduate course offerings is available from the department.

The four-year baccalaureate curriculum in mathematics is flexible and can accommodate students desiring to concentrate in mathematics, applied mathematics, or statistics. Programs in these concentrations are designed with the help of faculty advisors.

Mathematics Option

The mathematics option covers the classical mathematics curriculum. The core of the program is built around three years of analysis, as well as courses in modern and linear algebra. The program is flexible enough to accommodate students who wish to prepare for employment in business, industry, or government as technical analysts or specialists in the area of scientific computing. The core mathematics curriculum taken in conjunction with a secondary emphasis in other subject matter areas will prepare a student for teaching minor in an area of their choice.

When approved by an advisor, students may opt for a single endorsement in mathematics, in which case they take advanced coursework in mathematics instead of a minor.

Statistical Option

Statisticians are trained in principles of quantitative reasoning. They learn how to discover patterns in data, how to display data, how to construct mathematical models for data, and how to detect biases and uncertainties in data summaries or models. They are trained to design and analyze observational studies, surveys, and scientific experiments. The computer is an essential tool for statistical work.

Mathematics Teaching Option

The teaching option in the mathematics curriculum is designed specifically to prepare students to teach mathematics at the middle school or high school levels. The program includes the mathematics courses for a teaching major and the necessary courses in education which qualify the student for teacher's certification.

Students must consult with an advisor before selecting single or multiple endorsement. Most students opt for multiple subject endorsement, in which case they will complete a teaching minor in an area of their choice.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Core 2.0 must be completed for graduation.

Freshman Year

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>S</td>
</tr>
</tbody>
</table>

Choose one of the following:

- M 171Q-Calculus I
- M 181Q-Honors Calculus I

Choose one of the following:

- M 172Q-Calculus II
- M 182Q-Honors Calculus II

PHYS 211-Gen & Mod Phys I

PHYS 212-Gen & Mod Phys II

University Core and Electives

Sophomore Year

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>S</td>
</tr>
</tbody>
</table>

Choose one of the following:

- M 273Q-Multivariable Calculus
- M 283Q-Honors Multivariable Calculus

Choose one of the following:

- M 274Intro to Differential Equations
- M 284Intro to Diff Equations

M 242-Methods of Proof

STAT 332-Stat for Scientists & Engineers

University Core and Electives

Junior Year

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>S</td>
</tr>
</tbody>
</table>

Choose one of the following:

- M 333-Lineal Algebra
- M 381Advanced Calculus I

Choose one of the following:

- M 382Advanced Calculus II
- Math or Stat Elect (See List Above)

University Core and Electives

Senior Year

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>S</td>
</tr>
</tbody>
</table>

Choose one of the following:

- M 451Abstract Algebra I
- Math or Stat Elect (See List Above)

University Core and Electives

APPLIED MATHEMATICS OPTION

A total of 52 credits in the mathematical sciences are required. These include the following 40 credits of M 171 (or M 181), 172 (or M 182), 211, 212, 274 (or M 283), 274 (or M 284), 242, 333, 381, 382, 391, 441, 442, and STAT 332. In addition, 12 credits from the following list are required: M 328, 330, 335, 348, 349, 451, 450, 451, 454, 455, 472, STAT 421, and STAT 422. Six of these 12 credits must be from M 348, 349, 450, 451.

PHYS 211, 212, and 215 are required. However, with the agreement of the student’s advisor, PHYS 215 may be replaced with a course in another mathematical application area.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Core 2.0 must be completed for graduation.

Freshman Year

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>S</td>
</tr>
</tbody>
</table>

Take one of the following:

- CLS 101US-College Seminar
- COM 119US-Public Communication
- WRIT 101W-College Writing

Curricula in Mathematics

MATHMATICS OPTION

A total of 52 credits in the mathematical sciences are required. These include the following 37 credits of M 171 (or M 181, 172 (or M 182), 211, 274 (or M 283), 274 (or M 284), 242, 333, 381, 382, 431 and STAT 332. In addition, 15 credits from the following list are required: M 328, 330, 348, 349, 381, 386, 441, 442, 450, 451, 454, 455, 472, STAT 421, and STAT 422. Six of these fifteen credits must be from M 441, 442, 450, 451, 454, 455 and 472.

PHYS 211 and 212 are required. However, with the agreement of the student’s advisor, PHYS 212 may be replaced with a course in another mathematical application area.
Choose one of the two:
M 171Q-Calculus I.........................4
M 181Q-Honors Calculus I..................4
Choose one of the two:
M 172Q-Calculus II........................4
M 182Q-Honors Calculus II..................4
PHYS 211-Gen & Mod Phys I..................4
PHYS 212-Gen & Mod Phys II..................4
University Core and Electives.................4

Sophomore Year F S
M 221-Introduction to Linear Algebra..........3
Choose one of the two:
M 273Q-Multivariable Calculus.................4
M 283Q-Honors Multivariable Calculus........4
Choose one of the two:
M 274-Intro to Differential Equations...........4
M 284-Honors Intro to Diff Equations...........4
M 242-Methods of Proof......................4
PHYS 213-Gen & Mod Phys III.................4
University Core and Electives...................8

Junior Year F S
M 381-Advanced Calculus I..................3
M 382-Advanced Calculus II..................3
M 396R-Software Applications in Math...........3
STAT 352-Stat for Scientists & Engrs...........3
Math or Stat Elect (See List Above).............3
University Core and Electives...................6

Senior Year F S
M 441-Num Linear Alg & Optimization.........3
STAT 410-Data Analysis I...................3
STAT 412-Data Analysis II...................3
STAT 421-Probability Theory..................3
STAT 422-Mathematical Stat...................3
Math or Stat Elect (See Above)................3
University Core and Electives...................6

Actuary Profession Bound Students
Actuarial profession-bound students are advised to take STAT 421 and STAT 422 during the junior year in order to be prepared for the actuarial exams given during the senior year. For further guidance, see the Actuary Advisor in the Dept. of Mathematical Sciences, 2214 Wilson Hall.

MATHEMATICS

TEACHING OPTION

The following 51 credits of M 171, 172, 273, 274, 242, 328, 329, 428 and STAT 332 are required. PHYS 265 is required as a science course.

For a multiple subject endorsement, six additional credits of mathematics sciences electives are required. These credits may be chosen from M 221 or any other mathematics or statistics course numbered 300 or above. A teaching minor is required.

For a single subject endorsement in mathematics, M 221, 281, and nine additional credits of mathematics sciences electives are required. These credits may be chosen from any mathematics or statistics course numbered 300 or above.

Multiple Subject Endorsement

Freshman Year F S
Take one of the following:
CLS 101US-College Seminar..................3
COM 110US-Public Communication...........3
WRIT 101W-College Writing I................3
M 171Q-Calculus I............................4
M 172Q-Calculus II...........................4
University Core and Electives................8

Sophomore Year F S
M 221-Introduction to Linear Algebra........3
M 273Q-Multivariable Calculus.................4
Take either:
STAT 216Q-Introduction to Statistics........3
STAT 217Q-Interned Stat Concept.............3
or
STAT 332-Stat-Scientist & Engr.............3
STAT 338-Stat Computing & Graph Analysis......3
M 242-Methods of Proof.....................3
Science/ Lab Electives.......................4
University Core and Electives................4

Junior Year F S
M 441-Num Linear Alg & Optimization........3
STAT 410-Sampling..........................3
Math or Stat Elect (See Above)...............3
Science/ Lab Electives.......................4
University Core and Electives................5

Senior Year F S
M 410-Data Analysis I........................
STAT 412-Data Analysis II...................3
STAT 421-Probability Theory..................3
STAT 422-Mathematical Stat...................3
Math or Stat Elect (See Above)................3
University Core and Electives................6

Actuary Profession Bound Students
Actuary profession-bound students are advised to take STAT 421 and STAT 422 during the junior year in order to be prepared for the actuarial exams given during the senior year. For further guidance, see the Actuary Advisor in the Dept. of Mathematical Sciences, 2214 Wilson Hall.

MATHEMATICS

TEACHING OPTION

The following 51 credits of M 171, 172, 273, 274, 242, 328, 329, 428 and STAT 332 are required. PHYS 265 is required as a science course.

For a multiple subject endorsement, six additional credits of mathematics sciences electives are required. These credits may be chosen from M 221 or any other mathematics or statistics course numbered 300 or above. A teaching minor is required.

For a single subject endorsement in mathematics, M 221, 281, and nine additional credits of mathematics sciences electives are required. These credits may be chosen from any mathematics or statistics course numbered 300 or above.

Multiple Subject Endorsement

Freshman Year F S
Take one of the following:
CLS 101US-College Seminar..................3
COM 110US-Public Communication...........3
EDSD 412-In-School Experience.............3
WRIT 101W-College Writing I................3
Take one of the following:
HDCF 150IS-Lifespan Human Dev............3
HDCF 160-Human Development..............3
M 171Q-Calculus I............................4
M 172Q-Calculus II...........................4
Math or Stat Elect (See Above)...............3
University Core and Electives................6

Sophomore Year F S
EDSD 209-Ed Psych & Adol Dev.............3
EDSD 240D-Intro to Multicultural Ed........3
EDSD 320-Found of Ed Tech..................2
M 273Q-Multivariable Calculus.................4
M 274-Intro to Differential Equation........3
M 242-Methods of Proof.....................3

Junior Year F S
EDSD 360-Foundations of Assessment........3
EDSD 471R-Mthl Tch Mid Sch Math..........3
HDCF 356-Exceptional Children.............3
M 328-Higher Math for Sec Teachers.........3
M 329-Modern Geometry.....................3
STAT 332-Stat for Scientists & Engrs........3
Math/Stat (300+)...............................3
University Core, Minor, & Electives........5

Senior Year F S
EDSD 301-Teaching Practicum..............3
EDSD 410-Student Teaching................10
EDSD 415-Professional Issues.............2
EDSD 461-Mthl Tch Sr Hi Math..............3
M 428-Math Modeling for Teachers.........3
Math/Stat (300+)...............................3
University Core, Minor, & Electives........4

Single Subject Endorsement

Freshman Year F S
Take one of the following:
CLS 101US-College Seminar..................3
COM 110US-Public Communication...........3
EDSD 412-In-School Experience.............3
WRIT 101W-College Writing I................3
Take one of the following:
HDCF 150IS-Lifespan Human Dev............3
HDCF 160-Human Development..............3
M 171Q-Calculus I............................4
M 172Q-Calculus II...........................4
PHYS 265-College Physics I..................4
University Core and Electives................5

Sophomore Year F S
EDSD 209-Ed Psych & Adol Dev.............3
EDSD 240D-Intro to Multicultural Ed........3
EDSD 320-Found of Ed Tech..................2
M 273Q-Multivariable Calculus.................4
M 274-Intro to Differential Equation........3
M 242-Methods of Proof.....................3

Junior Year F S
EDSD 360-Foundations of Assessment........3
EDSD 471R-Mthl Tch Mid Sch Math..........3
HDCF 356-Exceptional Children.............3
M 328-Higher Math for Sec Teachers.........3
M 329-Modern Geometry.....................3
M 381-Advanced Calculus I..................3
Math/Stat (300+)...............................3
University Core and Electives................6

Senior Year F S
EDSD 301-Teaching Practicum..............3
EDSD 410-Student Teaching................10
EDSD 415-Professional Issues.............2
M 428-Math Modeling for Teachers.........3
EDSD 461-Mthl Tch Sr Hi Math..............3
Math/Stat (300+)...............................3
University Core and Electives................6
PROGRAMS OF INSTRUCTION – LETTERS AND SCIENCE

MATHEMATICS MINOR
(NON-TEACHING)

Credits

M 171Q-Calculus I ........................................... 4
M 172Q-Calculus II ........................................... 4
M 221Q-Introduction to Linear Algebra ......................... 3
M 273Q-Multivariable Calculus .................................. 4
M 274Q-Intro to Differential Equation ......................... 4

Nine credits from the following:
M 328Q-Higher Math for Sec Teachers ...................... 3
M 350-History of Mathematics ................................ 3
M 353-Lineare Algebra ......................................... 3
M 348-Techiques of Applied Math I ............................ 3
M 349-Techiques of Applied Math II ........................... 3
M 381-Advanced Calculus I .................................... 3
M 382-Advanced Calculus II ................................... 3
M 386R-Software Applications in Math ....................... 3
M 431-Abstract Algebra I ....................................... 3
M 441-Num Linear Alg & Optimization ....................... 3
M 442-Num Solution of Diff Equations ....................... 3
M 450-Applyed Mathematics I ................................ 3
M 451-Applyed Mathematics II ................................ 3
M 454-Qroto to Dynamical Systems I ......................... 3
M 455-Qroto to Dynamical Systems II ....................... 3
M 472Q-Intro to Complex Analysis ......................... 3
STAT 421-Probability Theory ................................ 3
STAT 422-Mathematical Statistics ............................ 3

STATISTICS MINOR
(NON-TEACHING)

One of these two: Credits
STAT 217Q-Intermed Stat Concept .......................... 3
Eight credits of Math (161 or higher)
Twelve credits of STAT (410 or higher). 23

Microbiology

Department of Microbiology
http://www.montana.edu/wwwmb/

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see page 84.

Programs are designed to prepare students for careers in microbiology with emphasis in medical microbiology, immunology, molecular biology, virology, microbial physiology, microbial ecology, microbial genetics, and environmental microbiology. The microbiology curriculum has three options: Microbiology, Environmental Health, and Medical Laboratory Science. Some courses in these options require additional course fees.

Microbiology Option

In this option, students obtain a thorough education in the fields of medical, ecological, physiological and environmental microbiology, immunology, virology, and molecular biology. This curriculum is excellent preparation for:

• graduate study in microbiology and other fields of the biological sciences;
• medical, dental, and other professional schools;
• careers in industry, university, institute, and government laboratories.

Environmental Health Option

The environmental health option provides a program for attaining a broad understanding of the physical, chemical, and biological factors in our environment, and their interactions that relate to health. Specific areas of study include reservoirs and vehicles of infectious and toxic agents; epidemiology of human diseases; control of hazardous substances and microbial agents in food, water, and air; and environmental control in medical care facilities. Students graduating in this option have taken positions in:

• local, state, and federal health and protection agencies;
• industry; or
• graduate studies in related fields such as environmental engineering and industrial hygiene.

Medical Laboratory Science Option

This option is designed to prepare students for careers in Clinical Laboratory Science. Students develop competence in a range of medically-oriented fields including immunology, medical bacteriology, virology parasitology, hematology, mycology, and chemistry. Foundations in molecular biology and statistics are also emphasized.

The Department of Microbiology has two plans for students seeking a career in Medical Laboratory Science (MLS). Plan A allows students to attend classes at MSU for three years and apply for an internship the fourth year with an affiliated MLS program. The Montana Medical Laboratory Science Training Program is located at MSU. MSU also has an affiliation agreement with the University of North Dakota (UND), Sacred Heart School of Medical Technology in Spokane and Health One Alliance School of Medical Technology, Denver.

Students with a 2.5 GPA or greater who are accepted will spend their fourth year in this program. Upon completion of the one-year internship, students receive a B.S. degree in Microbiology from MSU and take a national examination through the American Society for Clinical Pathologists or the National Certification Agency. They will then be qualified to practice as a Medical Laboratory Scientist. Plan B is for students who wish to attend four complete years at MSU and then independently seek an approved hospital training program in MLS for a one-year internship. Once training is complete, they will also be qualified to take a national registry exam and become certified as a MLS. This certification qualifies them for graduate education and careers in:

• clinical analysis (microbiology, hematology, chemistry, and immuno-hematology);
• medical research;
• industry (product development, sales, maintenance of equipment, etc);
• public health laboratories;
• health care administration.

Microbiology Minor (Non-Teaching)

A Microbiology minor is available to provide interested students with an understanding of the microbial basis of health and disease and environmental microbiology. Eligibility for a minor in Microbiology requires 29 credits in Microbiology and supporting subjects. This minor will complement other majors for those pursuing graduate school and professional programs in medical, dental, veterinary, ecological, industrial, pharmaceutical and related areas. The minor will also strengthen the background of science majors who wish to become more competitive in the job market.

Undergraduate Research Participation

An undergraduate research program, available to students who demonstrate an interest and ability, is open to non-majors as well as majors in Microbiology. The aim of this program is to foster increased creativity, imagination, inquisitiveness, and independence.

Departmental Honors in Microbiology

When appropriate, majors should consider the opportunities afforded by the departmental honors program.
**Microbiology Electives**

A minimum of 25 credits of additional Microbiology courses, some of which are listed below:

- MB 100-Careers in Microbiology (1 cr)
- MB 401-Immunology (3 cr)
- MB 402-Immunology Laboratory (1 cr)
- MB 405-Virology (4 cr)
- MB 406-Hematology (3 cr)
- MB 406-Hematology Laboratory (1 cr)
- MB 407-Microbiology Instructing (2 cr)
- MB 430-Medical Bacteriology (3 cr)
- MB 431-Medical Bacteriology Lab (2 cr)
- MB 437-Molecular Evolution (3 cr)
- MB 441-Eukaryotic Pathogens (4 cr)
- MB 450-Research Methods in Microbiology (4 cr)
- MB 489/490-Independent Research (4 cr. max. applied to MB electives)

Other suggested courses:
- BIOL 207-Anatomy & Physiology I (5 cr.)
- BIOL 208- Anatomy & Physiology II (5 cr.)
- BIOL 301- Guidelines for the Practice of Science (4 cr.)
- BIOL 312-Histology (5 cr.)
- WRT 221-Intermediate Technical Writing (5 cr.)
- VTM 424-Ethical Practice of Science (5 cr.)

A minimum of 120 credits is required for graduation; 42 of these must be in courses numbered 300 and above.

**ENVIRONMENTAL HEALTH OPTION**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 102-Molec &amp; Cellular Biology</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 141-College Chemistry I (or) CHMY 151-</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 143-College Chemistry II (or) CHMY 153-</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Math Requirements*</td>
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<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
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<td>30</td>
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<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 321-Organic Chemistry I (or) CHMY 331-</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 323-Organic Chemistry II (or) CHMY 333-</td>
<td>4</td>
</tr>
<tr>
<td>MB 301-General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>PHS 205-College Physics I (or) PHS 211-</td>
<td>4</td>
</tr>
<tr>
<td>PHS 206-College Physics II (or) PHS 212-</td>
<td>4</td>
</tr>
<tr>
<td>Microbiology Electives*</td>
<td>10</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11-12</td>
</tr>
<tr>
<td>50</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHM 340-Organic Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>Take one of the following two choices:</td>
<td></td>
</tr>
<tr>
<td>MB 435- Applied and Environ Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>MB 415- Microbial Diversity, Ecol &amp; Evol</td>
<td>3</td>
</tr>
<tr>
<td>Microbiology Electives*</td>
<td>10</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11-12</td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 400-Seminar, Capstone (two semesters)</td>
<td>2</td>
</tr>
<tr>
<td>MB 420-Microbial Physiology</td>
<td>3</td>
</tr>
<tr>
<td>MB 449-Microbial Genomics</td>
<td>3</td>
</tr>
<tr>
<td>Microbiology Electives*</td>
<td>10</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11-12</td>
</tr>
<tr>
<td>50</td>
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</tbody>
</table>

**Math Requirements**

Take one of the following two choices:
- M 161Q-Survey of Calculus (4 cr.) (and)
- PSP 318- Biometry (3 cr)
- M 165Q, 181Q, 191Q-Survey of Calculus I (3 cr)
- M 166Q, 182Q, 192Q-Calculus for Technology II (3 cr)
- M 161Q-Survey of Calculus (4 cr.) (and)
- M 165Q, 181Q, 191Q-Survey of Calculus I (3 cr)
- M 166Q, 182Q, 192Q-Calculus for Technology II (3 cr)
- M 161Q-Survey of Calculus (4 cr.) (and)
- M 165Q, 181Q, 191Q-Survey of Calculus I (3 cr)
- M 166Q, 182Q, 192Q-Calculus for Technology II (3 cr)

**Suggested Electives:**

(An elective course may be substituted for a required course following discussion with an advisor and if prerequisites are met or can be waived).
- MB 405-Virology (4 cr.)
- MB 406-Hematology (3 cr.)
- MB 406-Hematology Laboratory (1 cr.)
- MB 407-Microbiology Instructing (2 cr.)
- MB 430-Medical Bacteriology (3 cr)
- MB 431-Medical Bacteriology Lab (2 cr)
- MB 437-Molecular Evolution (3 cr)
- MB 441-Eukaryotic Pathogens (4 cr)
- MB 450-Research Methods in Microbiology (4 cr)
- MB 489/490-Independent Research (4 cr. max. applied to MB electives)

A minimum of 120 credits is required for graduation; 42 of these must be in courses numbered 300 and above.

**MEDICAL LABORATORY SCIENCE OPTION (3+1 PROGRAM)**

<table>
<thead>
<tr>
<th>Plan A</th>
<th>Freshman Year</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 401-Immunology</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB 402-Immunology Laboratory</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB 405-Virology</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB 406-Hematology</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB 406-Hematology Laboratory</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB 497-Microbiology Instructing</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB 420-Microbiology (or)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB 449-Microbial Genomics</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>6...6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 340-General Biochemistry</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>CHMY 352-General Biochemistry</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MB 420-Microbiology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MB 497-Microbiology Instructing</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>MB 449-Microbial Genomics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>6...2</td>
<td></td>
</tr>
<tr>
<td>15</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 401-Immunology</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MB 402-Immunology Laboratory</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>MB 405-Virology</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MB 406-Hematology</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MB 406-Hematology Laboratory</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>MB 497-Microbiology Instructing</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>MB 420-Microbiology (or)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MB 449-Microbial Genomics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>6...1 or 4...1 or 3</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

**Suggested Electives:**

(some taught alternating years)
- MB 415-Microbial Diversity, Ecol & Evol | 3 |
- MB 435-App & Environ Microbiology | 4 |
- MB 457-Molecular Evolution | 5 |
- MB 450-Research Methods in Microbiology | 4 |
- CHMY 321-Organic Chemistry | 4 |
- CHMY 323-Organic Chemistry | 5 |
SENIOR PROFESSIONAL YEAR
MONTANA MEDICAL LABORATORY
SCIENCE TRAINING PROGRAM

Students with a 2.5 GPA or higher can apply for a senior year of professional training. They will obtain a degree in Microbiology/Medical Laboratory Science option from MSU-Bozeman. The following courses are required in the program:

MB 460 - Summer Clinical Practicum - 12 credits
Clinical Immunohematology I
Clinical Chemistry Theory
Clinical Laboratory I
Clinical Hematology
Clinical Microscopy and Urinalysis;
Clinical Body Fluids
Clinical Immunohematology Theory;
Clinical Microbiology Theory and Laboratory

MB 461 - Professional Training I - Fall Semester
(Teaching Site) - 15 credits.
Clinical Immunohematology I;
Clinical Chemistry I
Clinical Hematology
Clinical Laboratory I
Clinical Microbiology
Clinical Laboratory II
Clinical Immunology
Medical Mycology

MB 462 - Professional Training II - Spring Semester
(Teaching Site) - 12 credits.
Financial and Quality Management
of the Clinical Laboratory
Clinical Chemistry II
Clinical Immunohematology III
Clinical Microbiology II
Clinical Hematology II

Total credits for graduation are 128; 42 of these credits must be in courses numbered 300 and above; and 32 of those credits must be in the distributed University Core. Note: Additional credits are required for this option because students take an additional summer session of courses. This additional semester is necessary because professional training programs approved by the National Committee for Clinical Laboratory Standards (NCCCLS) are twelve months in duration and not nine.

Courses for Montana Medical Laboratory Science Training Program

Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 471-Clinical Hematology III</td>
<td>2</td>
</tr>
<tr>
<td>MB 472-Clinical Chemistry III</td>
<td>2</td>
</tr>
<tr>
<td>MB 473-Clinical Immunohematology III</td>
<td>2</td>
</tr>
<tr>
<td>MB 474-Clinical Microbiology and Molecular Diagnostics</td>
<td>3</td>
</tr>
<tr>
<td>MB 475-Laboratory Practice III</td>
<td>2</td>
</tr>
<tr>
<td>MB 477-Laboratory Management</td>
<td>1</td>
</tr>
</tbody>
</table>

Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 483-Laboratory Practice II</td>
<td>1</td>
</tr>
<tr>
<td>MB 484-Clinical Hematology II</td>
<td>2</td>
</tr>
<tr>
<td>MB 465-Hemostasis</td>
<td>1</td>
</tr>
<tr>
<td>MB 466-Clinical Microbiology II</td>
<td>2</td>
</tr>
<tr>
<td>MB 467-Chemistry and Urinalysis II</td>
<td>3</td>
</tr>
<tr>
<td>MB 468-Clinical Immunohematology II</td>
<td>2</td>
</tr>
<tr>
<td>MB 469-Clinical Immunology/Serology</td>
<td>1</td>
</tr>
</tbody>
</table>

Microbiology elective must be numbered 280 and above. A minimum of 9 credits total must be in courses numbered 300 and above. A maximum of 2 Undergraduate Research credits can be applied to the minor.

Modern Languages and Literatures

Department of Modern Languages
http://www.montana.edu/mll/

The Department of Modern Languages and Literatures offers a full range of courses for students interested in language, culture, and literature. Non-majors interested in the literature and culture of French-, German-, Japanese-, and Spanish-speaking peoples may choose elective credits from a variety of courses taught in English. The study of foreign cultures, languages, and literature is an integral part of a basic education and an essential component of one’s university training. It provides students with the knowledge to better understand their own language and culture and to function intelligently as members of a multicultural society.

In addition to providing opportunities for students to participate in MSU-sponsored study abroad programs, the department offers advice concerning the role of language study in career planning. Foreign languages are used by interpreters, translators, and teachers. Language proficiency also enhances employment opportunities. With almost any “marketable” skill plus a foreign language, the chances of finding an interesting job are improved considerably. Foreign language training is a critically important skill for careers in business and commerce, secretarial/clerical positions, health care, government service, social services, and agriculture.

The department offers undergraduate options in French, German, Japanese, and Spanish. Lower division courses are designed to teach the five language skills: speaking, listening, understanding culture, reading, and writing. Advanced courses provide students with comprehensive knowledge of the important writers and movements of each language. Other advanced courses concentrate on history and contemporary culture. For students interested in teaching, K-12 teaching options are offered in
French, German, and Spanish. The Department, in conjunction with the Department of History & Philosophy, offers both a non-teaching minor in Japan Studies and a Japan Studies option, as well as a minor in Latin American and Latino Studies. We now offer Chinese language and culture classes. These will be part of a planned Asian Studies minor, in conjunction with the Department of History & Philosophy and the Department of Sociology & Anthropology.

For students planning careers in international business/management, the department offers a curriculum option to provide students with the training necessary to enter master’s degree programs in business. In conjunction with the College of Business, we also offer an International Business minor. This program also prepares students to compete for jobs in businesses where foreign language skills are desirable.

The following curricula are offered in modern languages and literatures: French and Francophone Studies Option

- German Studies Option
- Hispanic Studies Option
- French K-12 Teaching Option
- German K-12 Teaching Option
- Spanish K-12 Teaching Option
- Commerce Option
- French Minor (Non-Teaching)
- German Minor (Non-Teaching)
- Latin American and Latino Studies Minor (Non-Teaching)
- Chinese Classes (for the upcoming Asian Studies minor)

This curriculum leads to the baccalaureate degree in Modern Languages - French, German, Japanese Studies, and Spanish, with additional options in Commerce and Teaching. Students with previous language training will take a CLEP exam to place at the appropriate level. Courses taught in English may count toward the language major or minor with the consent of the advisor.

To be certified for graduation in a major option or a minor in the Department of Modern Languages and Literatures, students must take one-half of the required MLL upper division credits in the department. Students who have already completed a degree at another university and are seeking teaching certification from MSU may be required to take some additional course work in the language as determined by the language advisor. In addition, the department will not accept grades lower than “C” (2.0) or P in any of the upper division courses required for the degree. (Note: Department-approved study-abroad credits are considered to be the equivalent of resident credits.)

Students with native or near-native ability in a given language may only enroll in courses for credit which have been approved by the appropriate language section.

**FRENCH AND FRANCOPHONE STUDIES OPTION**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRCH 101D--Elementary French I ..................</td>
<td>4</td>
</tr>
<tr>
<td>FRCH 102D--Elementary French II ..................</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives ..................</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRCH 201D--Intermediate French I ..................</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 220D--French Language &amp; Culture ..................</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives ..................</td>
<td>24</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Junior And Senior Years</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRCH 305--Histoire Civilization ..........................</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 320--La France Aujourd’Hui ..........................</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 325--Adv Grammar &amp; Comp ..........................</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 324--Adv Conv and Phonetics ..........................</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 401--French Literature ..........................</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 402--French Literature ..........................</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 450--Sem: French Lit and Culture (cross-listed with FRCH 490R) ..........................</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 490R--Undergraduate Research (cross-listed with FRCH 450) ..........................</td>
<td>3</td>
</tr>
<tr>
<td>Select three credits from the following: ..........................</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 306H--From Reflection to Rev ..........................</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 322--19th Century Europe ..........................</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 324--20th Century Europe ..........................</td>
<td>3</td>
</tr>
<tr>
<td>Select four credits from the following: ..........................</td>
<td>4</td>
</tr>
<tr>
<td>ML 344--Instr Perspectives ..........................</td>
<td>3</td>
</tr>
<tr>
<td>ML 470--Individual Problems ..........................</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 254H--Intro to Language &amp; Linguistics ..........................</td>
<td>3</td>
</tr>
<tr>
<td>ART 415R--Beginnings of Modern Art ..........................</td>
<td>3</td>
</tr>
<tr>
<td>ART 440--Art in the Age of Revolution ..........................</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives ..................</td>
<td>29</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
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</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**HISPANIC STUDIES OPTION**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 101--Elementary Spanish I ..................</td>
<td>4</td>
</tr>
<tr>
<td>SPNS 102D--Elementary Spanish II ..................</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives ..................</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 201D--Intermediate Spanish I ..................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 220D--Spanish Language &amp; Culture ..................</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 130D--Latin American History ..................</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives ..................</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Junior And Senior Years</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 320--Spanish Culture &amp; Civilization ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 325--Early Cultures of Latin America ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 330--Modern Cultures of Latin America ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 350--US Latino Cultures ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 325--Adv Grammar &amp; Phonetics ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 324--Adv Conversation &amp; Comp ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 325--Survey of Spanish Lit ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 470R--Sem:Modern Hispanic Literature (Sr Capstone) ..........................</td>
<td>3</td>
</tr>
<tr>
<td>Select one course from the following: ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 354--Contemp Latin Amer Literature ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 355H--Travel in Latin American Lit &amp; Film (Summer, in English) ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 416--Spanish Culture &amp; Revolution ..........................</td>
<td>3</td>
</tr>
<tr>
<td>Select one course from the following: ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 430--Latin Amer Perspectives ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 460--Contemp Spain &amp; Nations ..........................</td>
<td>3</td>
</tr>
<tr>
<td>Select one course from the following for three optional credits: ..........................</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 330--History of Mexico ..........................</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 331--Race in Latin America ..........................</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 344--Gen Sex &amp; Soc Change in Lat Am ..........................</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 340--Latin Amer Soc History ..........................</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 332--Colonial Latin America ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 368--Latin Immigration ..........................</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives ..................</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
</tr>
</tbody>
</table>
It is highly recommended to take SPNS 325:Advanced Grammar and Phonetics and SPNS 324:Advanced Oral and Written Composition prior to taking 300 and 400 courses.

Requirements for the major comprise 57 credits. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**FRENCH K-12 TEACHING OPTION**

Students with a teaching option should file with Education Certification in the sophomore year to establish their program of study. These students will be required to pass a language proficiency test approved by the Modern Languages department in order to qualify for practice teaching.

**Freshman Year**  
FRCH 101-Elementary French I...........4  
FRCH 220-French Language & Culture....3  
EDCI 102-In-School Experience.......1  
HDCF 150-Lifespan Human Dev/nt.....3  
University Core and Electives........18  
Total: 30

HDCF 150 (3 cr.) must be taken prior to or concurrently with EDCI 208 or 209. (Take either EDCI 208 or EDCI 209 depending upon your preference for an elementary or secondary focus.)

**Sophomore Year**  
FRCH 201-Intermediate French I.....3  
FRCH 324-Adv Conv & Phonetics.....3  
EDCI 320-Found of Instr Computing...2  
Take one of the following:.................3  
EDCI 208-Ed Ps Hum Dev Sch Age.....3  
EDCI 209-Ed Ps Adol Dev............16  
Total: 30

**Junior & Senior Years**  
FRCH 305-Histoire Civilisation.....3  
FRCH 329-La France Aujourd’Hui....3  
FRCH 323-Adv Grammar & Comp.......3  
FRCH 490-Undergraduate Research...3  
Select one credit from the following...1  
ML 344-Instr Perspectives...........3  
HSTR 322-20TH Century Europe....3  
ART 418R-Beginnings of Modern Art..1  
ART 440-Art in the Age of Revolution.2  
EDCI 360-Found of Asmšt.........1  
EDCI 462-Meth of Teach Mod Lang...4  
EDDI 301-Teaching Practicum......3  
HDCF 356-Exceptional Needs 021...3  
University Core and Electives.......12  
EDDI 410-Student Teaching........6  
EDDI 415-Professional Issues.......6  
Total: 60

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Majors are encouraged to take more than the minimum of 36 credits required in the department.

**SPANISH K-12 TEACHING OPTION**

Students with a teaching option should file with Education Certification in the sophomore year to establish their program of study. These students will be required to pass a language proficiency test approved by the Modern Languages department in order to qualify for practice teaching.

**Freshman Year**  
GRMN 101-Elementary German I........4  
GRMN 102B-Elementary German II......4  
EDCI 102-In-School Experience.......1  
HDCF 150-Lifespan Human Dev/nt.....3  
University Core and Electives........18  
Total: 30

HDCF 150 (3 cr.) must be taken prior to or concurrently with EDCI 208 or 209. (Take either EDCI 208 or EDCI 209 depending upon your preference for an elementary or secondary focus.)

**Sophomore Year**  
GRMN 201D-Intermediate German I....3  
GRMN 220-German Language & Culture..3  
EDCI 240-Multicultural Education.....3  
EDDI 350-Found of Instr Computing...3  
Take one of the following:..............3  
EDCI 208-Ed Ps Hum Dev Sch Age.....3  
EDCI 209-Ed Ps Adol Dev............16  
Total: 30

**Junior & Senior Years**  
GRMN 303B-Issues of German Cinema..3  
GRMN 315-Survey German Literature..3  
GRMN 330-Adv Gram Conv Comp.....3  
GRMN 331-Adv Gram Conv Comp II......3  
GRMN 350-German Cult & Civ..........3  
GRMN 422-Text & Cinema.............3  
GRMN 458R-Sem: Germ Lit & Cult....3  
Select one credit from the following...1  
ML 344-Instr Perspectives...........3  
ML 470-Individual Problems........3  
GRMN 350H-German Myths: The Lorelei, Faust, Vampires.2  
EDCI 360-Found of Asmšt............2  
EDCI 462-Meth of Teach Mod Lang...4  
EDDI 301-Teaching Practicum......3  
HDCF 356-Exceptional Needs 021...3  
University Core and Electives.......12  
EDDI 410-Student Teaching........6  
EDDI 415-Professional Issues.......6  
Total: 60

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Majors are encouraged to take more than the minimum of 36 credits required in the department.

**COMMERCE OPTION**

This program is designed to provide students in the Department of Modern Languages and Literatures with a concentration of courses in Business which...
will provide them with a background necessary to enter degree programs for the MBA or master’s degree programs in International Management/Business. Students will need to satisfy the major requirements in the foreign language of their choice and at the same time complete courses for the commerce option. Students may count courses taught in English toward their major.

GERMAN MINOR (NON-TEACHING)

Freshman Year
- GRMN 101-Elementary German I ..................4
- GRMN 102D-Elementary German II ..................4

Sophomore Year
- GRMN 201D-Intermediate German I .................3
- GRMN 220D-German Language & Cult ...............3

Junior And Senior Years
- GRMN 330-Adv Gram Conv Comp I ..................3
- GRMN 331-Adv Gram Conv Comp II ..................3

JAPAN STUDIES MINOR (NON-TEACHING)

The Japan Studies Program offers a non-teaching, interdisciplinary minor in Japan Studies through the Department on History and Philosophy and the Department of Modern Languages and Literatures. The Program’s mission is to provide students with the skills and understanding they need to succeed in Japanese contexts. The minor requires basic Japanese language proficiency and a broad knowledge of Japanese history, literature, and civilization. It includes 8 credits in Japanese language training, 12 credits in elective course work, and a 3-credit capstone course, for a total of 23 credits.

Those wishing to declare a minor in Japan Studies must submit an “Application for a Non-teaching Minor” to the Registrar’s Office by the end of the semester one year prior to the semester of completion. In order to receive the minor, students must successfully complete the following course work:

HISPANIC STUDIES MINOR (NON-TEACHING)

Junior And Senior Years
- SPNS 325-Spanish Adv Grammar & Phonetics ..........3
- Select THREE COURSES from the following ........9

LATIN AMERICAN AND LATINO STUDIES MINOR (NON-TEACHING)

A Latin American and Latino Studies minor (LALS) is available to provide students interested in Latin American and Latino history and language with valuable interdisciplinary skills. Because this is an interdisciplinary
program, students will enroll in courses in History and Philosophy and Modern Languages. Courses in Sociology and Anthropology, as well as other departments with relevant course content, will also be allowed for credit subject to approval by the program coordinator. This minor will complement majors for students pursuing graduate school and professional programs in agriculture, engineering, history, literature, political science, sociology, international business, and more. The minor will also strengthen the skill-sets of students who wish to become more competitive in the Spanish speaking job market, either abroad or in the United States. A minor in LALS will prepare students for the close relationship developing between Latin American and the United States in trade agreements, the growing immigrant laborers, and the expansion of Latin American and Latino communities in the United States with significant political and economic power.

Those wishing to declare a minor in Latin American and Latino Studies must submit an “Application for a Non-teaching Minor” to the Registrar’s Office by the end of the semester one year prior to the semester of completion. The equivalent of four semesters of Spanish language is required. Students with prior experience in Spanish language may have some requirements waived. Students interested in the LALS minor should consult with the Modern Language Department immediately upon their decision to fulfill the minor so that they can ascertain the language requirements that are appropriate for them.

**CHINESE CLASSES**

(for the upcoming asian studies minor)

- CHIN 101-Elementary Chinese I .................4
- CHIN 102D-Elementary Chinese II ..............4
- CHIN 190D-Historical & Literary Journey to Modern China ..........3
- CHIN 201-Intermediate Chinese I ..............4
- CHIN 202-Intermediate Chinese II ..............4
- CHIN 320-History of Chinese Cinema ...........3

**Philosophy**

*Department of History and Philosophy*

http://www.montana.edu/history/

Philosophy is concerned with the underlying assumptions and broad implications of human knowledge and values. The curriculum in philosophy contains a wide range of courses that explore these topics by studying philosophical problems through the writings of important philosophers of the past and present. Emphasis is placed on understanding different solutions to these problems and on analyzing and criticizing them.

The Bachelor of Art in Philosophy has traditionally served as a basis for further study in philosophy, law, religion, or related fields. It may also be used as background training for government, business, or any field that depends upon a strong liberal arts education. The department has traditionally encouraged taking a double major and has restricted the number of required courses in philosophy so that this may be possible.

Students may elect to major in philosophy through either the philosophy option or the philosophy and religion option. The department also encourages students to engage in independent study through the departmental honors option. This option has the following requirements:

- Students must have a minimum 3.5 grade-point average in their major and a 3.0 GPA overall.
- Students must present an acceptable, bound senior thesis, and an oral defense of the thesis.
- Students may attain 3-4 undergraduate independent study credits while working for the thesis. Qualified students may enroll in the honors option through their departmental advisors.

**Curricula in Philosophy**

**PHILOSOPHY OPTION**

**Freshman Year**

- Credits
- CLS 101-US-University Seminar ..................3
- WRIT 101W-College Writing I ....................3
- Math Core .........................................................3
- Philosophy Electives ..................................6
- University Core and Electives ....................15

**Sophomore Year**

- Credits
- PHIL 231-Introduction to Logic ..................3
- One Year Modern Lang ..................8
- Select one of the following in political philosophy/aesthetics:
  - PHIL 311-Aesthetics & The Arts ..................3
  - PHIL 313-Philosophy and Film ..................3
  - PHIL 322RI-State, Community, and Individual ..3
  - PHIL 362-Philosophy and Race ..................3
  - PHIL 363-Philosophy and Feminism ..............3

- University Core and Electives ...................16

**Junior Year**

- Credits
- PHIL 305-History of Phil: Anc & Mediev ..........3
- PHIL 306-History of Phil: Modern .................3
- Select one of the following in ethics:
  - PHIL 332-Ethics ...........................................3
  - PHIL 334-Moral Theory ...............................3
  - PHIL 338-Bio-Medical Ethics .....................3
  - PHIL 340-Environmental Ethics ..................3

- University Core and Electives ...................21

**Senior Year**

- Credits
- PHIL 400-Seminar ...........................................3
- PHIL 400-Seminar ...........................................3
- Select one of the following in metaphysics/epistemology:
  - PHIL 342-Approaches to Epistemology ............3
  - PHIL 352-Metaphysics ..................................3
  - PHIL 364-Contemporary Philosophy .............3
  - PHIL 378-Philosophy of Science ..................3

- University Core and Electives ...................21

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C or better in all required courses.

**PHILOSOPHY AND RELIGION OPTION**

**Freshman Year**

- Credits
- CLS 101-US-University Seminar ..................3
- WRIT 101W-College Writing I ....................3
- Math Core .........................................................3
- University Core and Electives ....................21

**Sophomore Year**

- Credits
- PHIL 231-Introduction to Logic ..................3
- One Year Modern Lang ..................8
- Take one of the following:
  - RELS 202D-Asian Religions-Hinduism & Buddhism ..
  - RELS 202D-Asian Religions: from Taoism to Zen ...

- Reliability
Take one of the following:
RELS 260HI–The Origins of God ...............3
RELS 267HI–Myth, Metaphor, and
Metamorphosis ........................................3
University Core and Electives .................13

Junior Year Credits

PHIL 305–History of Phil: Anc & Mediev ........3
PHIL 306–History of Phil: Modern ............3
Take one of the following in ethics:
PHIL 332–Ethics ....................................3
PHIL 334–Moral Theory ................................3
PHIL 335–Bio-Medical Ethics .....................3
PHIL 340–Environmental Ethics ..................3
Take one of the following 300-level
Religious Studies courses:
PHIL 320–Philosophy of Religion ................3
RELS 325–Literature and Religion ..............3
RELS 326–Mystics, Founders, Reformers ......3
University Core and Electives .................18

30

Senior Year Credits

PHIL 400–Seminar ....................................3
PHIL 400–Seminar ....................................3
Take one of the following in metaphysics/
epistemology:
PHIL 342–Epistemology ..........................3
PHIL 352–Metaphysics ..............................3
PHIL 364–Contemporary Philosophy ...........3
Take one of the following 400-level
Religious Studies courses:
RELS 402–Natural, Unnatural, Supernatural ...4
RELS 405–Text and Image ........................3
RELS 410–Psyche and the Sacred ..............3
University Core and Electives .................18

50-31

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C- or better in all required courses.

PHILOSOPHY MINOR
(NON-TEACHING)

The minimum number of credits required for a non-teaching minor is twenty-one, with nine of those being upper-division credits.

Credits
PHIL 251–Introduction to Logic ..................3
PHIL 303HI–History of Phil: Anc & Mediev ......3
PHIL 306–History of Phil: Modern ..............3
Select one of the following:
PHIL 332–Ethics ....................................3
PHIL 334–Moral Theory ................................3
PHIL 335–Bio-Medical Ethics .....................3
PHIL 340–Environmental Ethics ..................3
PHIL 342–Approaches to Epistemology ..........3
PHIL 352–Metaphysics ................................3
PHIL 364–Contemporary Philosophy ...........3
PHIL 378–Philosophy of Science ...............3
Philosophy Electives; at least three
credits must be upper division ..................9

21

Physics

Department of Physics
http://www.physics.montana.edu/

The physics curriculum is designed with considerable flexibility in order to accommodate the variety of interests, plans, and needs of majors. At the same time, it provides a broad and thorough understanding of the fundamental ideas and concepts related to the physical world surrounding us. Using this broad base, which stresses fundamentals, undergraduates may enter graduate work in one of the pure or applied sciences or one of the non-sciences such as education, business administration, law, journalism, or philosophy. They may also choose to go directly into jobs in education, industry, government, or business.

The Department of Physics offers graduate work leading to the Master of Science and Doctor of Philosophy degrees. Furthermore, the faculty in all research groups are strongly committed to enriching the undergraduate experience by providing opportunities for undergraduates to fully participate in cutting-edge research projects working alongside faculty and graduate students.

Professional Option

Intended primarily as preparation for graduate work in one of the physical sciences or for those who desire a career in the physical sciences, the professional option provides a sound background in the fundamentals of physics and mathematics.

Interdisciplinary Option

This option requires a minimum of 16 credits in the declared area and is designed for those who desire a firm background in mathematics and physics coupled with a concentration in another discipline such as chemistry, biology, computer science, engineering, or technical writing. Each student choosing this option will work out a specific program with an advisor and the participating department in the declared area.

Teaching Option

This option is intended primarily as preparation for secondary school teachers. Teaching options require a teaching minor from the list under the Department of Education. However, the only teaching minor that can be completed within 128 credits is Mathematics. Please contact the department advisor for specifics on other options.

Undergraduate Research Participation

An integral component of all undergraduate major programs in physics is participation in undergraduate research. Based on student interest, the faculty work closely with students in identifying and addressing important problems in particular sub-fields. Completion of a minimum of 2 credits of undergraduate research/creative activity (Phys 490R) is required prior to taking the Capstone course (Phys 406C). Some students extend this experience beyond the minimum and work in research labs throughout their undergraduate program, including summers. Students from other majors who demonstrate interest and ability are also welcome to participate in undergraduate research in physics.

Senior Project

Students in the professional and interdisciplinary options will complete senior projects that integrate their physics knowledge and problem solving skills with research/creative activities. The senior project is designed to give a student the opportunity to develop skills that are necessary for work in a professional scientific environment by integrating their physics knowledge and problem solving skills with research/creative activities. For this activity, the student must enroll in a minimum of 2 credits of undergraduate research/creative activity (Phys 490R). The results of this senior project are generally the basis for the presentation given in the Capstone course (Phys 406C).

The senior project will be based on a collaboration of a student with a mentor on a project that is of interest to the student, is either experimental or theoretical in nature, has a defined objective and is primarily based on the student’s own work. Usually these senior projects are based on research guided by one of the faculty in the Physics Department. However, there are several other options available to the student for these senior projects. Other options include, but are not limited to, research projects done by the student in other departments at Montana State University, research projects done by the student
Capstone Experience

Students in the professional and interdisciplinary options will present the results of their senior project in oral and written forms in the Capstone course (PHYS 406C).

The capstone experience for those in the Physics Teaching Option is EDSD 410 - Student Teaching. Each student will submit a written report from the supervising teacher and a written self-assessment.

Departmental Honors in Physics

When appropriate, majors should consider the opportunities afforded by the departmental honors program. This program has the following requirements:

1. A minimum 3.5 grade-point average (GPA) in physics, 3.0 GPA overall.
2. A minimum of four credits of undergraduate research credit.
4. Participation in a physics seminar for one semester in either the junior or senior year.

A detailed description of the program is available from the department.

Curricula in Physics

PROFESSIONAL OPTION

Freshman Year

PHYS 221-Honors Gen & Mod Phys I*...... 4
*See note below on substitutions

Choose one of the two:
M 181-Honors Calc I
(Recommended) ................. 4
M 171-Calculus I ....................... 4

PHYS 222-Honors Gen & Mod Phys II*...... 4
*See note below on substitutions

Choose one of the two:
M 182-Honors Calculus II
(Recommended) ................. 4
M 172-Calculus II ....................... 4
Bio,Chem, or Earth Science Electives ........ 4
University Core and Electives ........ 7 3
15 15

Sophomore Year

PHYS 200-Research Programs in Physics.... 1
PHYS 215-Gen & Mod Phys III ............. 4

Choose one of the two:
M 283-Honors Multivar Calc
(Recommended) ................. 4
M 273-Multivariable Calculus ........... 4
PHYS 261-Laboratory Electronics I ........ 2

PHYS 261-Laboratory Electronics II ........... 2
PHYS 361-Laboratory Electronics II .......... 2
PHYS 251-Intro Theoretical Physics ......
Choose one of the two:
M 284-Honors Intro Diff Eqs
(Recommended) ................. 4
M 274-Intro to Different Equations ........ 4
University Core and Electives ........ 4 6
15 15

Junior Year

PHYS 301-Classic Mechanics ............... 4
PHYS 322-Intermediate Physics ............ 5
PHYS 317-Electricity & Magnetism I ....... 3
PHYS 331-Computational Physics ........... 1
PHYS 425-Thermodynamics & Stat Physics .... 3
PHYS 490-Undergraduate Research/
Creative Activity ................. 1
Math Electives ................. 3 3
Physics Electives ................. 3
University Core and Electives ........ 3 3
15 15

Senior Year

PHYS 318-Electricity & Magnetism II ...... 5
PHYS 411-Quantum Mech I ................ 5
PHYS 461-Senior Lab
(Fall and/or Spring) ................. 4
PHYS 490-Undergraduate Research/
Creative Activity ................. 1
PHYS 406-Capstone Presentations ........ 1
Math Electives ..................... 3
University Core and Electives ........ 1 7
15 15

The physics electives are to be selected from PHYS 253 and PHYS courses numbered 300 and above. The mathematics electives are to be selected from M 221 and MATH and STAT courses numbered 300 and above. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. A student changing majors or with unusual circumstances can substitute PHYS 211 for PHYS 221 or PHYS 212 for PHYS 222 with academic advisors approval.

PHYSICS TEACHING OPTION

Freshman Year

EDCI 102-In-School Experience ............ 1
HDCF 150S-LifeSpan Human Devl.* ........ 3
HDHIL 106-Drug Health Issue for Ed. ....... 1
PHYS 221-Honors Gen & Mod Phys I* ...... 4
*See note below on substitutions

Choose one of the two:
M 181-Honors Calc I
(Recommended) ................. 4
M 171-Calculus I ....................... 4

PHYS 222-Honors Gen & Mod Phys II* ...... 4
*See note below on substitutions

Choose one of the two:
M 182-Honors Calculus II
(Recommended) ................. 4
M 172-Calculus II ....................... 4
Bio,Chem, or Earth Science Electives ....... 4
University Core and Electives ........ 7 3
15 15

Sophomore Year

PHYS 200-Research Programs in Physics .... 1
PHYS 215-Gen & Mod Phys III ............. 4

Choose one of the two:
M 283-Honors Multivar Calc
(Recommended) ................. 4
M 273-Multivariable Calculus ........... 4
PHYS 261-Laboratory Electronics I ........ 2

PHYS 261-Laboratory Electronics II ........... 2
PHYS 231-Intro Theoretical Physics ......
Choose one of the two:
M 284-Honors Intro Diff Eqs
(Recommended) ................. 4
M 274-Intro to Different Equations ........ 4
University Core and Electives ........ 4 6
15 15

Senior Year

PHYS 301-Classic Mechanics ............... 4
PHYS 322-Intermediate Physics ............ 5
PHYS 317-Electricity & Magnetism I ....... 3
PHYS 490-Undergraduate Research/
Creative Activity ................. 1
Declared Area ..................... 4 4
Math Electives ..................... 5 3
University Core and Electives ........ 5
15 15

The physics electives are to be selected from PHYS 253 and PHYS courses numbered 300 and above. The mathematics electives are to be selected from M 221 and MATH and STAT courses numbered 300 and above. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. A student changing majors or with unusual circumstances can substitute PHYS 211 for PHYS 221 or PHYS 212 for PHYS 222 with academic advisors approval.

INTERDISCIPLINARY OPTION

Freshman Year

PHYS 221-Honors Gen & Mod Phys I* ...... 4
*See note below on substitutions

Choose one of the two:
M 181-Honors Calc I
(Recommended) ................. 4
M 171-Calculus I ....................... 4

PHYS 222-Honors Gen & Mod Phys II* ...... 4
*See note below on substitutions

Choose one of the two:
M 182-Honors Calculus II
(Recommended) ................. 4
M 172-Calculus II ....................... 4
Bio,Chem, or Earth Science Electives ....... 4
University Core and Electives ........ 7 3
15 15

Sophomore Year

PHYS 200-Research Programs in Physics .... 1
PHYS 215-Gen & Mod Phys III ............. 4

Choose one of the two:
M 283-Honors Multivar Calc
(Recommended) ................. 4
M 273-Multivariable Calculus ........... 4
PHYS 261-Laboratory Electronics I ........ 2

PHYS 261-Laboratory Electronics II ........... 2
PHYS 231-Intro Theoretical Physics ......
Choose one of the two:
M 284-Honors Intro Diff Eqs
(Recommended) ................. 4
M 274-Intro to Different Equations ........ 4
University Core and Electives ........ 4 6
15 15

Senior Year

PHYS 301-Classic Mechanics ............... 4
PHYS 322-Intermediate Physics ............ 5
PHYS 317-Electricity & Magnetism I ....... 3
PHYS 490-Undergraduate Research/
Creative Activity ................. 1
Declared Area ..................... 4 4
Math Electives ..................... 5 3
University Core and Electives ........ 5
15 15

The physics electives are to be selected from PHYS 253 and PHYS courses numbered 300 and above. The mathematics electives are to be selected from M 221 and MATH and STAT courses numbered 300 and above. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. A student changing majors or with unusual circumstances can substitute PHYS 211 for PHYS 221 or PHYS 212 for PHYS 222 with academic advisors approval.

Note on Substitutions:

*See note below on substitutions

M 284-Honors Intro Diff Eqs
M 274-Intro to Different Equations
University Core and Electives
15 15

The physics electives are to be selected from PHYS 253 and PHYS courses numbered 300 and above. The mathematics electives are to be selected from M 221 and MATH and STAT courses numbered 300 and above. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. A student changing majors or with unusual circumstances can substitute PHYS 211 for PHYS 221 or PHYS 212 for PHYS 222 with academic advisors approval.

The physics electives are to be selected from PHYS 253 and PHYS courses numbered 300 and above. The mathematics electives are to be selected from M 221 and MATH and STAT courses numbered 300 and above. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. A student changing majors or with unusual circumstances can substitute PHYS 211 for PHYS 221 or PHYS 212 for PHYS 222 with academic advisors approval.
Choose one of the two:
M 284-Honors Intro Diff Equ
(Recommended) .................................. 4
M 274-Intro to Different Equations .................. 4
M 242-Methods of Proof .......................... 3
University Core and Electives .......................... 3

<table>
<thead>
<tr>
<th>University Core and Electives</th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
<td>16</td>
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<td>16</td>
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</table>

**Senior Year**
F  S
EDSD 501-Teaching Practicum ............... 1
EDSD 461-Method Teach Sec Science .......... 3
EDSD 466-Teach Content Read Strat .......... 3
M 428-Math Modeling for Teachers .......... 3
STAT 216Q-Intro to Statistics ............... 3
EDSD 410-Student Teaching .................. 10
EDSD 415-Professional Issues ............... 2
Physics Electives ............................. 3
University Core & Electives .................. 4

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<thead>
<tr>
<th>University Core &amp; Electives</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
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<td></td>
<td>16</td>
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</tbody>
</table>

The physics electives must be numbered 200 and above. A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. A student changing majors or with unusual circumstances can substitute PHYS 211 for PHYS 221 or PHYS 212 for PHYS 222 with academic advisors approval.

**PHYSICS MINOR (NON-TEACHING)**

Choose one of the two:
PHYS 211-Gen & Mod Phys I ...................... 4
PHYS 221-Honors Gen & Mod Phys I (Recommended) ............. 4

Choose one of the two:
PHYS 212-Gen & Mod Phys II .................... 4
PHYS 222-Honors Gen & Mod Phys II (Recommended) ............... 4
PHYS 215-Gen & Mod Phys III ................... 4
PHYS 251-Intro Theoretical Phys ............... 5

Choose one of the two:
PHYS 301-Classical Mechanics ................. 4
PHYS 322-Intermediate Physics ................ 3

Physics electives
(201 or 300 level or above) ....................... 8

<table>
<thead>
<tr>
<th>Physics electives</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

PHYS 221 and 222 are recommended choices. Students who complete PHYS 201 require 7 additional physics electives. Students who complete PHYS 322 require 8 additional physics electives.

**Political Science**

**Department of Political Science**

http://www.montana.edu/wwwpo/

The study of political science gives the student an understanding of politics, government, and public affairs. Political science graduates develop a coherent and reasoned knowledge respecting government law, governance, political behavior, and public administration. In addition, they are prepared to be part of an informed national and global citizenry. Political science provides an excellent academic background for students preparing for careers in law, the public service, journalism, teaching, as well as many private sector jobs. Advising within the department is conducted in groups and by individually assigned advisors. Students are expected to attend the group advising sessions.

The department has a pre-law advisor, a collection of current law school catalogues and offers the opportunity for pre-law internships to qualified students. In addition to classroom work, the political science program encourages students to gain practical experience through its legislative and public affairs intern program. The intern program gives students the opportunity to earn university credit for on-the-job experience with government agencies, law firms, the Congress, state legislatures, and with public policy groups. In order to graduate, all students are expected to successfully complete the five political science foundation courses (PSCI 210S, 214S, 230D, 200 & ECNS 101S). The student must also complete the capstone (PSCI 409R).

The department offers a Bachelor of Arts degree with four options. The department requires a mandatory advising meeting during the student’s sophomore year to plan their course for their selected option. All options require the completion of 120 credits, which must include MSU’s CORE requirements, and the successful completion of a minimum of 42 upper-division (300 and 400 level) courses.

**Analysis & Policy Option**

This option emphasizes public policy analysis and American political institutions. In addition to the required foundational courses and advanced political science courses, students will also complete two (6 credits) upper division political science courses in the policy and analysis subfield and, PSCI 310 to fulfill their skills requirement.

**International Relations Option**

This option is for students with an interest in international relations who wish to acquire a sound background in the fundamentals of international relations theory, international institutions, international policy and international political economy. In addition to the required foundational courses and advanced political science courses, students will also complete two (6 credits) upper division political science courses in the international relations subfield and, demonstrate competency in a foreign language to fulfill their skills requirement.

**Political Theory Option**

This option is for students who wish to pursue upper level coursework addressing key questions of political theory, including questions about rights, identity, power, virtue, gender, knowledge, and justice, among others. In addition to the required foundational courses and advanced political science courses, student will also complete two upper level courses (6 credits) in the political theory subfield and take Introduction to Logic (PHIL 231) to fulfill their skills requirement.

**Political Institutions Option**

This option is for students with an interest in political institutions, such as legislatures, executives, or the courts, who wish to acquire a sound background in the fundamentals of how political systems operate. This option includes courses on the American political system, as well as the governing institutions of other nation-states. In addition to the required foundational courses and advanced political science courses, students will also complete two upper level courses (6 credits) in the institutions subfield and take any one of the skills course to fulfill their Skills requirement.

**Curriculum in Political Science**

Before a political science major may enroll in any upper division political science course, the student is expected to have achieved a grade of “C” or better in the five political science foundation
**PROGRAMS OF INSTRUCTION – LETTERS AND SCIENCE**

**POLITICAL INSTITUTIONS OPTION**

Take two courses from the following:

- PSCI 302 – Media & Politics
- PSCI 306 – Legislative Process
- PSCI 341 – Political Parties and Election
- PSCI 346 – American Presidency
- PSCI 471 – American Constitutional Law
- PSCI 408 – Environmental Politics
- PSCI 444 – Congressional Campaigns

**INTERNATIONAL RELATIONS OPTION**

Take two courses from the following:

- PSCI 351 – International Relations Theory
- PSCI 418 – War and Peace
- PSCI 434 – International Law
- PSCI 435 – Globalization and Politics
- PSCI 436 – Politics of Food and Hunger
- PSCI 437 – International Political Economy
- PSCI 439 – International Human Rights

**ANALYSIS AND POLICY OPTION**

Take two courses from the following:

- PSCI 310 – Statistical Tech in Pol Sci
- PSCI 365 – Pub Policy Issues and Analysis
- PSCI 362 – Natural Resource Policy
- PSCI 407 – Public Policy Analysis
- PSCI 465 – Public Admin and Policy
- PSCI 461 – Administrative Law
- PSCI 491 – The Political Economy of Energy

**POLITICAL THEORY OPTION**

Take two courses from the following:

- PSCI 323 – Modern Political Thought
- PSCI 352 – American Political Thought
- PSCI 353 – Classical Political Thought
- PSCI 354 – Contemporary Theory
- PSCI 451 – Ancient & Medieval Pol Phil
- PSCI 454 – Cinema and Political Theory

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. No political science course may be counted in more than one upper division subfield requirement except for PSCI 499R (as core). Political science majors must fulfill Diversity University Core requirements outside of the PSCI rubric. ECNS 101IS or ECNS 202 is a requirement for political science majors; the University Core requirement for Inquiry Social Science (IS) is satisfied by ECNS 101IS. Before a political science major may enroll in any upper division political science course, the student is expected to have achieved a grade of "C" or better in the five political science foundation courses (PSCI 210IS, 214IS, 230D, 200, 230D). To be credited toward graduation, a student must not earn less than a "C" in any upper division political science course being counted toward graduation requirements in the discipline. In addition to being required for the major, PSCI 499R may also be used to fulfill the Research and Creative Experience core requirement.

**PSYCHOLOGY**

**Department of Psychology**

http://www.montana.edu/wwpsy/

Psychology is the scientific study and application of knowledge concerning the behavioral and cognitive processes of humans and other animals. The Department offers a Bachelor of Science (B.S.) degree in Psychology. This degree prepares students for employment in applied settings or for graduate study in psychology and related fields. Students who choose not to continue toward a graduate degree may find employment in a wide variety of organizations and agencies as well as in research settings where knowledge of behavior and cognition is useful. For such students, a B.S. in psychology offers a broad liberal arts background. Those students who obtain an advanced degree (typically an M.S. or a Ph.D.) may find employment in research settings, academic settings, or private practice, although individuals with advanced degrees also work in a wide variety of other organizations.

The psychology curriculum introduces students to the basic scientific and applied areas of the discipline. It emphasizes theories, methods, and terminology, as well as research findings in each of psychology’s major subareas. Students learn about various research methods used to study psychological phenomena, as well as the strengths and limitations of each. Students conduct psychological research or perform fieldwork in a setting related to psychology, gaining experience that forms the basis for the Senior Thesis Capstone course.
Prerequisite Requirements

Any student who enrolls in a psychology course without having passed all prerequisite(s) with a "C" or better grade will be required to withdraw from the course.

Curricula in Psychology

Psychological Science and Applied Psychology Options

Psychology Minor (Non-Teaching)

The program leading to a B.S. degree offers psychological science and applied psychology options. Within these options, students select the appropriate psychology electives and career electives in consultation with their advisors based on the student’s career goals and interests. Options and electives are described below. Psychology majors cannot have a grade less than "C" in a PSYX course used to satisfy graduation requirements.

PSYCHOLOGICAL SCIENCE and
APPLIED PSYCHOLOGY OPTIONS

Freshman Year

<table>
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<tr>
<th>Courses</th>
<th>Credits</th>
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<td>PSYX 101B-Intro to Psychology</td>
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<td>Take at least one of the following</td>
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<tr>
<td>BIOL 100B-Organism Function</td>
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<tr>
<td>BIOL 102-Molecular &amp; Cellular Biol</td>
<td>4</td>
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<td>BCHM 104RN-Biochem of Health</td>
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<td>Take at least one of the following</td>
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<td>M 14Q or higher</td>
<td>3</td>
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<td>STAT 216Q</td>
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<td>University Core, PSYX, and Career Elects</td>
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Sophomore Year

<table>
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<th>Courses</th>
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<td>PSYX 225-Research Design &amp; Analysis I</td>
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<tr>
<td>PSYX 225-Research Design &amp; Analysis II</td>
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<td>University Core, PSYX, and Career Elects</td>
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Sophomore, Junior & Senior Years

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<th>Courses</th>
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<td>Take at least eight of the following</td>
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<tr>
<td>PSYX 270-Fund Psychology of Learning</td>
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<td>PSYX 274-Psychological Measurement</td>
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<td>PSYX 325-Applied Critical Thinking</td>
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<td>PSYX 333-Psychology of Aging</td>
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<tr>
<td>PSYX 335-Psychology of Gender</td>
<td></td>
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<tr>
<td>PSYX 340-Abnormal Psychology</td>
<td></td>
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<tr>
<td>PSYX 350-Physiological Psychology</td>
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<tr>
<td>PSYX 354-Sensation &amp; Perception</td>
<td></td>
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<tr>
<td>PSYX 360-Social Psychology</td>
<td></td>
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<tr>
<td>PSYX 370-Psychology of Learning</td>
<td></td>
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<tr>
<td>PSYX 375-Behavior Modification</td>
<td></td>
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<tr>
<td>PSYX 390-Memory &amp; Cognition</td>
<td></td>
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<tr>
<td>PSYX 384-Consciousness</td>
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<tr>
<td>PSYX 385-Psychology of Personality</td>
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<tr>
<td>PSYX 400-History &amp; Systems in Psychology</td>
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<tr>
<td>PSYX 401-Induct &amp; Organiz Psy</td>
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<tr>
<td>PSYX 402-Psychology of Prejudice</td>
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<tr>
<td>PSYX 403-Social Cognition</td>
<td></td>
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<tr>
<td>PSYX 481-Judgment &amp; Decision Making</td>
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<tr>
<td>PSYX 492-Psycholinguistics</td>
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</tbody>
</table>

Take at least one of the following:

- PSYX 490R-Undergraduate Research
- PSYX 495-Field Practicum in Appl Psych

Take the following:

- PSYX 499R-Senior Thesis Capstone

Electives

A minimum of 120 credits is required for graduation: 42 of these credits must be in courses numbered 300 and above.

Career Electives

All students must complete additional courses that complement their career goals in a discipline other than psychology. Specific courses are selected by the student. Each student should carefully consider electives based on career plans and goals. Disciplines from which electives are selected typically include: biology, chemistry, computer science, human development, industrial and management engineering, business, management, sociology and statistics. A minimum of 12 credits is required, although students are encouraged to take more than this minimum. Some of the credits shall be in upper-division courses.

Applied Psychology Option

Students interested in areas of applied psychology such as industrial/organizational psychology, human resource management, or organizational behavior, may consider the Applied Psychology Option and may choose career elective courses in such disciplines as business management, industrial and management engineering and statistics.

Psychological Science Option

Students interested in areas of psychological science may choose elective courses in disciplines such as biology, computer science, sociology and statistics.

Students interested in advanced study in clinical psychology or counseling psychology may follow either the Psychological Science Option or the Applied Psychology Option and should choose career elective courses in such disciplines as biology, or human development. Students in either option should consider taking career elective courses in other social science areas such as sociology or political science.

PSYCHOLOGY MINOR
(NON-TEACHING)

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Take one of the following</td>
<td></td>
</tr>
<tr>
<td>BIOL 100N-Organism Function</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 102-Molec &amp; Cellular Biol</td>
<td>4</td>
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<tr>
<td>BCHM 104RN-Biochem of Health</td>
<td>4</td>
</tr>
<tr>
<td>Take all of the following</td>
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<tr>
<td>PSYX 100N-Intro to Psychology</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 225-Research Design &amp; Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 225-Research Design &amp; Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 225-Research Design &amp; Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 225-Research Design &amp; Analysis II</td>
<td>3</td>
</tr>
</tbody>
</table>

Take at least four of the following:

- PSYX 290-Developmental Psychology
- PSYX 270-Fund Psychology of Learning
- PSYX 274-Psychological Measurement
- PSYX 325-Applied Critical Thinking
- PSYX 335-Psychology of Aging
- PSYX 335-Psychology of Gender
- PSYX 340-Abnormal Psychology
- PSYX 350-Physiological Psychology
- PSYX 354-Sensation & Perception
- PSYX 360-Social Psychology
- PSYX 370-Psychology of Learning
- PSYX 375-Behavior Modification
- PSYX 380-Memory & Cognition
- PSYX 384-Consciousness
- PSYX 385-Psychology of Personality
- PSYX 400-History & Systems in Psychology
- PSYX 401-Induct & Organiz Psy
- PSYX 402-Psychology of Prejudice
- PSYX 403-Social Cognition
- PSYX 481-Judgment & Decision Making
- PSYX 492-Psycholinguistics
- PSYX 491-Special Topics

Sociology

Department of Sociology & Anthropology
http://socanth msu montana edu/dept/

The Bachelor of Science in Sociology provides the student the opportunity to combine a liberal arts education with a unique focus on the empirical study of human societies including social dynamics, institutions and inequality. Students are permitted a large number of elective courses.

A Bachelor’s degree in Sociology prepares students for employment in a number of arenas, including governmental agencies, nonprofit organizations, for-profit businesses, agricultural organizations and academic institutions. The fields of law enforcement, probation & corrections, labor relations, business management, personnel administration, market analysis and various types of industrial research employ students who major in sociology. Many graduates enter social services. Sociology also provides excellent preparation for graduate
school and other educational and career opportunities.

We strongly recommend that prior to enrolling in any upper division courses in Sociology students complete their core in Writing, Quantitative Reasoning, Diversity and Inquiry - Social Sciences with a grade of “C” or better. We also recommend students take SOCI 202 in their sophomore year and SOCI 318 in their junior year.

Prerequisite Requirements

Any student who enrolls in a course offered by the Department of Sociology and Anthropology without the required prerequisite(s) will be required to withdraw from the course.

Curricula in Sociology

SOCIOMETRY

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 101W-College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 101S-Introduction to Sociology</td>
<td>3</td>
</tr>
<tr>
<td>University Seminar Core</td>
<td>3</td>
</tr>
<tr>
<td>Diversity Core</td>
<td>3</td>
</tr>
<tr>
<td>Quantitative Reasoning Core</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>SOCI 202-Social Statistics</td>
<td>3</td>
</tr>
<tr>
<td>SOCI Electives</td>
<td>6</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>15</td>
</tr>
<tr>
<td>Additional required social science, natural science &amp; humanities courses</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>SOCI 301-Intro to Social Theory</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 318R-Sociological Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>SOCI Electives</td>
<td>9</td>
</tr>
<tr>
<td>Additional required social science, natural science &amp; humanities courses</td>
<td>6</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCI 499-Senior Capstone Seminar</td>
<td>3</td>
</tr>
<tr>
<td>Sociology Electives</td>
<td>3</td>
</tr>
<tr>
<td>Additional required social science, natural science &amp; humanities courses</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

Required Courses: Students must complete SOCI 101, SOCI 202, SOCI 318 and SOCI 451 in sequence. In addition, students must complete SOCI 301 before they enroll in SOCI 451.

Sociology Electives: Students must take 24 additional credits from any courses designated as SOCI. All but 3 credits must be upper division and no more than 3 credits of SOCI 492, SOCI 498, and SOCI 490 combined can count toward the fulfillment of elective credits. Students may request, in writing, to count up to 6 credits of upper division ANTH courses as SOCI electives. SOCI 150D does not count toward the 39 total credits needed to fulfill major requirements.

Pre-medical/Pre-Health Professional Programs at MSU

The premedical option is part of a broader pre-health professions program at Montana State University administered through the Health Professions Advising Office (http://www.montana.edu/dis/hpa/). Students interested in attending medical, dental, pharmacy, physician assistant, optometry, or chiropractic school are encouraged to participate in this program. Students considering a health professional career can major in any curriculum within the institution. To facilitate this academic decision-making process, the Health Professions Advising Office, in conjunction with University Studies, is offering an optional Pre-Med’ entry major. As part of the entry major, student academic and health care exploration will be supported. Students will be poised to choose a major going into the sophomore year. The office will continue to provide information, advising, counseling and application support to all students interested in becoming health care professionals. An overview of services available through the Health Professions Advising Office is provided during orientation week at the start of the academic year. At this orientation session, students are given information about the courses required for making application to health professional school and encouraged to keep in contact with the Health Professions Advising Office.

Native American Studies

Department of Native American Studies
http://www.montana.edu/wwwnas/

Native American Studies offers an interdisciplinary program of study in American Indian culture and history, policy and law, community affairs, education, and other related areas through a non-teaching minor in Native American Studies, an Online Graduate Certificate in Native American Studies, a Master of Arts in Native American Studies, as well as opportunities for all MSU undergraduate students to gain a multicultural perspective in meeting the university’s Core Curriculum requirements.

Research and Creative Activity

The Department takes pride in the scholarship of its faculty. In 2000 the Department established its endowed Chair in Native American Studies. The scholarship and service offered by the holders of the Chair enhances the Department’s efforts to provide first class scholarship on behalf of Native
peoples and the university. Over the year faculty members have consistently published in professional journals, delivered papers at national and international meetings, held symposia here at MSU, and, by invitation, chaired and participated in panels at national professional association conferences.

Consistent with its service commitment to Montana’s tribal communities, much of the faculty’s research and creative activity responds to the educational, cultural, and economic development needs of Native Americans. In addition to scholarly research, faculty members have devoted much time and energy to developing new programs and finding external funding sources for those programs. During the past decade, the Department has received more than $5 million in federal, state, and private grants for programs which include graduate fellowships, tribal college development projects, international student exchanges, pre-college engineering and business programs, and national and international cultural development programs.

Service
The Department firmly maintains that Montana State University must be responsive to Indian communities in addressing tribally-identified educational, cultural, and economic development needs. Accordingly, the Department has directed much of its public service activity to Montana’s Indian communities. In doing so, Department faculty members have established close working relationships with tribal and intertribal groups as well as with national Indian offices and organizations.

Upon request, faculty members have also provided technical assistance in the areas of adult, vocational, and community college development, needs assessments, proposal writing, and program evaluations.

Utilizing the resources of the university to assist in the development of Montana’s seven tribally-controlled community colleges has been a major goal of the Department. For example, the Department has administered projects to provide graduate-level training to tribal college faculty, to provide in-service training and technical assistance, and to conduct significant research in areas of importance to the tribal colleges.

In addition, faculty members have presented continuing education workshops on Montana reservations, evaluated reservation cultural and education programs, and provided other public service. Faculty members have also, by invitation, read proposals for the U.S. Office of Education, the National Endowment for the Humanities, the National Institute of Education, and the National Science Foundation.

American Indian Student Programs and Services
In addition to the traditional functions of an academic department, Native American Studies places a high priority on providing student support programs and services, reflecting a strong commitment to Indian student retention and success. The student who decides to attend MSU will find a University-wide commitment manifested by a varied and extensive support system which is unequalled in the Great Plains region.

NATIVE AMERICAN STUDIES MINOR (NON-TEACHING)
The minor in Native American Studies is designed to enhance the student’s major area of study, offering an interdisciplinary program for Indian and non-Indian students who wish to concentrate in the study of Native American life or who are preparing for careers in tribal affairs.

Students who declare a minor in Native American Studies must complete 21 credits as outlined below:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAS 100-Intro Native Am Studies</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>NAS 201--Amer Indians in Mont</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>NAS 426--Amer Ind Policy &amp; Law</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>NAS Electives</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
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</tbody>
</table>

At least 9 credits must be in upper division courses, and at least 10 credits must be earned at Montana State University. Electives are to be selected in consultation with the minor advisor. NAS 290/489/490 (Undergraduate Research), NAS 470 (Individual Problems) and/or NAS 476 (Internship) may be included among the electives. No more than four (4) semester credits (equivalent quarter hours) of NAS 470 and/or NAS 290/489/490 and no more than four (4) semester credits of NAS 476 may be included in the minor program. Transfer credits or credits earned in related courses offered in other departments may be included in the student’s program, upon approval of NAS departmental certifying officer.

Any student wishing a minor in Native American Studies must file an “Application for a Non-teaching Minor” with the Registrar’s Office a minimum of two terms prior to graduation.

Women’s and Gender Studies Minor
The College of Letters and Science, in conjunction with all other colleges at MSU, offers an interdisciplinary minor in Women’s and Gender Studies. Students in the minor systematically study basic feminist theories and methodologies, as well as the experiences and contributions of women in a variety of cultures over time.

Students in the minor will examine issues and theories of gender inequity and gender identity, and will engage in feminist analysis within their disciplines. Students find the minor a stimulating challenge to traditional assumptions in their academic programs. Because of its interdisciplinary nature, the minor is individually shaped in consultation with a Women’s and Gender Studies advisor. Students who declare a minor in Women’s and Gender Studies must complete 21 semester credits as outlined below. Contact the CLS Dean’s Office for additional information.

OPTION A - SENIOR CAPSTONE OPTION

Select three of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 347-Sex, Gender and Sexuality in Japan</td>
<td></td>
<td></td>
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<tr>
<td>ENGL 330-Women &amp; Literature</td>
<td></td>
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<tr>
<td>LIT 431R-Studies in a Major</td>
<td></td>
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<tr>
<td>Author/s (when applicable)</td>
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<td></td>
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<tr>
<td>HDCF 425-Family Law and Public Policy</td>
<td></td>
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<tr>
<td>HDCF 464-Gender, Race, Class, and Family Diversity</td>
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<tr>
<td>HEST 240-Human Sexuality</td>
<td></td>
<td></td>
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<tr>
<td>HSTA 407-Gender in U.S. &amp; Canadian West</td>
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<td></td>
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<tr>
<td>HSTA 408-Gender in America</td>
<td></td>
<td></td>
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<tr>
<td>HSTR 444-Japanese Women’s History</td>
<td></td>
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<tr>
<td>HSTR 410-Fam.Gen &amp; Law in Ancient Gr./Rome</td>
<td></td>
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<tr>
<td>HSTR 434-Gend, Sex, &amp; Soc Chge in Lat Am</td>
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<td></td>
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<tr>
<td>HSTR 415-Gender and Technology</td>
<td></td>
<td></td>
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<tr>
<td>HSTR 445-Gender in Asia</td>
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<td></td>
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<tr>
<td>HUM 204-Gender &amp; Sexuality</td>
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</table>

Elective Course Work...........................................9
Accordingly, we:

- Inspire baccalaureate and graduate students, within a diverse, challenging, and engaging learning environment, to become leaders in the practice of professional nursing.
- Explore, discover, and disseminate, new knowledge related to nursing and health care.
- Create an interactive environment in which faculty and students integrate discovery, learning, and the application of knowledge to nursing practice.
- Promote the health of Montanans and the global community through collaboration, sharing of expertise, civic engagement, and leadership in the profession.

Philosophy: Nursing

The faculty of the Montana State University-Bozeman College of Nursing believe that:

- professional nursing practice is oriented toward promotion, maintenance, and restoration of health; prevention of disease, risk reduction and/or supporting the process of death with dignity. The professional nurse works intimately with individuals, families, groups, communities, and populations to assist them toward independence and their optimal level of health,
- the professional values of altruism, autonomy, human dignity, integrity and social justice provide the foundation for professional nursing practice,
- the professional nurse provides direct and indirect care, monitors the client, designs, manages and coordinates care, collaborates with other health care providers and serves as client advocate,
- the practice of nursing involves clients of all ages from diverse multicultural populations in a variety of settings,
- the client of nursing is any individual, family, group, community or population in need of assistance with health care,
- professional nursing has a social and professional responsibility for the provision of quality, cost effective care to any client in need of that care,
- the professional nurse requires a knowledge of human beings throughout the life span which is acquired from the arts, humanities, and sciences,
- the practice of professional nursing requires knowledge of economic, technological, social, political, ethical and cultural influences affecting health care policy and client health practice,
- the professional nurse uses critical thinking and assessment skills to identify questions to be tested by systematic inquiry with findings utilized to enhance the quality of nursing and health,
- that health is a perceptual state in which human beings, individually and in groups, are able to perform social roles, capable of adaptation to the environment and in possession of a sense of well-being. Further, we believe that access to the means for achieving health is a fundamental human right,
- that humans are open systems where the internal and external environments are constantly exchanging matter and energy and that these processes influence health. All humans are potential clients of nursing and each human is unique as a result of genetic factors, psychosocial development, differing cultural values, spiritual dimensions and capacity for adapting to the environment, and
- the practice of professional nursing includes four essential features as defined by ANA in their Social Policy Statement (1995, p. 6). These include:
  - attention to the full range of human experiences and responses to health and illness without restriction to a problem-focused orientation;
  - integration of objective data with knowledge gained from an understanding of the patient or group’s subjective experiences;
  - application of scientific knowledge to the processes of diagnosis and treatment;
  - provision of a caring relationship that facilitates health and healing.

Philosophy: Nursing Education

The faculty believe that:
- "to prepare professional nurses for this multi-faceted role, several components are essential for all baccalaureate nursing programs.

http://www.montana.edu/wwwnu/

Vision

The College of Nursing is nationally recognized for innovation, discovery, excellence, and leadership.

Mission

The mission of the MSU College of Nursing is to provide leadership for professional nursing through excellence in education, research, and service.
These components are liberal education, professional values, core competencies, core knowledge and role development.” (The Essentials of Baccalaureate Education for Professional Nursing Practice, 2008),

- socialization into the professional nursing role is a major learning process through which the student develops professional identity and commitment. To facilitate socialization, faculty and other professional nurses serve as role models and interact in dynamic relationships where inquiry facilitates growth and change,
- faculty assist students to build bridges between their liberal education courses and nursing practice. In the process of socialization into the profession, faculty facilitate cognitive and affective skill development and design learning opportunities that support empathetic, sensitive, compassionate and appropriate care. Day to day experiences serve as resources for active learning,
- the teacher transmits to the student an enthusiasm for nursing and excitement for investigating the unknown, a commitment to lifelong learning, and a perspective of knowledge not likely to be derived from learning in isolation,
- students learn by active involvement in such cognitive processes as inquiry, analysis, and synthesis of facts, theories, values, and skills,
- repetition and practice facilitate use of the cognitive processes as well as internalization of knowledge, values and skills,
- carefully planned learning activities enhance the student’s use of cognitive processes and the development of decision making skills and judgment,
- students learn best when decision making skills and judgment are applied and tested in clinical settings which allow for development of clinical competence and identification with nurses as professional care providers and managers,
- clinical application of theoretical learning must be organized and planned with sufficient time for internalization,
- basic concepts and ideas are developed in successive learning experiences in a variety of settings,
- students increase their effectiveness in use of problem solving and the ability to understand increasingly complex and abstract concepts or ideas as they progress through the program,
- opportunities to learn involve a sharing of responsibilities between teacher and student. The teacher is viewed as a facilitator of learning and encourages student commitment and responsibility for learning,
- the teacher assists the student to utilize critical thinking,
- the teacher and student bring skills and sensitivity in human relations to the teaching-learning process. In addition, they have an awareness of their individual needs and motivations and the effect of these upon the learning process,
- evaluation is an integral part of the teaching learning process with the student always accountable for individual performance,
- the teacher facilitates the communication of ideas between student and teacher, student and student, student and other professionals and student and client by creating a climate which enables the student to examine new ideas,
- the teacher’s attitude conveys to the student that difference in perspective and approach are advantageous. Faculty choose a variety of teaching strategies that encourage thinking, reasoning, decision-making and discussion,
- in a larger sense the climate where students are socialized into the profession is one where faculty are actively involved in the full scope of professional behavior, and that
- collectively the faculty are expert educators, clinicians, researchers, citizens, leaders, and facilitators of change.

Programs
The undergraduate professional nursing program is approved by the Montana State Board of Nursing and is nationally accredited by the Commission on Collegiate Nursing Education (CCNE). The program includes two years of lower division study and two years of upper division study. It is possible for a student to complete all of the required prerequisite coursework at institutions other than Montana State University. All transfer credits are carefully evaluated to ensure equivalent content when students transfer to MSU and the College of Nursing curriculum. While it is possible to complete the program in four years, this requires careful planning and uninterrupted progression through the curriculum. Delays in progression related to reduced credit loads, repeated coursework, securing upper division placement, or change of curriculum commonly result in the student taking longer than four years to complete the program. Lower division nursing courses may be completed on the Bozeman campus, or on the outreach campuses at specified times and with an additional distance access fee of $500 per course. All upper division coursework is taken at one of five upper division campus sites: Bozeman, Billings, Great Falls, Kalispell, and Missoula. Completing the entire nursing program in Bozeman is possible, but highly competitive due to limited upper division slots.

The college also offers a graduate program leading to a Master of Nursing (MN) degree as well as a certificate in teaching. Degree options are Family Nurse Practitioner (FNP), Clinical Nurse Leader (CNL), and Family Psychiatric Mental Health Nurse Practitioner (FPMHNP). Post master’s certificates are also available. For specifics refer to the appropriate section of the online catalog under the Division of Graduate Education.

Undergraduate Program Objectives
Graduates of the BSN program will be able to:

- Utilize a foundation of community-based nursing to provide client-centered health care.
- Synthesize theoretical and empirical knowledge from nursing, the sciences, the arts and the humanities to practice safe and effective professional nursing.
- Apply principles of critical thinking in professional decision making.
- Evaluate the applicability of research findings for evidence based nursing practice.
- Utilize evidence-based clinical judgments to assist clients with the promotion, maintenance and restora-
tion of health; prevention of disease and death with dignity.

- Incorporate professional values of altruism, autonomy, human dignity, integrity and social justice and value-based behaviors into nursing practice.
- Employ legal and ethical principles in the practice of professional nursing.
- Assume responsibility for career development and participation in life-long learning.
- Utilize effective communication in professional relationships with clients in order to influence health and healing over time.
- Utilize progressive technology and information systems to support nursing practice and deliver client care.
- Collaborate with communities to design, implement, and evaluate population-based approaches to care.
- Provide culturally sensitive direct and indirect care for clients across a variety of settings.
- Participate as a member of the nursing profession.

Admission to the Pre-Nursing Major

Enrollment in the pre-nursing major is available for students admitted to Montana State University-Bozeman provided they have met the University admission requirements (are not admitted on probation) and, if transferring from another institution, have at least a 3.0 cumulative GPA. Montana State University students in another curriculum may process a change of curriculum request into nursing provided their Montana State University cumulative GPA is 3.0 or better. Pre-nursing majors are assigned to advisors in the College of Nursing.

Admission to the Nursing Major

Admission to the College of Nursing as a nursing major is achieved through a competitive application process. Acceptance into the nursing major (placement on a specific upper division campus site) is based on a combination of the student’s grades in the required prerequisite courses for the nursing major, student’s choice of campus sites and consideration of special needs. Pre-nursing majors (at both Montana State University-Bozeman and transfer institutions) apply for admission to the nursing major during Spring semester of the first year of lower division study. (See Application for Nursing Major and Upper Division Placement.) Admission to the nursing major permits students to be enrolled in sophomore, junior, and senior restricted entry nursing courses.

Progression through the Nursing Curriculum

Through careful selection of courses, a student may complete the curriculum in four academic years. Lower division courses must be completed prior to upper division courses. Nursing courses are generally offered every fall and spring semester. Some summer courses may be offered. Not all required non-nursing courses are offered every semester.
1. All required courses must be completed with a grade of C or better (C- grades are not acceptable).
2. Required courses may not be repeated more than once, regardless of when or where taken.
3. Effective Spring 2002, the College of Nursing considers a “W” grade on a transcript the same as C-, D, or F grades. “W” grades indicate an unsuccessful attempt to achieve a grade of C or better in a course.
4. Prerequisite courses for any nursing course must be completed with a grade of C or better (C- grades are not acceptable) before enrolling in the nursing course for which the prerequisite course is required.
5. Restricted entry lower division nursing courses are first offered to students in the nursing major. Students in the pre-nursing major may be enrolled pending space availability and placement on the wait list.
6. A student’s MSU-Bozeman cumulative GPA must be at least 2.5 prior to beginning upper division study.
7. Unsatisfactory completion of required clinical nursing course(s) in two different semesters prohibits continuation in the nursing curriculum.
8. Exceptions to any requirements or readmission to upper division coursework after removal from the nursing curriculum in which there were documented extraordinary circumstance (eg death in family, etc) are dependent upon a successful appeal to the College of Nursing Scholastic Committee. Placement of students who have failed or have withdrawn from coursework is dependent upon space availability and may be in competition with other students.

Application for Nursing Major and Upper Division Placement

In order to ensure the quality of education, the number of students admitted to the nursing major and offered placement on one of the upper division campus sites each semester is regulated to provide the best utilization of financial resources, clinical facilities, and faculty. The application procedure for admission to the nursing major has been developed in order to:
1. provide the most highly qualified students a place in upper division coursework (pending successful completion of required lower division courses), and
2. achieve maximum utilization of limited resources, and increase the supply of professional registered nurses.

1. Applications are accepted during a specified period or periods each year. These periods are publicly announced in advance. The number of application periods held each year is dependent on spaces remaining available throughout the year. The first opportunity for students to submit an application will be by April 30th during spring semester of their freshman year as pre-nursing students.
2. Students enrolled (or previously enrolled) at MSU-Bozeman, other units of the Montana University System, or other institutions of higher learning may apply for placement.
3. An application may be obtained from the College of Nursing Web Site. When submitting an application, the student needs to specify the semester and year he/she plans to begin upper division coursework.
4. A $200 deposit must accompany an acceptance of upper division placement. This deposit will be applied toward fees for first semester junior nursing courses taught at upper division.
5. On the application form, students may indicate the campus of their
choice for upper division placement; however, upper division placement does not mean placement at a particular campus. Upper division placement means placement at one of the upper division campus sites during the academic year for which admission is sought. Upper division placement is dependent upon the grade point average in required lower division courses. (Note: In years with excessive numbers of applicants, the grade point average in required lower division courses will most likely need to be considerably higher than 3.0 to be admitted into the nursing major through an upper division placement offer.)

6. Assignment to a specific campus is determined by the grade point average in required lower division courses and points awarded for special needs. Examples of “special needs” include financial, medical, or support systems.

7. When there are more students than places available for upper division courses for the time period cited in the application, students wishing to be considered for admission in later years must reapply.

8. A wait list of students with 3.0 or higher gpa in required lower division courses will be maintained in order to fill unexpected openings for placement at upper division campus sites. Students with gpa lower than 3.0 are not likely to be placed.

9. Students need to carefully plan their course of study in order to complete all required lower division courses prior to upper division placement.

10. Students who have not completed required lower division courses forfeit their upper division placement. The $200 deposit will be forfeited unless students notify the Undergraduate Associate Dean’s office in writing at least a month in advance of placement that they will not be ready to use their placement.

Transfer Students

The above criteria and procedures for progression through the nursing curriculum apply to transfer students as well as MSU-Bozeman students. Students do not have to be enrolled at Montana State University-Bozeman to submit an application for admission to the nursing major and upper division placement. However, students who have been enrolled as nursing students at any other institution (have nursing courses on their transcripts) must provide a letter from their Dean or Director regarding their status at the time they left the previous nursing program prior to enrolling in any nursing courses at MSU.

In order to facilitate transcript evaluation, all transfer students must provide a copy of the transcript(s) from all institutions of higher education they have attended to the College of Nursing Undergraduate Student Services Coordinator. Out-of-state transfer students must also provide a catalog or course descriptions from their former institution(s), if possible.

Standards of the Nursing Profession

The primary aim of the College of Nursing is the education of persons for professional nursing practice. Graduates of the program are recommended for admission to the national licensing examination for registered nurses (NCLEX-RN). As educators, faculty members have the responsibility to provide students with appropriate educational opportunities and with reasonable guidance and supervision. As professional practitioners, faculty members also have the obligation to patients to ensure that nursing students who care for them are competent to do so without lowering standards. This responsibility also extends to the health agency administrator, to all licensed personnel providing care within that agency, and, in fact, to the nursing students themselves—all in the interest of safeguarding patient safety.

The 2001 ANA Code of Ethics for Nurses, Provision 3.4 states, “Nursing is responsible and accountable for assuring that those individuals demonstrating the knowledge, skill, practice experiences, commitments, and integrity essential to professional practice are allowed to enter into and continue to practice within the profession. Nurse educators have a responsibility to ensure that basic competencies are achieved and to promote a commitment to professional practice prior to entry of an individual into practice.”

The student, upon admission to the nursing curriculum, assumes the obligations of performing and behaving according to the standards set by the College of Nursing. Mere satisfactory academic performance does not in and of itself constitute the basis for progression through the nursing major.

In keeping with the standards of the profession, the College of Nursing expects nursing students to demonstrate ethical behavior. Expected behaviors include but are not limited to abiding by guidelines for academic integrity; respecting the privacy rights of patients, students, and faculty members; placing priority on the health, safety, and welfare of patients; and avoiding prejudicial or discriminatory behavior in relationships with patients, students, and faculty members.

Some examples of misconduct are sharing confidential information, fabrication or falsification of information in the classroom or clinical area, any form of cheating including plagiarism, and aiding or facilitating dishonesty or unethical behavior in others. Breaches in professional standards will result in disciplinary action, including the possibility of removal from the nursing curriculum. Students are responsible for reviewing the following publications which are available on each College of Nursing campus:

- Conduct Guidelines and Grievance Procedures for Students (MSU-Bozeman)
- Essentials of Baccalaureate Education for Professional Nursing Practice (AACN, 2008)
- Code of Ethics for Nurses (ANA, 2001)

Where there is failure on the part of the student to meet reasonable standards of performance or behavior or when, in the judgment of the faculty member, reasonable supervision is inadequate to ensure patient safety, the faculty member has the authority to remove a student from the clinical setting (see College of Nursing Policy G-6).

The criteria which will be considered in denying the student access to patients are: demonstrated emotional instability, indifference or insensitivity to patient safety and comfort, lack of professional judgment, disregard for professional ethics and standards, any health condition which makes it impossible for the student to carry out her/
his work without jeopardizing patient safety and comfort, or any other condition or circumstance which constitutes an unreasonable risk to the safety and well being of the patient. A nursing student may be referred to appropriate resources for assistance with problems which are non-academic in nature but which might impair the student’s effectiveness as a professional nurse.

Whenever, pursuant to the foregoing, denial of student access to a clinical agency will result in the student being dismissed from the nursing program, the student shall be fully informed of the decision and its consequences and shall be afforded the right to appeal. Appeals are submitted to the College of Nursing Dean.

Unique Requirements:

Transportation: Access to an automobile is necessary, particularly for clinical work in the community including home visits, as well as in rural areas. Public transportation is not adequate in the cities with upper division campuses. Students are responsible for providing their own transportation.

Varied Schedules: Students are expected to participate in clinical experiences in a variety of community and rural agencies and at variously scheduled times. Therefore, students must make arrangements to accommodate an irregular academic schedule that may include evening and weekend hours.

Expenses: Nursing students have additional expenses beyond those normally required in other curricula. They include, but not limited to uniforms, immunizations, background checks, and current professional CPR certification (including infants, children and adults) before beginning clinical coursework. Special purchases include, but are not limited to stethoscope and computer hardware and software. Because many of the courses in the nursing program are Web-based or Web-enhanced, students must have access to and skills in using a computer and a printer. They must also have a reliable connection to the Internet with a current Internet browser.

Word processing skills are required. Microsoft Word is recommended.

Questions about requirements can be directed to the College of Nursing, Computer Specialist, Trevor Murray at (406) 994-6846 or Email: tlmurray@montana.edu.

Curriculum in Nursing

REQUIRED LOWER DIVISION COURSES*

The following courses must be completed prior to progression to upper division courses. Students are advised to consult appropriate sections of the MSU bulletin regarding required prerequisites for these courses.

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<tr>
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<td>CLS 101US-College Seminar or CLS 201</td>
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<td>College Writing (W)</td>
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<td>WRIT 101W-College Writing 1</td>
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<td>Quantitative Reasoning (Q)</td>
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<tr>
<td>STAT 216Q-Introduction to Statistics</td>
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<tr>
<td>Contemporary Issues in Science (CS)</td>
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<td>HDFN 221CS-Human Nutrition</td>
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CORE 2:0: Ways of Knowing

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<tr>
<td>SOCI 101S-Introduction to Sociology</td>
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<tr>
<td>HDFC 150S-Lifespan Human Development</td>
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Natural Science Inquiry (IN) or Research and Creative Experience (R)

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<tr>
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<tr>
<td>Research and Creative Experience(R)</td>
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</tr>
<tr>
<td>N 367R-Research in Health Care</td>
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Other Required Courses

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<td>BIOL 207- Anatom &amp; Physiology I w/ Lab</td>
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<tr>
<td>BIOL 208- Anatom &amp; Physiology II w/ Lab</td>
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<tr>
<td>CHMY 125-Introduction to Organic &amp; Biochemistry</td>
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<tr>
<td>MB 201- Infectious Diseases</td>
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The following core courses must be completed prior to graduation:

Arts(A)

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<tr>
<td>Humanities (H)</td>
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REQUIRED UPPER DIVISION COURSES

The University requires that 42 of these credits be in courses numbered 300 and above. The College of Nursing requires that 55 credits be in courses numbered 300 and above.

Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>N 337: Nursing Pharmacotherapeutics</td>
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<td></td>
</tr>
<tr>
<td>N 342: Psychosocial Nursing Concepts</td>
<td>3</td>
<td></td>
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<tr>
<td>N 348: Nursing Care of Childbearing Family</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>N 349: Nursing Care of Children and Families</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>N 354: Acute &amp; Chronic Illness</td>
<td>5</td>
<td></td>
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<tr>
<td>N 377: Introduction to Community-Based Nursing</td>
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<tr>
<td>N 387R: Research in Health Care</td>
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<td></td>
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</tbody>
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*NOTE: Required nursing curriculum courses must be completed with a grade of C or better and no more than one repeat of a course is permitted regardless of when or where taken. The College of Nursing does not accept C as a passing grade in required courses.

Elective credits as required to meet the minimum of 120 required credits for graduation.
UNIVERSITY COLLEGE

Gregory Young, Vice Provost for Undergraduate Education
Jeff Adams, Assistant Vice Provost for Undergraduate Education

Undergraduate Degree and Certificate Programs Available
• B.A. and B.S. in Directed Interdisciplinary Studies
• B.A. in American Studies
• B.A. in Liberal Studies
• University Honors Degree
• MSU Leadership Fellows Certificate

Special Programs for Academic Enrichment
• University Studies Program
• Undergraduate Honors Program
• Undergraduate Scholars Program
• Academic Advising Center
• National Student Exchange

University College offers several important academic programs to students, regardless of major. Undergraduate research and creative activity, interdisciplinary study, thematic research seminars, and major/career exploration are just a few more of the many opportunities available. Specific degree programs include the Bachelor of Arts in Liberal Studies and the Bachelor of Arts or Bachelor of Science in Directed Interdisciplinary Studies. Special programs for academic enrichment include the University Honors Program, the Undergraduate Scholars Program, and University Studies. University College also includes the MSU Advising Center and the National Student Exchange, which are housed in University Studies.

University Studies Program
University Studies (www.montana.edu/wwwus) is the initial academic program, which is not as descriptive as traditional curricula. To complement the advising component of University Studies, students in the program enroll in US 101, the First-Year Seminar, a 3-credit course that fulfills the University Seminar requirement of CORE 2.0. The seminar focuses on helping students reach their academic and intellectual potential through a concentration on critical thinking, verbal and written communication, and academic exploration.

University Honors Program
The University Honors Program (see full description in Special Academic Opportunities at Montana State University) provides opportunities for students to study, conduct research, and exchange ideas in a challenging and supportive academic environment. In addition to learning from outstanding faculty members, Honors students can attend special Honors seminars, take interdisciplinary Honors courses, and engage in independent study and research opportunities.

For details about admission and graduation requirements, contact the University Honors Program Office in Quad D by calling 406-994-4110, sending e-mail to honors@montana.edu or checking www.montana.edu/honors.

Undergraduate Scholars Program
The Undergraduate Scholars Program (USP) continues in its campus leadership role of facilitating and supporting undergraduate research in collaboration with MSU faculty. This program has grown substantially since its inception and now supports approximately 150-200 students annually by awarding grants and/or providing academic credit to students who undertake an investigative or creative project in collaboration with a faculty mentor. For details about the application process, current scholars, funding opportunities, and deadline requirements, contact the Undergraduate Scholars Program Office by calling 406-994-3561, sending e-mail to usp@montana.edu or checking www.montana.edu/usp.

The mission of the Undergraduate Scholars Program (USP) is to encourage, facilitate and support undergraduate research in collaboration with faculty. “Research” in the USP context is interpreted as any scholarly or creative activity ranging from traditional scientific experimentation to the creation of new artistic works.

American Studies
The American Studies program is designed to meet the needs of students, including non-traditional major and lifelong learners, who want to pursue a flexible, multi-disciplinary curriculum in American Studies. Students explore the experience and values of the people of the United States as embodied in their history, literature, art, and other forms of cultural expression. All students are required to choose one of three program focus areas: American Arts, American History, or American Literature.

Liberal Studies
The Liberal Studies curriculum provides a degree designed specifically to meet the needs of students wanting to pursue a flexible cross-disciplinary educational program, which is not as prescriptive as traditional curricula. Some of the most exciting and innova-
tive advances in human knowledge are occurring at the intersections of traditional academic disciplines, and the Liberal Studies degree provides curricular structure that allows students to explore these emerging areas. The intellectual skills provided by rigorous, cross-disciplinary studies are increasingly being recognized as the appropriate foundation for success in a broad range of careers and post-baccalaureate programs ranging from business and management to medicine.

**MSU Leadership Fellows Program**

The MSU Leadership Fellows Program, administered by University College, challenges students to discover their true potential by developing ethical and critical thinking skills as they relate to leadership. Students completing the requirements will receive certificates of completion and have “Leadership Fellow” noted on their academic transcripts. For more information, see www.montana.edu/lf.

**Academic Advising Center**

At MSU, advising is a dynamic process by which advisors serve not only as sources of information but also as mentors. Advising is an integral part of teaching; it provides the opportunity to encourage students to engage in a systematic, strategic planning process and to take responsibility for their personal and professional development.

The Academic Advising Center (AAC) is available to all undergraduate students. The AAC provides professional advising to help students 1) explore their academic strengths and interests, 2) choose a degree program suited to their personal and career goals, and 3) achieve success in their academic pursuits. The AAC also provides services to faculty and staff across campus to support and complement the advising specific to their departments and programs.

**Services for Students**

The AAC offers students advising that addresses their individual needs and interests. The AAC’s advising services focus on students who are in any of the following situations:

- Exploring major options
- Transitioning between majors
- Completing CORE 2.0 requirements
- Transferring from other institutions
- Interested in majors not offered at MSU
- Experiencing limited access to departmental advising
- Provisionally admitted to MSU
- Seeking (or have been denied) admission to competitive degree programs
- Interested in programs for academic enhancement (National Student Exchange, Undergraduate Scholars, etc.)
- Enrolled in University Studies
- Majoring in Liberal Studies or American Studies.

**Services for Faculty and Staff**

AAC services in support of advising across campus consist of the following:

- Informational materials about the AAC for use in referring students
- General academic advising for all freshmen and sophomores, regardless of declared major
- Information and updates on curricula, CORE 2.0, advising scheduling, and deadlines
- Professional development and training for advisors

**National Student Exchange**

University Studies coordinates the National Student Exchange (NSE), a consortium of over 180 state-supported colleges and universities offering students the opportunity to study for up to one year at a university in another part of the United States.

By bringing together students from different areas of the country, NSE encourages participants to broaden their academic, social, and cultural awareness. Through a straightforward admissions process, students are able to enroll at a host institution with the same financial benefits enjoyed by in-state residents. Credits and grades are recorded at MSU-Bozeman as a part of the student’s regular transcript.

**Directed Interdisciplinary Studies**

For undergraduates interested in pursuing an area of scholarly/creative inquiry that falls outside the established departmental structure of Montana State University, a bachelor’s degree in Directed Interdisciplinary Studies is available. Directed Interdisciplinary Studies (DIS) is neither a “double-degree” nor a “major-minor” degree program. Interdisciplinary study is defined as the integration of more than one intellectual or methodological perspective within a field of study (or related fields) identified by the student and approved by the Faculty Advisory Committee (FAC). The FAC consists of three faculty members representing at least three different categories within two academic disciplines.

A DIS major entails an intellectually coherent sequence of course work, seminars, and supervised reading/research projects culminating in a substantial written and/or creative senior year thesis. Students are required to meet with their FAC and file a progress report each semester.

Applicants must have a university GPA of 3.3 and a letter of reference from an adviser chosen from the FAC attesting to the applicant’s self-motivation. B.A. and B.S. DIS degrees must include a minimum of 45 semester credit hours of DIS course work, at least 36 of which must be at the upper-division level at Montana State University. The senior thesis project must represent at least 9 semester credit hours at the upper-division course level. A final oral presentation of the thesis will be presented before the FAC and members of the DIS Oversight Board.

A minimum of 120 semester credit hours is required for graduation. Students will not be eligible for the DIS degree unless they have also satisfied the Montana State University Core Curriculum requirements. Upon satisfaction of the requirements established for each DIS student by the DIS Oversight Board and approval of the student’s college, students will be recommended to the President of Montana State University and the Board of Regents for the B.A. or B.S. in Directed Interdisciplinary Studies (with citation of thesis and GPA honors as determined by established Montana State University regulations).

For details about admissions and an application, contact the University Honors Program Office in Quad D, call 406-994-4110, or send e-mail to honors@montana.edu.
American Studies
University College
http://www.montana.edu/amst/

The American Studies program is designed to meet the needs of students, including non-traditional majors and lifelong learners, who want to pursue a flexible, multi-disciplinary curriculum in American Studies. Students explore the experience and values of the people of the United States as embodied in their history, literature, art, and other forms of cultural expression. All students are required to choose one of three program focus areas, American Arts, American History, or American Literature.

Students must complete a minimum of 45 credits in the program after declaring themselves to be American Studies majors. Up to 12 credits required in a minor or in a second degree program may be applied toward the American Studies degree requirements. Courses taken to complete requirements in the American Studies program may also be used to satisfy University Core requirements.

For details about the American Studies degree, contact the Program Administrator, Scarlet Reierson, at 406-994-3561 or scarlet.reierson@montana.edu, or check the American Studies web site www.montana.edu/amst.

Foundation Courses

All students, regardless of program focus area, must complete the following courses: AMST 201D, Introduction to American Studies, LIT 110IH Intro to Lit, NAS 100D, Introduction to Native American Studies, and PSCI 210IS, Introduction to American Government.

Foreign Language Requirement and Study Abroad

Students are required to take the first two courses in a foreign language (8 credits) or to demonstrate equivalent competency. Additionally, to better understand how America is perceived in the world, students are encouraged (although not required) to spend at least one semester abroad at a Center for American Studies.

Capstone Experience

All students in the major take a common 4-credit capstone course in their final year (AMST 401, Seminar in American Studies). Students will work together in small groups to design solutions to contemporary issues in American society (e.g., immigration). Each small-group project will result in a scholarly product (typically a paper or presentation) that will serve as a measurable indication of the extent to which students have mastered the critical thinking, reading, writing, and oral communication skills that are the principal learning objectives of the program.

American Studies Courses (General and Focus Area Requirements)

With the exception of the foundation courses described above, all courses that apply to the American Studies requirements are listed below. This includes a general component, required of all focus areas, as well as the more specific requirements of the individual focus areas.

American Studies Courses - General Requirement

In consultation with their advisor, students will select 33 credits from the list of American Studies Courses (below). Courses used to satisfy this requirement cannot be used to satisfy other American Studies requirements, although they may count toward CORE 2.0. Students in the American Arts focus area may select no more than 12 credits from Art (ART), Media & Theater Arts (MTA), and Music (MUS). Students in the American History focus area may select no more than 12 credits from History (HIST). Students in the American Literature focus area may select no more than 12 credits from English (ENGL). Regardless of their focus area, all students will complete the following:

One (1) ENGL course
One (1) 300 or 400-level HIST course
One (1) NAS course

ANTH 201 – Human Prehistory
ANTH 204 – Culture & Society
ANTH 310 – Native North America
ANTH 320 – Archeology of North America
ART 203IA – Renaissance through Modern Art History
ART 318 – 19th Century Art
ART 419 – 20th Century Art
ECNS101 – Economic Way of Thinking
ECNS572 – Economic History of the U.S.
PROGRAMS OF INSTRUCTION — UNIVERSITY COLLEGE

AMERICAN ARTS FOCUS AREA (13 cr.)

This focus area explores the ways in which art, architecture, music, and film have shaped, and been influenced by, American values and behaviors. Students must complete the following:

- AMST 202RA – The Arts in America
- MUSI 203IA – American Popular Music: Reflections of Politics & Society
- LIT 210 – American Lit I
- LIT 211 – American Lit II

or

- HSTA 101IH – American History I
- or
- HSTA 102IH – American History II
- or
- HSTA 160D – Introduction to the American West

Freshman Year

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<tr>
<td>AMST 101D (Formerly AMST 201D)</td>
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<td>Modern Language</td>
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Sophomore Year

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<td>LIT 110IH</td>
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<td>HSTA 101IH or 102IH or 160D</td>
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<td>MUSI 203IA – American Popular Music:</td>
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<td>Reflections of Politics &amp; Society</td>
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Junior Year

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Senior Year

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<td>Focus Area requirements</td>
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A minimum of 42 credits must be in courses numbered 300 and above. In addition to AMST 401, at least 9 credits must be in courses numbered 400 and above.

*Students have the option to take WRIT 101W in the spring semester and 3 additional university core electives in the fall semester.

AMERICAN HISTORY FOCUS AREA (18 cr.)

Students will acquire a broad understanding of the major events and processes of American history, and of the ways in which modern American society has been shaped by its historical development. Students must complete the following:

- HSTA 101IH – American History I
- HSTA 102IH – American History II
- HSTA 160D – Introduction to the American West
- AMST 202RA – The Arts in America
- or
- MUSI 203IA – American Popular Music: Reflections of Politics & Society
- LIT 210 – American Lit I
- or
- LIT 211 – American Lit II

Freshman Year

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Sophomore Year

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A minimum of 42 credits must be in courses numbered 300 and above. In addition to AMST 401, at least 9 credits must be in courses numbered 400 and above.

*Students have the option to take WRIT 101W in the spring semester and 3 additional university core electives in the fall semester.

AMERICAN LITERATURE FOCUS AREA (13 cr.)

This focus area will examine critical approaches to studying the American literary tradition, and its relationship to the major social and cultural movements of American history. Students must complete the following:

- AMST 202RA – The Arts in America
- or
- MUSI 203IA – American Popular Music: Reflections of Politics & Society
- LIT 210 – American Lit I
- LIT 211 – American Lit II
- HSTA 101IH – American History I,
- or
- HSTA 102IH – American History II
- or
- HSTA 160D – Introduction to the American West

Freshman Year

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Senior Year

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*Students have the option to take WRIT 101W in the spring semester and 3 additional university core electives in the fall semester.

Liberal Studies

University College

http://www.montana.edu/lsdegree/

All students are required to choose one of two program options, either the Quaternity (option I), which offers the more traditional broad-based liberal arts education, or a cross-disciplinary cluster of thematically related courses (option II), which currently includes the Environmental Studies and the Global and Multicultural Studies options. Courses that are used to satisfy one degree requirement cannot be used to satisfy another. Students must complete a minimum of 45 credits in the program after declaring themselves to be Liberal Studies majors.

Students who have successfully completed the first two years of any MSU-Bozeman degree with a minimum of 60 credits (all degree requirements and completion of the university core) will be able to construct a program of study for completion of the Quaternity option, in consultation with the Program Director and the Liberal Studies Program Committee, requiring no more than 60 additional credits.

For details about the Liberal Studies degree, contact the Office of the Provost by calling 406-994-4371, sending e-mail to liberalstudies@montana.edu or checking the liberal studies web site at www.montana.edu/lsdegree.
PROGRAMS OF INSTRUCTION — UNIVERSITY COLLEGE

Liberal Studies Seminars
All students in Liberal Studies, regardless of option, will take a series of integrative seminars (LS 101 and LS 301). These seminars are designed to provide a sense of academic community, improved critical thinking and communication skills, and a better understanding of the factual knowledge and theoretical foundations of the disciplines encompassed by the arts, humanities, natural sciences, and social sciences.

Integrative Studies Requirement
Students are required to take 4 courses (minimum of 12 credits) in addition to the university’s Core curriculum, one course each in arts, humanities, natural science, and social sciences.

Foreign Language Requirement
Students in the Quaternary option are to complete the first two courses in a foreign language (8 credits) or to demonstrate equivalent competency. Students in the Global and Multicultural option are to complete the first three courses in a foreign language (11 credits) or to demonstrate equivalent competency.

Capstone Experience
All students in the major take a common 4-credit capstone course in their final year. Students work together in small groups to design solutions to contemporary public policy issues (e.g., overpopulation). Each small-group project results in a scholarly product (typically a paper or presentation) that serves as a tangible and measurable indication of the extent to which students have mastered the critical thinking, reading, writing, and oral communication skills that are the principal learning objectives of the program.

ENVIRONMENTAL STUDIES OPTION
This option is designed for students interested in developing a broad understanding of environmental issues from scientific and public policy perspectives. In addition to some common foundations courses, students select 21 credits each from approved lists of science and public policy courses. Proposed substitutions must be submitted in writing to the Program Director.

International Studies Option
This option is designed for students interested in a global perspective on natural resource management. Students select 21 credits each from approved lists of science and public policy courses. Proposed substitutions must be submitted in writing to the Program Director.

Capstone Experience
All students in the major take a common 4-credit capstone course in their final year. Students work together in small groups to design solutions to contemporary public policy issues (e.g., overpopulation). Each small-group project results in a scholarly product (typically a paper or presentation) that serves as a tangible and measurable indication of the extent to which students have mastered the critical thinking, reading, writing, and oral communication skills that are the principal learning objectives of the program.

GLOBAL AND MULTICULTURAL STUDIES OPTION
In addition to selecting 27 credits from an approved list of global/multicultural courses spanning a wide range of disciplines, students in this option select a specific area studies focus in which they take 12

Freshman Year
F  S
LS 101 ..............................................................5
WRIT 101W** ..................................................3
BIOL 101 ......................................................4
GPHY 111 ......................................................4
STAT 216Q ...................................................3
GPHY 121D ...................................................3
University Core: .................................5 ..........2
Electives ..................................................5 ..........5
15 15

Sophomore Year
F  S
LS 301 ..............................................................1
Integrative Studies: .............................6 ......6
Natural Science Electives** .........................6
Public Policy Electives*** .........................3
University Core: .................................3 ......2
Electives ..................................................3 ......5
15 15

Junior Year
F  S
LS 301 ..............................................................1
PHIL 340 ...........................................................3
Natural Science Electives** .........................3 ......6
Public Policy Electives*** .........................3 ......6
University Core: .................................5 cigarettes
Electives ..................................................2 ......3
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A minimum of 42 credits must be in courses numbered 300 and above. In addition to LS 401, at least 9 credits must be in courses numbered 400 and above.

* Students have the option to take WRIT 101W in the spring semester and 3 additional university core electives in the fall semester.

** Natural science electives to be selected from: AGEC 315 – Follow the Grain
ARNR 101 – Natural Resource Conservation
ARNR 102 – Principles of Rangeland Management
ARNR 125 – Nature of Yellowstone
ARNR 240 – Natural Resource Ecology
ARNR 345 – Riparian Ecology & Management
ARNR 353 – Grazing Ecology & Management
ARNR 354 – Fire Ecology & Management
ARNR 425 – Wildlife Ecology Lab
CHMY 123 – Intro to Organic & Biochem
Biol 102 – Environmental Science & Society
Biol 106 – Insects & Human Society
Biol 251 – Botany: An Introduction to Plant Biology
Biol 305 – Principles of Ecology
Biol 405 – Behavioral & Evolutionary Ecology
Biol 407 – Alpine Ecology
Biol 421 – Yellowstone Wildlife Ecology
Biol 424 – Freshwater Ecology
Biol 439 – Stream Ecology
Biol 447 – Conservation Ecology
CHMY 102 – Analytical Chemistry to Society
CHMY 121 – Intro to General Chemistry
CHMY 451 – Honors Chemistry I
CHMY 145/153 – College/Honors Chemistry II
EART 312 – Yellowstone Scientific Lab
ERTH 367 – Principles of Geomorphology
ERTH 342 – Surface Water Resources
ERTH 440 – Hydrogeology

F&W 301 – Principles of Fish & Wildlife Management
GPHY 441 – Biogeography
ERTH 305 – Weather & Climate
GPHY 441 – Mountain Geography
GEO 103 – Intro to Environmental Geology
GEO 211 – Early History and Evolution
LRES 110 – Land Resources & Environmental Sciences
LRES 291 – Soil Resources
LRES 244 – Introduction to Water Resources
LRES 344 – Water Quality
LRES 351 – Nutrient Cycling
LRES 355 – Soil & Environmental Chemistry
LRES 425 – Remote Sensing
LRES 444 – Watershed Hydrology
LRES 455 – Soil & Environmental Physics
LRES 454 – Landscape Pedology
LRES 460 – Soil Remediation
LRES 461 – Restoration Ecology
MBEH 210 – Principles of Environmental Health Science
PSPP 102 – Plant Science – Resources & the Environment
PSPP 105 – Miracle Growing Intro to Horticulture
PSPP 424 – Ecology of Fungi
UNIV 125 – Microbes & the Environment.

*** Public policy electives to be selected from:
AGEC 210 – Economics of Agricultural Business
AGEC 337 – Agricultural Law
AOT 425 – Water Management
ARNR 456 – Conflict Resolution in Natural Resource Management
BREN 350 – Waters Resources Law
ECNS 101 – Economic Way of Thinking
ECNS 352 – Econ & the Environment
ECNS 357 – Economic Development
ECNS 352 – Econ of Natural Resources
LIT 414 – Lit of Place
GPHY 141 – Geography of World Regions
GPHY 284 – Intro to GIS Science & Cartography
GPHY 365 – Geographical Planning
GPHY 391 – Urban Geography
GPHY 392 – Economic Geography
GPHY 461 – Tourism Planning
HSTA 468 – History of Yellowstone
HSTA 470 – American Environmental History
HIST 484 – World Environmental History
LRES 421 – Holistic Thought & Management
MGMT 406 – Negotiation & Dispute Resolution
MGMT 473 – Modern Management of Western Resources
PSCE 310 – Intro to American Government
PSCE 390 – Intro to State and Local Govt
PSCE 360 – Legislative Process
PSCE 365 – Pub Policy Issues and Analysis
PSCE 411 – Montana Local Politics
PSCE 456 – Politics of Food and Hunger
REL 223 – Nature & Culture
SOCI 355 – Population & Society
SOCI 470 – Environmental Sociology
SOCI 352 – Society & Consumption.

Up to 12 credits required in a minor or in a second degree program may be applied toward the Natural Science and Public Policy electives.
additional credits to provide deeper understanding of that region or field of study. In addition, students are required to achieve competence at an intermediate level, in a foreign language appropriate to their field of area studies. Students in this option are encouraged to study abroad in a region appropriate to their field of area studies. Credits earned abroad may, with the approval of the Program Director, be substituted for global/multicultural or area studies courses as appropriate.

**Freshman Year**

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* Students have the option to take WRIT 101W in the spring semester and 5 additional university core electives in the fall semester.

**Global and multicultural electives to be selected from:

ANTH 101 – Anthropology & the Human Experience
ANTH 204 – Culture & Society
ANTH 220 – Language & Culture
ANTH 405 – Myth – Magic & Religion
ARCH 221 – World Architecture: Modern-Contemporary
ARCH 322 – World Architecture: Ancient
ARCH 325 – World Architecture: Medieval-Baroque
ART 407 – Islamic Art & Architecture
ECNS 314 – International Economics
ECNS 317 – Economic Development
EDCT 240 – Introduction to Multicultural Education
EDEL 307 – Teaching the Multicultural Child
EDSS 365 – Multicultural Education
LIT 285 – Mythologies
LIT 214 – Regional Lit
LIT 508 – Multicultural Lit
LIT 440 – Studies in World Lit
ENGL 436 – Studies in Emergent Lit
GPHY 141, Geography of World Regions
GPHY 121 – Human Geography
GPHY 252 – Cultural Geography
HDPE 410 – International Perspective of History & Philosophy in Health – Sport & Physical Education
HHD 205 – Dance as Cultural Expression
HISTR 160 – Modern World History
HISTR 366 – Middle East/20th Century
HSTA 416 – Race & Class in America
HISTR 484 – World Environmental History
MGMT 245 – Cultural Dimensions of International Business
MGMT 464 – International Management
MKTG 242 – Introduction to Global Markets
MKTG 411 – International Marketing
MUN 312 – World Music
PHIL 105 – Problems of Good & Evil
PHIL 208 – Philosophy & Culture
PHIL 201 – Introduction to Philosophy
PHIL 362 – Philosophy & Race
PHIL 368 – Language & the World
PSCI 230 – Introduction to International Rel
PSCI 341 – International Relations Theory
PSCI 454 – International Law
PSCI 436 – Politics of Food & Hunger
PSCI 439 – International Human Rights
PSCI 437 – International Political Econ
PSCI 435 – Globalization & Politics
RELS 105 – Introduction to the Study of Religion
RELS 110 – Religion – Conflict & Politics
RELS 355 – The Religious Background of Social & Political Categories
RELS 402 – The Natural – The Unnatural & the Supernatural
RELS 410 – Psyche & the Sacred
SOCI 345 – Sociology of Race & Ethnicity
SOCI 436 – Law and Inequality
SOCI 358 – Crime and Inequality
SOCI 352 – Society & Consumption

With consent of the program director, courses from the Area Studies categories below, excluding Europe, may be applied as Global and Multicultural Electives.

***Area studies electives to be selected from courses on one of the following areas.

**Asia**

ANTH 252 – Contemporary Japan
ANTH 336 – Contemporary Pacific Societies
ANTH 347 – Sex – Gender & Sexuality in Japan
ANTH 353 – Popular Culture In/Out of Japan
ART 302 – Survey of Asian Art
GPHY 436 – East Asia in the Global System
HISTR 140 – Modern Asia
HISTR 145 – History of Japan
HISTR 340 – Age of the Shoguns
HISTR 342 – Japan’s Long 19th Century – HISTR 345 – Modern China
HISTR 346 – Modern India – Pakistan & Bangladesh
HISTR 444 – Japanese Women’s History
HISTR 446 – Science & Medicine in China
HISTR 489 – Creatures: Art and Biology from Early Modernity to Now
HISTR 485 – Cab of Cur: Travels of Exotica
HISTR 445 – Sci – Tech & Environment in Japan
HISTR 443 – Gender in Asia
PINS 350 – Japanese Cult & Civl
PINS 352 – Japanese Portraits of WWVII
PINS 315 – Introduction to Japanese Literature
PINS 320 – Classical Japanese Literature
PINS 321 – Modern Japanese Literature
PINS 325 – Women in Japanese Literature & Culture
PINS 361 – Text & Cinema
PINS 371 – Japanese Film & Anime
PHIL 220 – Philosophies of Asia
RELS 992 – Asian Religions & Philosophy in Health – Sport
RELS 205 – Asian Religions: From Taoism to Zen.

**Europe**

ART 205 – Renaissance through Modern Art
LIT 223 – British Lit I
LIT 224 – British Lit II
LIT 225 – Brit/Old/Middle English
LIT 324,16th/17th Cntry Brit Lit
LIT 325 – Rest/18th Cntry Brit Lit
LIT 326 – 19th Century British Lit
LIT 473 – Studies in Shakespeare
HISTR 101 – Origins of Western Civilization
HISTR 192 – Western Civilization II
HISTR 359 – Russia to 1917
HISTR 322,19th Century Europe
HISTR 324 – 20th Century Europe
HISTR 350 – Modern Britain
HISTR 353 – Modern France
HISTR 362 – Modern Germany
HISTR 372 – The World at War: WWII
HISTR 423 – European Intellectual History
FRCH 306 – From Reflection to Revolution
GRMN 350 – Adv Gram,Conv – Comp I
GRMN 303 – Issues in German Cinema
GRMN 360 – The Faust Myth
MUN 210 – Masterworks in Music
PHIL 305 – History of Western Philosophy: Ancient & Medieval
PHIL 306 – History of Western Philosophy: Modern
PHEL 390 – Reason & Revolution
PSCI 451 – Ancient & Medieval Pol Phil.

**Latin America**

HISTR 130 – Latin American History
HISTR/RELS 232 Religion in Latin America
HISTR 330 – History of Mexico
HISTR 432 – Colonial Latin America
HISTR 430 – Latin Amer Soc History
HISTR 431 – Race in Latin America
HISTR 434 – Gender – Sexuality & Social Change in Latin America
SPNS 330 – Latin Amer Cult & Civ
SPNS 332 – Contemporary Latin American Literature
SPNS 335 – Travel in Latin American Lit & Film
SPNS 362 – Hispanic Poetry
SPNS 416 – Culture & Revolution
SOCIO 368 – Latino Immigration: Latinos in the US.

**Native American Studies**

ANTH 310 – Native North America
ART 316 – Indigenous Ceramics
HISTR 430 – History of American Indians
HISTR 100 – Introduction to Native American Studies
NANS 201 – American Indians in Montana
NANS 229 – American Indian Art
NANS 240 – NANS Theories & Methods
NANS 242 – American Indians in Contemporary Society
NANS 315 – Native American Indians & the Cinema
NANS 329 – American Indian Religions
NANS 325 – Native Peoples of the Americas
NANS 330 – American Indian Policy & Law
NANS 340 – American Indian Literature
NANS 405 – Gender Issues in Native American Studies
NANS 415 – Native Food Systems
NANS 345 – Pan-Indianism in American Society
NANS 430 – American Indian Education.

**Women’s Studies**

ANTH 347 – Sex – Gender & Sexuality in Japan
ART 421 – Women Artists
ENGL.330 Women & Literature
HDHL 240 – Human Sexuality
HISTA 407 – Gender in US & Canadian West
HISTA 408 – Gender in America
HISTR 414 – Women’s History
HISTR 410 – Fam,Gen & Law in Antc Grc./Rome

PROGRAMS OF INSTRUCTION – UNIVERSITY COLLEGE 195
**University Honors Program**

University life serves many ends, but an essential component of higher education is to prepare students to better understand themselves, others and the increasingly complex world around them. Undergraduate education in particular has the goal of helping students become, in time, their own best teachers. At Montana State University, the University Honors Program addresses this goal by providing academically motivated students with unique opportunities to undertake interdisciplinary course work and undergraduate research leading to a university honors degree. Such studies, in addition to courses within their chosen discipline, provide extraordinary preparation for professional and technical careers, or graduate and advanced studies.

Entering students have the opportunity to undertake innovative studies during their freshman year. Texts and Critics: Knowledge and Imagination are both semester-long seminars that address fundamental issues in the humanities, social sciences, natural sciences, and the fine arts through critical reading and analysis of seminal texts which serve as a foundation for advanced studies in major disciplinary fields. Instructed by faculty representing every college at the University, Texts and Critics earns University Seminar honors. Admission is normally limited to students in public schools.

**Special Honors sections of departmental courses in Chemistry, Physics, Math, Music, English, Biology, Sociology, Spanish and Economics are also offered. Limited enrollment in seminars and classes permits lively discussion and interactive study among faculty and students.**

**Great Expeditions is an annual Honors course that involves two-weeks of international travel following a semester of study pertinent to the expedition theme. After travel is completed, students present a public symposium highlighting the results of their journey.**

**Mentoring Gifted Students**, a service-learning course, enables students to work with gifted and talented students in public schools.

**Additional opportunities for independent study are available through Honors contracts, which are offered primarily at the upper-division level. Contracts often provide students the opportunity to undertake independent studies in the humanities, social sciences, natural science or Mathematics, or social sciences.**

**Students have the option to take WRIT 101W in the spring semester and 5 additional university core electives in the fall semester.**

**A minimum of 42 credits must be in courses numbered 300 and above. In addition to LS 401, at least 9 credits must be in courses numbered 400 and above. Up to 6 credits required in a minor or in a second degree program may be applied toward the 12 credit elective requirement in arts, humanities, natural science or Mathematics, or social sciences.**

---

**Programs of Instruction — University College**

- HSTR 434 – Gen & Sex & Soc Chge in Lat Am
- HSTR 415 – Gender & Technology
- HSTR 445 – Gender in Asia
- HUM 204 – Gender & Sexuality
- JPSN 325 – Women in Japanese Lit & Cult
- NAS 405 – Gender Issues in Native American Studies
- PHL 363 – Philosophy & Feminism
- PSYX 235 – Contemp Issues in Human Sexual
- PSYX 335 – Psychology of Gender
- RELS 321 – Gender & Religion
- SOCI 326 – Sociology of Gender
- WS 201 – Introduction to Feminist Theories & Methodologies
- WS 301 – Integrative Seminar in Women’s Studies
- **QUATERNITY OPTION**

The Quaternity option is a student-centered option that aims at exploring four different but interconnected concepts of knowledge-thinking, feeling, intuition, and sensation-which are derived from the complex interaction of myths (story, fable, imagination) and logos (truth, fact, reality). Students in the Quaternity are expected to approach and to interrogate all of their courses through this epistemological lens, and to demonstrate that they have done so through writing assignments in the Liberal Studies seminars and other course assignment.

In addition to the integrative seminars, university core, and liberal studies requirements described above, students in the Quaternity require a foreign language (8 cr.) and an additional 4 courses (12 cr.) in each area of the quaternity - arts, humanities, natural science or Mathematics, and social sciences.

**Freshman Year**

- **F**
  - LS 101 .............................................. 3
  - WRIT 101W** ................................ 3
  - Modern Language ................................ 4
  - University Core ................................ 3
  - Electives ........................................ 2
  - Total ........................................... 15

**Sophomore Year**

- **F**
  - LS 301 .............................................. 1
  - Integrative Studies ................................ 6
  - Quaternity Electives* ......................... 6
  - University Core ................................ 6
  - Electives ........................................ 3
  - Total ........................................... 15

**Junior Year**

- **F**
  - LS 301 .............................................. 1
  - Integrative Studies ................................ 3
  - Quaternity Electives** .................... 9
  - Electives ........................................ 2
  - Total ........................................... 15

**Senior Year**

- **F**
  - LS 301 .............................................. 1
  - LS 401 .............................................. 1
  - Quaternity Elective* ....................... 12
  - Electives ........................................ 2
  - Total ........................................... 15
3.5 overall grade-point average; and one-year (or its equivalent) of a foreign language. To graduate with Highest Distinction, a thesis and a minimum cumulative 3.7 GPA are required. Students with energy, self-reliance, and imagination should discuss their interest with the Director.

For details about admission and graduation requirements, contact the University Honors Program Office by calling 406-994-4110, or by sending an e-mail to honors@montana.edu. In addition, we encourage you to visit the Honors website at www.montana.edu/honors.

MSU Leadership Fellows Certificate

The MSU Leadership Fellows Certificate, www.montana.edu/lf, administered by University College, challenges students to discover their true potential by developing ethical and critical thinking skills, leadership skills and leadership effectiveness. It is intended that these students will become effective agents of positive change in society.

16 total credits of leadership course work are required for the certificate. Four credits are the foundational and capstone courses: Leadership Foundations (UC 202, 3 credits) and Leadership Capstone (UC 302, 1 credit). Within both courses, students will practice leadership skills by engaging in 10 hours of community/campus service and participating in MSU leadership events.

The remaining 12 credits are fulfilled from the approved list of Leadership Electives. Students may take a maximum of 6 credits in their Major/Minor toward the Leadership Electives. This list of electives does change, so please ensure you have the most recent version by emailing cmcspadden@montana.edu. Additional courses may be petitioned for approval by the program committee.

Students interested in pursuing the MSU Leadership Fellows Certificate will be asked to declare their interest prior to or at the start of UC 202. This declaration can be made by emailing cmcspadden@montana.edu. During UC 302, students will complete an application to receive their certificate upon graduation. Also, MSU Leadership Fellow will be noted on their academic transcripts and may also be listed on the student’s resume.

Other requirements: 1) Earn a grade of “C” (2.0) or better in each course used to satisfy the certificate 2) No “credit by exam” may be used.

<table>
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<th>Course</th>
<th>Credits</th>
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<tr>
<td>UC 202-Leadership Foundations</td>
<td>3</td>
</tr>
<tr>
<td>UC 302-Leadership Capstone</td>
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<tr>
<td>Leadership Electives</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
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COLLEGE OF TECHNOLOGY

Bob Hietala, Chief Operations Officer/Assistant Dean for Bozeman campus
Janet Heiss Arms, Director of Developmental Education
Ryan Haskins, Director of Workforce Programs
Joseph Schaffer, Dean/CEO of MSU-Great Falls COT

The College of Technology in Bozeman offers academic development services, college preparatory courses, Associate of Applied Science degrees in Interior Design, Design Drafting, and Aviation, and a Certificate of Applied Science in Welding.

Academic Development Center

The College of Technology’s academic success initiatives provide the courses, services, and support necessary for students to be academically successful. To be successful, most college students need courses that are at the level that will challenge, but not frustrate them. College preparatory courses offered by the College of Technology in Bozeman provide courses below core level to allow students to sharpen their skills and understanding before they take on higher levels of Math and Writing.

Services
- Free Math tutoring and Writing Center
- Well-equipped and comfortable student computer lab
- Assistance with admissions, application, financial aid, academic advising, and other administrative processes for COT programs
- Referral for community and Montana State University resources
- Assessment testing and placement
- Test proctoring for online courses

College Preparatory Courses

Preparatory courses are available to MSU students through regular registration processes. These courses count as part of the student’s full-time course load, appear on their transcripts, and are paid for along with any other MSU courses. Preparatory courses are designed to develop skills to ensure student success in follow-on courses in respective MSU curricular areas. High quality instruction, small class sizes, and out-of-class support are hallmarks of the College of Technology in Bozeman.

- OOLS 100: Effective Academic Practices
- OOLS 101US: First Year Seminar
- WRIT 080: Basic Writing Skills
- WRIT 095: Developmental Writing
- M 065: Pre-Algebra
- M 096: Survey of Algebra

Transfer Degree Programs (Online)
- MT University Core Associate of Arts
- Associate of Science
- Associate of Applied Science in Health Information Technology
- Certificates of Applied Science in Health Information Coding, Medical Billing, and Medical Transcription

Associate of Applied Science Degrees

The Associate of Applied Science (AAS) degree is awarded in specific career fields. This degree is designed to prepare students for immediate entry into employment but may be fully or partially transferable to programs at four-year universities. Students are encouraged to speak with the program director or academic advisor about their academic and career plans to determine potential for transfer.

Aviation

Students completing the AAS in Aviation will have credentials required to pursue a career as a professional pilot. Job opportunities in the Aviation industry range from high-profile occupations as pilots for national or
regional carriers, to less well-known but in-demand work as pilots for cargo services, air taxis, media aircraft and corporate aviation. New graduates typically begin their careers as flight instructors or military pilots. Students who combine the AAS with a Bachelor’s degree in a related field will be especially competitive in the entry level job market.

Completion of the AAS in Aviation requires that students contract with a flight school recommended by the Aviation Science Advisory Council to complete flight training requirements leading to a Private Pilot Certificate, Commercial Pilot Certificate, and Instrument Rating.

Upon submission of these Certificates the students will receive credit for the following courses:

- AST 142-Private Pilot (50 flight hours) 2 credits
- AST 242-Commercial/Instrument I (75 flight hours) 2 credits
- AST 252-Commercial/Instrument II (125 flight hours) 2 credits

Students may choose to take flight training at any point during their course of study. They may also enter the program having already completed flight training.

Students who have not completed flight training are strongly encouraged to follow a sequence of courses outlined by the Aviation Program Advisor.

### Interior Design

The Interior Design program has been developed to prepare students with a wide variety of skills and competencies for entry into various areas of the design field, ranging from residential to commercial design. The College of Technology in Bozeman program is working to become National Kitchen and Bath Association (NKBA) accredited school.

Graduates are prepared to:

- Understand the theory and history of design and apply design principles and elements to their projects.
- Communicate in the language of interior design using listening, verbal, and written skills to interact with clients.
- Communicate graphically according to current architectural and NKBA standards using both hand-drafting and AutoCAD techniques.
- Demonstrate research abilities and critical thinking in space planning, selection of finish materials, and application of codes for residential and commercial projects.
- Increase their body of knowledge in a wide variety of areas including construction and finish materials, color and lighting technologies, NKBA guidelines, residential and commercial codes, sustainability, and professional practice.
- Employ creative skills to create presentations of their projects using hand- and AutoCAD drafting and rendering and professional sample boards and finish schedules.

### Design Drafting Technology

Design drafters translate the ideas and rough sketches of engineers and architects into technical drawings and plans used for manufacturing, aircraft, architecture, civil engineering and other industries. Upon completion of the Associate of Applied Science AAS in Design Drafting Technology, students will have the qualifications necessary for entry level drafting jobs in the design drafting industry.

Graduates are prepared to:

- Create detail and assembly drawings to American National Standards Institute (ANSI) standards on the drawing board.
- Produce detail and assembly drawings using computer-aided design software (CAD).
- Generate two-dimensional solid models using CAD software.
- Create a complete set of residential plans using CAD software.
- Construct a site plan including topography using CAD software.
- Solve graphical problems using the principles of descriptive geometry and create thematic maps from GIS data.

### Welding Technology

Upon completion of this program, students are AWS qualified welders in one or more welding processes and are eligible to apply to be listed in the AWS National Registry of Welders.

Graduates are prepared to:

- Make satisfactory welds in all positions using the following welding types:
  - Shielded Metal Arc Welding (SMAC)
  - Gas Metal Arc Welding (GMAW)
  - Flux Cored Arc Welding (FCAW)
  - Gas Tungsten Arc Welding (GTAW)
- Make satisfactory cuts with the following processes:
  - Oxygen Fuel Cutting (OFC)
  - Plasma Arc Cutting (PAC)
  - Air Carbon Arc Cutting (ACC)
  - Interpret welding blueprints and welding symbols.
  - Perform pipe layouts.
  - Utilize basic welding metallurgy.

### Accreditation

MSU-Great Falls College of Technology is accredited through the Northwest Commission on Colleges and Universities.

Contact Information:

201 Culbertson Hall
Tel:(406) 994-5536
Fax:(406) 994-5577
bozeman.msugf.edu
## DIVISION OF GRADUATE EDUCATION

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

### DIVISION OF GRADUATE EDUCATION

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**Division of Graduate Education**

**Graduate Education at Montana State University**

http://www.montana.edu/wwwdg/

**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 life-style 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 pro-
grams 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 web site 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 Agricultural Economics and Economics
www.montana.edu/ECNS/docs/graduate.html
• Master of Science in Applied Economics

Division of Agriculture Education
www.ag.montana.edu/ageducation/
• Master of Science in Agricultural Education – administered through Division of Agricultural Education/ Agricultural Operations Technology

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
www.arch.montana.edu/program/degrees/masters.htm
• Master of Architecture

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

College of Business
www.montana.edu/cob/Graduate/MPAc2002.htm
• Master of Professional Accountancy

Department of Cell Biology and Neurosciences
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
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 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/ecology/current_pages/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)
• Education Specialist (options in Adult and Higher Education, Curriculum and Instruction, and Education Administration)
• Doctor of Education (options in Adult and Higher Education, Curriculum and Instruction, and Education Administration)
Department of Electrical and Computer Engineering
www.coe.montana.edu/ee/research/eegrad1.htm
- Master of Science in Electrical Engineering
- Doctor of Philosophy in Engineering (option in Electrical & Computer)

Department of English
www1.english.montana.edu/index.php?s=graduate
- Master of Arts in English

Division of Graduate Education Programs
www.montana.edu/msse
- Master of Science in Science Education (interdisciplinary)

Department of Health and Human Development
www.montana.edu/wwwwhd/academicprograms/graduate/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/wwwhi/
- Master of Arts in History
- Doctor of Philosophy in History

Department of Land Resources and Environmental Sciences
http://landresources.montana.edu/
- Master of Science in Entomology (coordinating department)
- Master of Science in Land Rehabilitation
- Master of Science in Land Resources and Environmental Sciences
- Doctor of Philosophy in Ecology and Environmental Sciences

Department of Mathematical Sciences
www.M.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)

School of Film and Photography
http://naturefilm.montana.edu/
- Master of Fine Arts in Science and Natural History Filmmaking

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/wwwnu/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/student-Grad.htm
- Master of Science in Entomology (interdisciplinary)
- Master of Science in Plant Pathology
- Master of Science in Plant Science
- Doctor of Philosophy in Plant Science

Department of Political Science
www.montana.edu/wwwpo/mpaprogram/
- Master of Public Administration

Department of Psychology
www.montana.edu/wwwpy/
- Master of Science in Psychological Science

Department of Veterinary Molecular Biology
http://vmb.montana.edu/graduate/
- Master of Science in Veterinary Molecular Biology
- Doctor of Philosophy in Veterinary Molecular Biology

Interdisciplinary Programs
http://montana.edu/gradstudies/
- IGERT: Geobiological Systems
- Master of Science in Ecological and Environmental Statistics
- Master of Science in Science Education

Molecular Biosciences Program
- Doctor of Philosophy in Ecology and Environmental Sciences

Graduate Web Pages
The Division of Graduate Education web pages include an online application and instructions on how to apply for a graduate degree program. Information about research opportunities at MSU, graduate assistantships, fellowships, scholarships,
degree requirements, and other policies and procedures can be found online. For further information, contact the department you are interested in, or visit the DGE web pages at www.montana.edu/wwdg. We look forward to discussing Montana State University’s graduate education possibilities with you.

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: 406-994-6696

ag.montana.edu/agededucation/
aged@montana.edu

Professor
- Martin Frick; program planning and evaluation, curriculum, power mechanics, cooperative business education; international agriculture (406) 994-5773; mfrick@montana.edu

Associate Professor
- 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 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.

Program Requirements
- M.S. in Agricultural Education

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.

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 regarding 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
The Department of Land Resources and Environmental 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 the 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 one upper level (400 or 500) course in statistics.
3. Students must declare either the Animal Science, Range Science or Biology Emphasis:
   a. Course requirements for students in the Animal Science Emphasis:
      · At least two courses from the Graduate Animal Science block (must be 500 level course)
   b. Course requirements for students in the Range Science Emphasis:
      · At least two courses from the Graduate Range Science block (must be 500 level course)
   c. Course requirements for students in the Biology Emphasis:
      · At least two biology-related 500-level courses in their area of emphasis

AND
· At least one course from the Graduate Animal Science block or Range Science block
· NOTE: students emphasizing meat science in the Biology Emphasis can substitute BCHM 441–Biochemistry of Macromolecules for one of the two 500-level courses.

Graduate Animal Science Block

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<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 525 Advanced Physiology</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 524 Advanced Animal Breeding</td>
<td>3</td>
</tr>
<tr>
<td>ARNA 525 Muscle and Growth Biology</td>
<td>3</td>
</tr>
</tbody>
</table>

Graduate Range Science Block

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARNR 541 Range Ecophysiology</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 Animal 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.

**Grazing Management**
(ARNR 333 – Grazing Ecology and Management)

**Plant Ecology**

**Plant Identification**
(ARNR 350 – Range Vegetation Or BIOL 434 – Agrostology)

**Plant Physiology**
(FSP 450 – Plant Physiology Or ARNR 541 – Range Ecophysiology)

**Vegetation Measurements**
(ARNR 453 - Habitat Inventory and Analysis)

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 course work 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. 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.
• Biology (BIOL 213, 214, 215 – Introductory Biology)
• Ecology (BIOL 303 – Principles of Ecology; BIOL 405 – Behavioral & Evolutionary Ecology)
• Chemistry (CHMY 151, 143 – College/Honors Chemistry I; CHMY 211 - Elements of Organic Chemistry; CHMY 311 – Analytical Chem-Quant Analysis; CHMY 311, 312 – Organic Chemistry)
• Biochemistry (BCHM 340 – General Biochemistry)
• Entomology (BIOL 204N – Insect Biology)
• Food Science / Meat Science (Introductory Food Science or upper division food science or food safety course)

Requirements for Ph.D. in Animal & Range Sciences
PhD students in Animal and Range Sciences will be required to take 5 credits of ARNR 507 Research Methods. All PhD programs must comply with the Division of Graduate Education, including 60 credits hours (18 which must be dissertation credits) above the B.S. degree. Beyond this there are no specific minimum course requirements for the PhD program. Specific requirements are to be decided by 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
Dr. Wendy Stock

Professors
• J.A. Atwood; production economics, agricultural finance.
• G.W. Brester; agricultural marketing.
• R.K. Flester; public choice, public finance, economic history.
• 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.

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

Assistant Professors
• D.A. Griffith; farm management, computer assisted decisions.

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:

**Required Core Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEC 467</td>
<td>Quantitative Methods in Economics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 401</td>
<td>Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 501</td>
<td>Advanced Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 502</td>
<td>Macroeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 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 ECNS 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 ECNS 570, AGEC 570, ECNS 580, or AGEC 580 can 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 Division of Graduate Education 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 can be completed in two semesters. The thesis must be acceptable to the student’s graduate committee and to the Division of Graduate Education, 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 (ECNS 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) can be completed in two semesters. The paper must be original, of professional quality (meet style and format requirements set forth in the Division of Graduate Education’s 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 Vice Provost for Graduate Education 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
resinfo@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. Tracy M. Sterling
330 Leon Johnson Hall
(406) 994-4605

Professors
• J.W. Bauder; soil and water quality management.
• W.P. Inskeep; soil chemistry.
• R.L. Lawrence; remote sensing, GIS, spatial analysis.
• B.D. Maxwell; agroecology and weed biology.
• T.R. McDermott; soil ecodynamics 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.
• D.M. Ward; microbial ecology.

Associate Professors
• R.E. Engel; soil nutrient management and plant nutrition.
• B.L. McGlynn; watershed hydrology.
• 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.

Assistant Professors
• J. Brookshire; biogeochemistry.
• S.S. Ewing; biogeochemistry.
• C. M. Foreman (research); microbial ecology.
• C.A. Jones; soil fertility and nutrient management.
• L.A. Marshall; watershed analysis.
• F.D. Menalled; cropland weed ecology and management.
• G.C. Poole; fluvial landscape ecology.
• L.J. Rew; plant ecology.
• P.C. Stoy; land atmosphere interaction.

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 the research project. Research projects involve topics such as hydrology, watershed analysis, integrated management of invasive plant 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 detailed information, refer to the sections on Admission Policies and Application Requirements. Successful applicants are accepted into the department and the Division of Graduate Education.

M.S. DEGREE IN LAND REHABILITATION

Course work in land rehabilitation is designed to serve students new to the rehabilitation field, as well as to experienced individuals or those already working in land rehabilitation or restoration ecology and who desire further education and training. Montana State University offers core courses in land rehabilitation and restoration ecology, and a very strong array of supporting courses in relevant disciplines. These courses are integrated with the core curriculum to add breadth and depth to the program and to make specialization possible in a given aspect of land rehabilitation. Site revegetation, soil remediation, restoration of riparian zones and stream channels, remediation of contaminated sites, management of invasive plants and restoration of ecosystem processes are among the many potential areas of study. Emphasis is placed on developing a broad understanding of soil, plant and hydrologic processes as foundation to effective applications. Course sequences will be designed to correspond with the specific needs, interests, and educational goals of the individual student. This program emphasizes soil, vegetation, and water sciences, and graduates are expected to be well versed in these areas in addition to the student’s particular area of interest.

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.

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 0-4 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  credits
(must be taken by all M.S. students):
BIOL 455 Insect Identification .........................4
ENTO 525 Insect Morphology ..........................2
ENTO 520 Insect Physiology ..........................3
ENTO 590 Master’s Thesis ..............................10
STAT 401* Applied Methods in Statistics .................3
STAT 412* Methods for Data Analysis II .................3

Restricted Electives  (fulfill one each; 1-2 credits)
ENTO 514 Behavioral Ecology ...........................3
ENTO 516 Biosystematics ...............................3
ENTO 590 Master’s Thesis ..............................10

Other entomology elective courses:
BIOL 204 Insect Biology (Perquisite for upper division Entomology courses) ......................3
ARNR 410 Veterinary Entomology ......................3

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.

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://plantscience.montana.edu/

Interested students should contact Graduate Program Coordinator,
sion. 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://cesprogram.montana.edu/index.asp for additional information and to submit a graduate pre-application or application.

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 (emeritus); 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.
• M.A. Young; virology, thermal biology.

Associate Professors
• C. Cripps; mycology, mycorrhizae.
• T.A.O. Dougher, horticulture.
• Alan Dyer; soil-borne pathogens.
• F. V. Dunkel; entomology.
• A. Fischer; plant biochemistry, tissue senescence.
• Mike Ivie; entomology.
• A.D. Richman; molecular evolution.

Assistant Professors
• Mary Burrows (extension); plant pathology.
• W.E. Grey (research adjunct); soil-borne disease, seed production.
• William Hoch; horticulture.
• L. Huang; genetics.
• Robyn Klein (adjunct); medicinal plants.
• Chaofu Lu; genetics.
• Alice Pilgeram (research adjunct); bacterial diseases.
• J. Sherman (research adjunct); cytogenticis.
• K. Wanner (extension); entomology.
• Yousef Zadegan; landscape design.

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, 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

Associate Professors
• R.A. Bessen; prion diseases
• M.E. Hardy; virology
• B. Lei; bacteriology
• J.R. Radke; parasitology
• E.E. Schmidt; molecular genetics

Assistant Professors
• R.A. Cramer; fungal pathogenesis
• R.J. Mattix (adjunct); veterinary medicine
• J.J. Obar; immunology
• J.M. Vojich-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 and 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 adjuvant 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 diseases. 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 section, 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 - Masters

Graduate students in VMB are expected to have a basic understanding of biochemistry, molecular biology, immunology, and microbiology. The Master of Science degree requires a minimum of sixteen (16) course credits
and fourteen (14) 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 coursework credits
   BCHM 441 Biochemistry (Required, or satisfactory undergrad equivalent) ............. 3
   VHMB 580 Microbial Pathogenesis ......... 3

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

   Required coursework credits
   BCHM 524 Mass Spectrometry .............. 3
   BCHM 543 Proteins ........................... 3
   BCHM 544 Molecular Biology ............... 3
   VTMB 503 Adv.Virology .......................... 3
   VTMB 580 Microbial Pathogenesis ........... 3

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

   Elective coursework courses
   BCHM 524 Mass Spectrometry .............. 3
   BCHM 543 Proteins ........................... 3
   BCHM 544 Molecular Biology ............... 3
   VTMB 503 Adv.Virology .......................... 3
   VTMB 580 Microbial Pathogenesis ........... 3

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

   VTMB 590 Master’s Thesis ..................... 14

   Program Requirements - Ph.D.

   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 credits
   BCHM 441 Biochemistry (Required, or satisfactory undergrad equivalent) ............. 3
   BCHM 442 Biochemistry (Required, or satisfactory undergrad equivalent) ............. 3
   MB 401 Immunology (Required, or satisfactory undergrad equivalent) .................. 3
   STAT 401 Statistics (Elective) ............... 3
   VTMB 424 Ethical Science (Required) ........ 3

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

   Required coursework credits
   BCHM 524 Mass Spectrometry .............. 3
   BCHM 543 Proteins ........................... 3
   BCHM 544 Molecular Biology ............... 3
   MEDS 525 Molecular Cell Disease .......... 4
   VTMB 503 Adv.Virology .......................... 3
   VTMB 580 Microbial Pathogenesis ........... 3

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

   Elective coursework credits
   VTMB 590 Master’s Thesis ..................... 14

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

   Research

   The research problem will be chosen in consultation with the student’s thesis or dissertation advisor. 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.A. in Art History
   • 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
   • Dr. Fatih Rifki

   Graduate Program Coordinator
   • Christopher Livingston

   Professors
   • J. Brittingham; architectural design, theory.
   • R. Johnson; architectural design, history, theory.
   • S. Juroszek; design, graphics.
   • H.E. Sorenson, Jr.; delineation, architectural design.
   • T.R. Wood; architectural design, environmental technology.
   • F. Rifki; design, planning.

   Associate Professors
   • M.E. O’Neill; architectural design
   • C. Livingston; design, building construction
   • M. Everts; design, professional practice.
Assistant Professors
• Z. Kurezewska; design, graphics.
• B. Wrightsman; design, structures.
• D. Fortin; design, history

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.

Doctor of Architecture and Master of Architecture 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.

Montana State University, College of Arts and Architecture, School of Architecture offers the following NAAB-accredited degree program:
Master of Architecture (Pre-professional degree + 42 graduate credits)
The next accreditation visit for this degree program will take place in 2014.

Admission
Admission into the architecture graduate program is highly competitive. The school is able to admit approximately 70 graduate students per year, many of whom represent the best students from our own undergraduate B.A. in Environmental Design program. However, a limited number of spaces are available for highly qualified students with undergraduate degrees from other universities. Placement may vary depending upon the student’s background; students with an undergraduate degree in a field other than architecture will be considered, and must, if accepted, complete a full course of study in design studio.

Portfolio review is of primary importance to the School of Architecture’s application review committee. All applicants are required to submit a portfolio of their best work that is reviewed by the school’s faculty. In addition, students accepted into the graduate architecture program must meet one of the following criteria, as established by the Division of Graduate Education:
A. 3.0 overall average GPA for full admission.
B. 2.75 - 2.999 overall average GPA. Applicants will be reviewed on an individual basis.
C. Those with professional experience will be considered on a case-by-case basis.

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 and a comprehensive studio, 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 three 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.
Plan B Students:
required for all graduate students.
Arch 558 Advanced Building Studio is
agenda or theoretical component.
complex problem with an underlying
best described as a programmatically
Arch 558 Advanced Building Studio is
558 Advanced Building Studio with.
mum. Students will enroll in the Arch
study will still include 42 credits mini-
instead of a thesis and the program of
a 6 credit comprehensive studio course
1. All graduate students will be re-
quired 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 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 Build-
ing 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 substi-
tute for any graduate level studio.

Notes:
1. All graduate students will be re-
quired 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 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
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ing 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 substi-
tute for any graduate level studio.

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

Professors
• Jeffrey Conger; graphic design
• Stephanie Newman; graphic design

Associate Professors
• Harvey Hamburgh; art history
• Gesine Janzen; printmaking
• Todd Larkin; art history
• Sara Mast; painting

Assistant Professors
• Rollin Beamish; painting/drawing
• Nelleke Beltjens; sculpture
• Nathan Davis; graphic design
• Josh DeWeese; ceramics
• Regina Gee; art history
• Meta Newhouse; graphic design
Continuing Adjuncts
• Dean Adams; ceramics/drawing
• Denise Carter; foundations
• Bryan Petersen; metalsmithing
• Dede Taylor; art history

Degrees Offered
• Master of Fine Art
• Master of Art in Art History

The School of Art, accredited by the National Association of Schools of Art and Design, offers a Master of Fine Arts (MFA) degree and a Master of Art (MA) in Art History. The MFA degree requires 60 credits of coursework including a minimum of 15 credits of thesis. It is designed for the professional artist or craftsperson 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 and no longer requires the GRE for entrance to the MFA program. The MA in Art History degree requires 32 credits for completion. This degree option offers a general track in art history, which covers most periods and mediums of Western culture from ancient to contemporary as well as non-Western fields of Asian, African, Pre-Columbian and Pacific Islander.

Admission
Students applying to the MFA program should submit along with the online application, a portfolio of 20 slides or digital images in jpg format on a CD (preferred), 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 MFA program for the following academic year must be received by February 15.

Program Requirements - MFA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

Program Requirements - MA credits

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.

School of Film and Photography

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, MFA Program Administrator
• Vicki Miller, Student Coordinator

Director
• Dr. Robert Arnold
(406) 994-7588
rfarnold@montana.edu

Professors
• Arnold, Robert, Ph.D.
• Aig, Dennis, Ph.D.
• Tobias, Ronald, MFA
• Savoie, Phil, MS
• Lipfert, Theo, MFA
• Stillwell, Cindy, MFA

Degrees 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.

1st Year

<table>
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<tr>
<th>Credits</th>
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| Fall – required
| MTA 510 Fundamentals of Film making | 3 |
| MTA 504 Film and Documentary Theory | 3 |
| MTA 505 Critical Approaches to Natural History Filmmaking | 3 |
| MTA 507 Form and Theory of the Image (Faculty work) | 1 |
| Spring – required
| MTA 515 Science and Natural History Film production | 3 |
| MTA 519 Post Production Workflow | 3 |
| MTA 517 Production Management: (Hybrid 400/500 level) | 3 |
| MTA 518 Writing for Documentary & Non-fiction Film | 3 |
| Total 1st year | 21 |

2nd year

<table>
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<tr>
<th>Credits</th>
</tr>
</thead>
</table>
| Fall – required
| MTA 521 Contemporary Trends/Non-fiction | 3 |
| MTA 506 Critical Approaches to Science Film | 3 |
| Electives
| Take a minimum of 10 (12) credits of the following:
| MTA 513 Advanced Cinematography | 3 |
| MTA 529 2nd year Film Prep | 3 |
| (may be required and must be taken Fall semester of 2nd year) | |
| MTA 557 Post Production, Info Design (Hybrid course 400/500 level) | 3 |
| MTA 579 Independent Study | 3 |
| MTA 576 Professional Internship | 3 |
| Total 2nd year | 12-14 |

Electives

Take a minimum of 10 (12) credits of the following:

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>MTA 513 Advanced Cinematography</td>
</tr>
<tr>
<td>MTA 529 2nd year Film Prep</td>
</tr>
<tr>
<td>(may be required and must be taken Fall semester of 2nd year)</td>
</tr>
<tr>
<td>MTA 557 Post Production, Info Design (Hybrid course 400/500 level)</td>
</tr>
<tr>
<td>MTA 579 Independent Study</td>
</tr>
<tr>
<td>MTA 576 Professional Internship</td>
</tr>
<tr>
<td>Cumulative Required Years 1 &amp; 2</td>
</tr>
</tbody>
</table>

3rd Year

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
</table>
| Fall
| Thesis | 8 |
| Spring
| Thesis | 7 |
| 3rd Year Total | 15 |

Note: You must be enrolled in at least 3 hours of thesis credit the semester you graduate.

Financial Assistance

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

COLLEGE OF BUSINESS

Dan Moshavi, Ph.D., Dean
Bruce Raymond, Ph.D., Associate Dean for Administration and Finance
Susan Dana, J.D., Associate Dean for Academic Affairs
Christine Lamb, Ed.D., Assistant Dean
Bonita Peterson Kramer, Director of the Master of Professional Accountancy Program

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

http://www.montana.edu/cob/accounting/mpac.html
email: busgrad@montana.edu

Professors

• Anne Christensen, Ph.D.
• Bonita Peterson Kramer, Ph.D.

Associate Professors

• Marc Giulianii, Ph.D.
• Christie Johnson, MBA

Assistant Professors

• Perry Solheim, ABD
• Angela Woodland, Ph.D.

Degree Offered

• M. of Professional Accountancy

M. of Professional Accountancy

The Master of Professional Accountancy (MPAc) degree is designed to prepare students for professional careers in accounting. With the assistance of the MPAC Director, students will formulate a graduate program that 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 accounting or business from an accredited college or university provides the best foundation for this program. Students who have undergraduate course deficiencies may be provisionally admitted while attending to subject matter deficiencies. To apply, individuals must submit an application and fee, a GPA calculation form, scores from either the Graduate Record Exam (GRE) or the Graduate Management Admission 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 in the Division of Graduate Education part of this Catalog 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 at least a 3.0 semester grade point average, and at least a 3.0 cumulative grade point average at all times while in the MPAc program.

Refer to the For Master’s Students section in the Division of Graduate Education part of this Catalog 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
A limited number of graduate teaching assistantships, awarded on a competitive basis, are available to fully admitted MPAc students. See the Graduate Assistantships section in the Division of Graduate Education part of this Catalog for detailed information on appointment criteria.

COLLEGE OF EDUCATION, HEALTH AND HUMAN DEVELOPMENT

Larry J. Baker, Dean
Jill Thorngren, Associate Dean

Graduate Programs Available:
• M.Ed. in Education
• M.Ed. in Education
  (Offered through Northern Plains Transition to Teaching-NPTT)
• M.Ed. in School Counseling
• M.S. in Health and Human Development
• Ed.S. in Education
• Ed.D. in Education

Department of Education

For information on graduate programs, please contact the appropriate Program Leader:
• Educational Leadership: Dr. William Ruff, (406)-994-4182 or email wruff@montana.edu
• Adult & Higher Education: Dr. Marilyn Lockhart, (406)-994-6419 or email lockhart@montana.edu
• Curriculum & Instruction: contact department head

For graduate programs admissions materials and information contact:
• Graduate Program Assistant, Amanda Brown, (406)-994-6786
• Department Head Dr. Jayne Downey, 253 Reid Hall, 406-994-6670, jdowney@montana.edu

Professors
• J. Bruwelheide; Library Media
• R. Carson; Educational Foundations
• A. deOnis; Reading, Language arts
• M.P. Vogel; Extension Housing Specialist

Associate Professors
• A. Bangert; Educational Statistic
  Educational Research
• M. Brody; Science Education.
• J. Carjuzaa; Multicultural Education
• S. Davis; Technology Education
• J. Downey; Educational Psychology
• J. Erickson; Educational Leadership
• J. Herbeck; Reading, Language arts
• M. Lockhart; Adult & Higher Education

• 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
• M. Redburn; Educational Leadership
• W. Ruff; Educational Leadership

Adjunct Faculty
• L. J. Baker; Higher Education.
• J. Cook; Instructional Computing
• W. Freese; Instructional Media
• L. Kelting-Gibson; Assessment
• N. Lux; Educational Technology
• L. Runkel; Technology Education
• R. Shafer; Educational Leadership

Professional Faculty
• P. Ingraham; Field Placements & Licensure

Degrees Offered

M.Ed. with majors in:
• Adult and Higher Education
• Curriculum and Instruction
• Educational Leadership

Ed.S. with majors in:
• Educational Leadership

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

The department is comprised of three units: Curriculum & Instruction, Educational Leadership, and Adult & Higher Education. Master’s (M.Ed.) and Doctoral (Ed.D.) programs are offered in three majors: Educational Leadership, Adult and Higher Education; and Curriculum and Instruction. An educational specialist degree (Ed.S.) is available in Educational Leadership. 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 Department of Education Graduate Programs Office, 215 Reid Hall, Montana State University, Bozeman, MT 59717. For specific program information contact the Program Leaders (listed above).
DIVISION OF GRADUATE EDUCATION

For admissions information and forms contact 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 weekends. 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, and the scholarship of teaching and learning. 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/ehhd/educ/ahe/hdbook.html for additional and current information regarding courses offered and schedules.

See course listings, application process, and schedule on-line at: www.montana.edu/ehhd/educ/ahe

**Curriculum and Instruction**

The program in Curriculum and Instruction offers two degrees: Master of Education, and Doctor of Education. The Master of Education degree is a hybrid (on-line and face-to-face) program designed to meet the needs of practicing elementary and secondary classroom teachers, and educational scholars and researchers. The Master of Education (M.Ed.) degree has three options:

- Professional Educator option
- Educational Research option
- Technology Education option

See www.montana.edu/ehhd/educ/curriculumGrad/index.html for additional and current information.

**Educational Leadership**

The program in Educational Leadership offers three degrees: Master’s in Education, Education Specialist, and Doctor of Education. The Master’s degree curriculum is designed to prepare K-12 principals with the knowledge and skills needed to lead schools and contains the required coursework needed for a Montana Class 3 K-12 Principal Certificate. The Educational Specialist degree is designed to prepare school system leaders as well as provide the knowledge, skills and competencies necessary to advance effective practices in the field of Educational Leadership. Doctoral students may elect to take the required coursework needed for a Montana Class 3 Superintendent Certificate or elect to take coursework that will facilitate entry into the professoriate. In addition to these degree programs, students currently holding a Master’s degree in an area other than Educational Leadership may elect to take only the courses needed to obtain a Montana Class 3 administrative certificate as a K-12 Principal or School Superintendent.

**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.

**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 webpages 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 Division of Graduate Education 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 department is responsible for making all arrangements for comprehensive examinations.

**Dissertation**

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 (NPTT)**

P.O. Box 172940
Bozeman, MT 59717-2940
npt@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

**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 (includes internship): 24

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).

**Admissions**
The Northern Plains Transitions to Teaching (NPTT) 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 document-
B. Letiecq; family health
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
J. Seifert; exercise science
A. Smith; marriage and family counseling
J. Thorngren; marriage and family counseling
L. Owens; health enhancement
G. Olson; health enhancement teaching K-12
R. Koltz; counseling
A. Harmon; food and nutrition/sustainable food systems
R. Pitcher; health enhancement teaching K-12
E. Rink; health education

Assistant Professors
N. Colton; health enhancement teaching K-12
A. Harmon; food and nutrition/sustainable food systems
R. Koltz; counseling
G. Olson; health enhancement teaching K-12
R. Pitcher; health enhancement teaching K-12

Adjunct Faculty
C. Blank; counseling
P. Donahoe; counseling
D. Tarabochia; community health

Degree Offered
M.S. in Health & Human Development with options in:
- Counseling
- Exercise and Nutrition Sciences
- Family & Consumer Sciences
- Family, Food, and Community Health Sciences

M.Ed. in School Counseling
Graduate programs in the Department of Health and Human Development lead to a Master of Science degree in Health and Human Development with options in counseling, exercise and nutrition sciences, family and consumer sciences, and family, food, and community health sciences. The Master of Education degree is given to those completing the school counseling degree.

Graduate programs are coordinated by a graduate coordinator for the counseling program or by a graduate coordinator in exercise and nutrition sciences and family, food, and community health sciences. 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 and family counseling program prepares counselors to address mental health and relationship 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 environments in which individuals and families interact and the plethora of influences (i.e. social, cultural, and economic) that affect human growth and development. Interpersonal issues between family members and the family and outer environmental systems are highlighted.

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

Graduates of the program qualify for certification through The National Academy for Certified Family Therapists (an affiliate of the International Association of Marriage and Family Counselors). Upon completion of this program and additional licensing requirements, graduates are eligible to apply for clinical privilege with Montana’s mental health centers.
**Mental Health Counseling**

Mental health counseling involves the application of principles of psychotherapy, human development, learning theory, group dynamics and the etiology of mental illness and dysfunctional behavior to individuals, couples, families and groups for the purposes of treating psychotherapy and promoting 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 700 hours of supervised experience in appraisal, individual, family and group counseling, and consultation in clinics, agencies, schools and/or hospitals. They are eligible for national certification as Clinical Mental Health Counselors and they have equivalent status to persons from “core provider” professions (psychiatry, clinical psychology, clinical social work and psychiatric nursing) when applying for clinical privilege with Montana’s mental health centers.

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**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 certificate), or certified with a Guidance and Counseling endorsement on a Montana teaching certificate. In addition, graduates may apply for licensure as a licensed professional counselor with the Board of Social Work Examiners and Professional Counselors after completing 2200 hours (post-graduate) of supervised counseling experience 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 germaine 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.

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**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 suc-
cessfully 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, developing, 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)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 402</td>
<td>Edc Stat ...............................................</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 555</td>
<td>Percep Child &amp; Adol Dev...............................</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 567</td>
<td>Research Des in HHD ....................................</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 576</td>
<td>Internship ................................................</td>
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<tr>
<td>HDPE 590</td>
<td>Master’s Thesis (Plan A Only) .......................</td>
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</tr>
<tr>
<td>HDPE 590</td>
<td>Curriculum Design .......................................</td>
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</tr>
<tr>
<td>HDPE 590</td>
<td>Prof Comm Skills in HHD ..............................</td>
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</tr>
<tr>
<td>HDPE 590</td>
<td>Research Des in HHD ....................................</td>
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<tr>
<td>HDPE 590</td>
<td>Pol S 590 Prof Eval &amp; Policy .......................</td>
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</tr>
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<td>HDPE 425</td>
<td>Fam Law &amp; Pub Policy ...................................</td>
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**Non-Thesis Option (Plan B)**

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<td>HDPE 563</td>
<td>Multicultural Awareness ................................</td>
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</tr>
<tr>
<td>HDPE 575</td>
<td>Prof Paper/Proj ..........................................</td>
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</tr>
<tr>
<td>HDPE 567</td>
<td>Internship ................................................</td>
<td>3</td>
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<tr>
<td>Take one of the Following:</td>
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</tr>
<tr>
<td>EDCI 506</td>
<td>App Edc Research ........................................</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 507</td>
<td>Qualitative Methods ....................................</td>
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</tr>
<tr>
<td>HHD 512</td>
<td>Research Des in HHD ....................................</td>
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<td>XXX Supporting Courses</td>
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</table>

**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 two programs of study: 1) exercise physiology and nutrition, and 2) sport and coaching sciences. The exercise physiology and nutrition program allows students to focus on understanding the determinants of physical activity and energy expenditure, adaptations to exercise that impact human work performance and disease risk, and exercise metabolism and nutrition. Although not required, a graduate student may simultaneously complete course work needed to become a Registered Dietitian. The sport and coaching sciences program is designed to meet the need in advanced coaching and sport science abilities at the local, state, national and international levels. Course work includes knowledge pertinent to coaches of all sports at developmental, competitive, and high performance levels as well as sport administrators in both public and private sectors. Interested students may obtain descriptions by calling (406) 994-3242, or visiting the department web site at www.montana.edu/hhd. Depending on the students’ goals, undergraduate degree, and course work, additional courses may be added or deleted to supplement the curriculum.

**Required Courses for Exercise Physiology and Nutrition program options:**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
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<tbody>
<tr>
<td></td>
<td>HDPE 515 Exercise Performance &amp; Nutr...............</td>
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<td>HDPE 545 Graduate Exercise Physiology .............</td>
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<td>HDPE 590 Thesis ........................................</td>
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<td></td>
<td>HDPE 575 Research or Prof Paper/Proj ................</td>
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<tr>
<td></td>
<td>HDPE 465 Exercise Test &amp; Prescrip ..................</td>
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<td></td>
<td>Elective ..................................................</td>
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</tr>
<tr>
<td></td>
<td>HDPE 512 Research Des in HHD ........................</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HDPE 545 Grad Exercise Phys ..........................</td>
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<td></td>
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<tr>
<td></td>
<td>Elective ..................................................</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>HDPE 575 Research or Prof Paper/Proj ................</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HDPE 590 Thesis ........................................</td>
<td>10</td>
<td></td>
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<tr>
<td></td>
<td>Elective ..................................................</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>HDPE 512 Research Des in HHD ........................</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HDPE 545 Grad Exercise Phys ..........................</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elective ..................................................</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Total**

| Credits | 36-38 |

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**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. Nonthesis and thesis plans are available. A nonthesis 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.
Required Courses for Sport and Coaching Sciences program: 

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>EDCI 402 Educational Statistics I</td>
<td>3</td>
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<tr>
<td>HDHL 455 The Ethic of Care</td>
<td></td>
</tr>
<tr>
<td>or HDPE 445R Applied Sport Psychology</td>
<td>3</td>
</tr>
<tr>
<td>or HDH 501 Prof Communications in HHD</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>HDPE 506 Exercise and Chronic Disease</td>
<td>3</td>
</tr>
<tr>
<td>HDH 512 Research Design in HDH</td>
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<tr>
<td>Electives</td>
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<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>HDPE 467 Advanced Concepts in Coaching</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 520 Curriculum Design</td>
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<td>Electives</td>
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<td>Spring</td>
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<tr>
<td>HDPE 575 Research or Prof Paper/Project</td>
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<td>or HDPE 590 Thesis</td>
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<td>Electives</td>
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<td>Total</td>
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</table>

Food, Family, and Community Health Sciences Option

The Department of Health and Human Development offers a Master of Science degree with an option in food, family, and community health sciences with two programs of study: 1) family and community health, and 2) sustainable food systems. The family and community health program offers a skills-based program which integrates theory and critical thinking to assess the needs of individuals, families, and communities. Students learn to plan, implement and evaluate programming designed to promote health, human development and well-being. The sustainable food systems program focuses on sustainable food production, food preparation and processing, distribution, nutrition, and community food security in order for students to better understand how food systems influence health. Interested students may obtain descriptions by calling (406) 994-3242, or visiting the department web site at www.montana.edu/hhd. Depending on the students’ goals, undergraduate degree, and course work, additional courses may be added or deleted to supplement the curriculum.

Family and Community Health program: credits

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
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<tr>
<td>HDHL 445 Prog Planning and Eval</td>
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<td>HDH 501 Prof Communications in HHD</td>
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<tr>
<td>STAT 401 Statistics for Researchers</td>
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<tr>
<td>or EDCI 402 Educational Statistics I</td>
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Spring

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>HDCO 554 Devel Theory Across the Lifespan</td>
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</tr>
<tr>
<td>or HDPE 501 Theories and Models in Health</td>
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<tr>
<td>Electives tailored to program</td>
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Fall

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>HDPE 464 Gender, Race, Fam Diversity</td>
<td>3</td>
</tr>
<tr>
<td>or HDCF 563 Multicultural Awareness</td>
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<td>Electives tailored to program</td>
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Spring

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>HDPE 575 Research or Prof Paper/Project</td>
<td>3</td>
</tr>
<tr>
<td>or HDCF 590 Thesis</td>
<td>10</td>
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<tr>
<td>Electives tailored to program</td>
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Electives (other electives can be approved by the advisor)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EDCI 501 Educational Statistics II</td>
<td>3</td>
</tr>
<tr>
<td>or HDCF 425R Family Law and Public Pol</td>
<td>3</td>
</tr>
<tr>
<td>or HDCF 429 Small Business Oper in HHD</td>
<td>3</td>
</tr>
<tr>
<td>or HDCF 458 Assessment and Intervention</td>
<td>4</td>
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<tr>
<td>or HDFN 511 Global Food Perspectives</td>
<td>3</td>
</tr>
<tr>
<td>or HDHL 410 Human Response to Stress</td>
<td>3</td>
</tr>
<tr>
<td>or HDHL 440 Principles of Epidemiology</td>
<td>3</td>
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<tr>
<td>or HDHL 445 The Ethic of Care</td>
<td>3</td>
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<tr>
<td>or HDHL 452 Health Disparities</td>
<td>3</td>
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<tr>
<td>or HDPE 506 Exercise and Chronic Disease</td>
<td>3</td>
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<tr>
<td>or HDPE 520 Curriculum Design</td>
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<td>or EDCI 502 Educational Statistics II</td>
<td>3</td>
</tr>
<tr>
<td>or EDCI 507 Qualitative Educational Research</td>
<td>3</td>
</tr>
<tr>
<td>or HDCF 551 Sustainable Food Systems</td>
<td>3</td>
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<tr>
<td>or MEDS 562 US Healthcare Systems</td>
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<tr>
<td>or MGMT 469 Community &amp; Social Entrepreneur</td>
<td>3</td>
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<tr>
<td>or NAS 524 Contemp Iss in Amer Ind Studies</td>
<td>3</td>
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<tr>
<td>or NAS 530 Federal Law &amp; Indian Policy</td>
<td>3</td>
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<tr>
<td>or PSCI 456 Politics of Food and Hunger</td>
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<td>or PSCI 559 Food Eval &amp; Policy Analysis</td>
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Sustainable Food Systems program:

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<td>HDH 501 Prof Communications in HHD</td>
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<td>or EDCI 402 Educational Statistics I</td>
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Spring

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<th>Course</th>
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<tbody>
<tr>
<td>HDPE 451 Sustainable Food Systems</td>
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<tr>
<td>or HDFN 445 Culinary Marketing: Farm to Table (summer)</td>
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<td>HDH 512 Research Design in HDH</td>
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Fall

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<th>Course</th>
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<tbody>
<tr>
<td>HDPE 551 Global Food Perspectives</td>
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<td>or HDFN 576 Internship</td>
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Spring

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<td>or HDFN 590 Thesis</td>
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Electives (other electives can be approved by the advisor)

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<tbody>
<tr>
<td>HDCF 429 Small Business Oper in HHD</td>
<td>3</td>
</tr>
<tr>
<td>HDCF 563 Multicultural Awareness</td>
<td>3</td>
</tr>
<tr>
<td>HDHL 445 The Ethic of Care</td>
<td>3</td>
</tr>
<tr>
<td>HDHL 452 Health Disparities</td>
<td>3</td>
</tr>
<tr>
<td>HDPE 501 Theories and Models in Health</td>
<td>3</td>
</tr>
<tr>
<td>LRES 528 Crop Systems &amp; Sustainable Ag</td>
<td>3</td>
</tr>
</tbody>
</table>

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 Assistantships sections for detailed information on appointment criteria. Assistantships are requested from the student’s home department.

COLLEGE OF ENGINEERING

Dr. Robert J. Marley, Dean, and Director of the Engineering Experiment Station
Dr. Anne K. Camper, Associate Dean for Research and Graduate Studies
Heidi M. Sherick, Assistant Dean for Undergraduate Programs and Diversity

Graduate Programs Available

- Master of Construction Engineering Management (M.C.E.M)
- M.S. in Chemical Engineering
- M.S. in Civil Engineering
- M.S. in Computer Science
- M.S. in Electrical Engineering
- M.S. in Environmental Engineering (Please see Interdisciplinary Programs)
- M.S. in Industrial and Management Engineering
- M.S. in Mechanical Engineering
- Ph.D. in Computer Science
- Ph.D. in Engineering
Department of Civil Engineering

Montana State University
Po Box 178900
Bozeman, MT 59717-3900
Tel: (406) 994-2111

www.coe.montana.edu/ce
ceedpt@ce.montana.edu

Department Head
• Dr. Brett W. Gunnink

Professors
• E.E. Adams; engineering mechanics, continuum and snow mechanics.
• A. Al-Kaisy; transportation engineering.
• J.E. Cahoon; overland flow, soil-plant-water relationships, soil physics, hydraulics, river engineering.
• A.K. Camper; water quality and treatment, environmental engineering.
• A.B. Cunningham; water resources, environmental engineering.
• J.J. Fedock; structural engineering.
• R.D. VanLuchene; structural engineering, computer analysis of blast-resistant structures.
• S.W. Perkins; geotechnical and pavements 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.

Associate Professors
• W.I. Jones; environmental engineering.
• R.G. Oakberg; engineering mechanics.

Assistant Professors
• M. Berry (research); structural engineering.
• P.M. Knoll; construction 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.
• L.R. McKittrick (research, adjunct); engineering mechanics.
• D.J. Peterson; construction management.
• D.E. Smith (adjunct); surveying engineering.

Instructors
• S.A. Keller (adjunct); transportation engineering.
• S.C. Morrical (adjunct); concrete engineering.
• S. R. Smith; construction

Degrees 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
  • 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 Admission Policies and Application Requirements sections. Successful applicants are accepted into both the department and 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 ENVE 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 exam-
inclusion 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.

Program Requirements: 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 Rehabilitation through the Department of Civil Engineering are referred to the Interdisciplinary M.S. Degree in Land Rehabilitation description in the College of Agriculture section.

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:

<table>
<thead>
<tr>
<th>Course Name</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>Total</td>
<td>30</td>
</tr>
</tbody>
</table>

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.

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@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.
- A. 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 the appropriate department and/or to the appropriate graduate department and/or 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 510</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 556</td>
<td>Environmental Engr Process &amp; Design</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</td>
<td>3</td>
</tr>
<tr>
<td>ENVE 563</td>
<td>Wastewater Treatment Processes &amp; Design</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 590</td>
<td>Masters Thesis credits</td>
<td>10</td>
</tr>
</tbody>
</table>

(Additional recommended courses:
- CE 529 Groundwater Contamination 3
- CHBE 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.

**Department of Chemical and Biological Engineering**

Montana State University
Po Box 173920
Bozeman, MT 59717-3920
Tel: (406) 994-2221
www.chbe.montana.edu
che_b@montana.edu

**Department Head**
- Ronald W. Larsen, Ph.D., P.E.

**Professors**
- R.W. Larsen; modeling and transport phenomena, engineering education
- B.M. Peyton; extremophiles, bioprocessing, biofilms, bio remediation
- J.D. Seymour; magnetic resonance microscopy, membrane and separation science, transport in porous media, suspension, granular and colloidal rheology, materials characterization
- P.S. Stewart; biofilm engineering

**Associate Professors**
- R. Gerlach; biofilm barriers, bioremediation, bacterial transport in porous media, extremophile biofilms, biofuels

**Assistant Professors**
- J.R. Brown; magnetic resonance microscopy
- R.P. Carlson; biochemical eng., systems biology, metabolic eng., biofilm physiology and control
- P.E. Gannon; Fuel Cells: SOFC Corrosion Protection
- J.J. Heys; modeling of biological systems mechanical coupling between a moving fluid and tissues, Biofilm-fluid interaction and quorum sensing
effects of variable permeability on the resistance to flow through the tissues and biofilms
• A.M. Richards; microbial iron uptake under high salinity and/or pH, self-assembly of iron-binding molecules, affect of microbial exudates on metal speciation and mobility

Professors Emeritus
• M.C. Deibert; fuel cell
• J.F. Mandell; composite materials, materials behavior, fracture mechanics, wind energy
• D.L. Shaffer; hazardous waste

Research Professors
• G. Cokelet; suspension, granular and colloidal rheology

Degree Offered
• M.S. in Chemical Engineering
• M.S. in Environmental Engineering
• Ph.D. in Engineering

The department offers graduate programs leading to the Master of Science in Chemical Engineering degree and a Master of Science degree in Environmental Engineering. The department participates in the Doctor of Philosophy degree in Engineering through the College of Engineering, with options available in Chemical Engineering and Environmental Engineering.

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) for “Thesis Option” students. A “Non-Thesis Option” is also available. 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.

CHBE 500 Graduate Seminar
(May be taken twice).................................1
CHBE 503 Thermodynamics...........................3
CHBE 530 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 Mematical 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
Research areas are broadly classified as follows:
Energy
• Wind: Composite Materials for Wind Turbine Blades
• Fuel Cells: SOFC Corrosion Protection

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.

Department of Computer Science
Montana State University
357 EPS Building
Bozeman, MT 59717
Tel: (406) 994-4780
www.cs.montana.edu
csinfo@cs.montana.edu

Department Head
• John Paxton

Graduate Coordinators
• Rafal Angrzyk (Ph.D.)
• Rocky Ross (Master’s)
**Professors**

- John Paxton: artificial intelligence, machine learning, computer science education.
- Rocky Ross: web-based active learning resources, theoretical computer science.
- Denbigh Starkey: computer graphics, scientific visualization.
- Binhai Zhu: applied computational geometry, intelligent web searching, combinatorial optimization.

**Associate Professors**

- Brendan Mumey: algorithms, optimal and wireless networking, computational biology.
- John Sheppard: machine learning, data mining, evolutionary computation, Bayesian methods, fault diagnosis and prognosis, domain ontologies.
- Year-Back Yoo: supercomputing, parallel algorithms, heterogeneous computing.

**Assistant Professors**

- Rafał Angryk: data mining, database systems, mobile agents, artificial intelligence.
- Clem Izurieta (research): software engineering, software evolution, ecological modeling.
- Hunter Lloyd (adjunct): Robotics, computer vision, multimedia and animation.

**Degrees Offered**

- M.S. in Computer Science
- Ph.D. in Computer Science

**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-degree.

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-degree.

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 the thesis option, the project option, or the courses-only option. All options require 30 credits. For more information, please refer to http://www.cs.montana.edu/masters-degree.

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>
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</thead>
<tbody>
<tr>
<td>CS 510 Computability</td>
<td>3</td>
</tr>
<tr>
<td>CS 515 Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS 517 Master’s Project</td>
<td>4</td>
</tr>
<tr>
<td>CS 590 Master’s Thesis</td>
<td>10</td>
</tr>
</tbody>
</table>

**Program Requirements: 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-degree. 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>CS 510 Computability</td>
<td>3</td>
</tr>
<tr>
<td>CS 515 Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS 517 Computational Research Topics</td>
<td>3</td>
</tr>
<tr>
<td>CS 518 Advanced Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 525 Computer Graphics</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>
</tr>
<tr>
<td>CS 540 Distributed Computing</td>
<td>3</td>
</tr>
<tr>
<td>CS 541 Advanced Networking</td>
<td>3</td>
</tr>
<tr>
<td>CS 550 Advanced Compilers</td>
<td>3</td>
</tr>
</tbody>
</table>

**Research Experience**

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. 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 OS X 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 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 Computer Science 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.ece.montana.edu

Department Head
• Dr. Robert C. Maher, Associate Department Head

Graduate Coordinator
• Dr. Joseph Shaw, Associate Professor

Assitant Professors
• Hongwei Gao; electric motor drives, power electronics, electric vehicles, renewable energy.
• Brock LaMeres; high speed digital design, programmable logic, interconnect systems, microprocessor and microcontroller based systems.
• Wataru Nakagawa; near-field optical Interactions In nanostructures, scanning 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.
• Vikun 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.

Associate Professors
• James Becker; silicon micromachining for millimeter wave applications, microwave and millimeter-wave electronics applications.
• David Dickensheets; optical microscopy and tissue imaging, silicon micromachining 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.

Research and Adjunct Faculty
• Richard Wolff, Gilhousen Telecommunications Chair; optical networks, packet switching, wireless systems, satellite communications, rural ad hoc networks, telematics.

Master of Science Degree in Electrical Engineering

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. 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
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 (excluding thesis)
  • ≤ 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 examination
• 3 credits Advanced M (committee approved)
• 3 credits Numerical Methods (committee approved)
• 18 credits dissertation (EE 690)
• 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 M 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 nanowave 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

Mechanical and Industrial 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, applications to energy systems.
• V. Cundy: heat transfer; heating, ventilating, and air conditioning (HVAC).
• C.H.M. Jenkins: computational and experimental mechanics, analysis and design of compliant structures, continuum and solid mechanics, theoretical and experimental structural dynamics, mechanical design.
• R.J. Marley: human factors/ergonomics, applied statistics, engineering management.
• J. Stasiaklo (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
• S. Codd: magnetic resonance microscopy studies of ceramics, fluid dynamics in hydrogels, biofilms, and polymer electrolyte membranes.
• A.H. George: heat transfer, measurements and instrumentation.
• E.L. Mooney: discrete optimization, scheduling, systems modeling, operations research.
• D.K. Sobek II: management engineering, product development, production engineering and management, lean manufacturing, healthcare engineering.

Assistant Professors
• 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, thermoelctrics, and photoluminescent ceramics.
• L.M. Stanley: ergonomics, traffic safety, system interface design, human factors, biomechanics.

Research Professors
• R. Badaliance: materials and structures.

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
The minimum requirement for admission is a bachelors degree in engineering, and evidence of an ability to maintain a minimum 3.0 grade point average while pursuing a graduate degree. Graduates from outside fields 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.

M.S. in Industrial and Management Engineering Degree Requirements

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

Master’s students following Plan B choose additional coursework and/or a graduate project (I&ME 575) in lieu of completing a thesis. Plan B students completing a graduate project pursue a particular area of interest under the supervision of a professor, and demonstrate their ability to define, organize, and follow through on a small research investigation.

Plan A - Thesis Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&amp;ME 500-level courses</td>
<td>12</td>
</tr>
<tr>
<td>I&amp;ME 590 Thesis</td>
<td>10</td>
</tr>
</tbody>
</table>

Plan B - Non-Thesis Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&amp;ME 500-level courses</td>
<td>21</td>
</tr>
<tr>
<td>I&amp;ME 400-level courses</td>
<td>12</td>
</tr>
</tbody>
</table>

Students may use a 500-level course to meet a 400-level course requirement. Students entering with a degree in Industrial Engineering may substitute non-I&ME courses to meet the 400-level course requirement. Plan B students may elect to use three credits...
M.S. in Mechanical Engineering Degree Requirements

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.

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>3 Graduate course credits outside the student's emphasis</td>
<td>3</td>
</tr>
<tr>
<td>ME 500 Seminar (two semesters)</td>
<td>2</td>
</tr>
<tr>
<td>ME 590 Thesis</td>
<td>10</td>
</tr>
</tbody>
</table>

Elective Courses (Maximum of 3 cr. ME 570) ........ 9

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.

Ph.D. in Engineering

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

Degrees Offered

- Ph.D. in Engineering with options in:
  - Applied Mechanics
  - Civil Engineering
  - Chemical Engineering
  - Electrical & Computer Engineering
  - Environmental Engineering
  - Industrial Engineering
  - Mechanical Engineering

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, geomechanics, 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, bioreheology, 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
      - 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. Department/s attach summary admission form and circulate application to match students with research needs.
   c. 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.

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 13 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

**Minimum Credits**

<table>
<thead>
<tr>
<th>Course</th>
<th>Minimum Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 610</td>
<td>3</td>
</tr>
<tr>
<td>can only be taken once</td>
<td></td>
</tr>
<tr>
<td>ENGR 600 2</td>
<td>2</td>
</tr>
<tr>
<td>credits maximum counted for program</td>
<td></td>
</tr>
<tr>
<td>Advanced Math*</td>
<td>3</td>
</tr>
<tr>
<td>see declared option coursework</td>
<td></td>
</tr>
<tr>
<td>Numerical Methods*</td>
<td>3</td>
</tr>
<tr>
<td>see declared option coursework</td>
<td></td>
</tr>
<tr>
<td>Other Graded Courses</td>
<td>24</td>
</tr>
<tr>
<td>see declared option coursework</td>
<td></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 exam. 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.

Credits applied from a prior Masters degree must:
- be graded course credits (e.g., not M.S. thesis or independent study credits),
- have a grade of B or higher (or equivalent), and
- be approved by the student’s graduate committee.

Students are expected to attend the COE Seminar Series presentations.

### 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. candidate status, 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-session 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.
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 .........................3
- EMS10 – Elastic and Inelastic Analysis ................3
- ME530 – Advanced Fluid Mechanics ................3
- EMS60 – Finite Elements Analysis in Engineering ........................................3

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 examination 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 .................3
- ChBE 525/ME 511 – Advanced Numerical Methods ........................................3

Requirements include:

- ChBE 505 – Thermodynamics .........................3
- ChBE 530/ME 533 – Transport ..........................3
- ChBE 510 – Reactions ....................................3

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 1 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 I 3 credits
- Numerical Methods
- ME511, Advanced Engineering Analysis II 3 credits

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

Note: These requirements are satisfied by the MSU MS in Mechanical Engineering

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).

Ph.D candidates under the IE Option must take a minimum of 30 credits of 500-level courses (in addition to ENGR 610 and ENGR 600), of which at least 18 credits must be I&ME courses. Furthermore, Ph.D. candidates must complete the following coursework with a grade of B or better:
- I&ME 554, I&ME 567, or other course approved by the I&ME Graduate Studies Committee to satisfy the Advanced Math requirement.
- I&ME 509, I&ME 558, or other course approved by the I&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 qualifying exam will cover three of the following core undergraduate IE topical areas:
- work design and measurement (I&ME 313)
- economic analysis (I&ME 325)
- probability and statistics (I&ME 354)
- linear modeling (I&ME 364)
- three other I&ME courses from among those the student has taken at MSU.

The student will request a qualifying exam from the I&ME Graduate Studies Committee within three weeks of the start of the term in which s/he intends to take the qualifying exam. The I&ME Graduate Studies Committee will assemble an examining committee to administer the exam, chaired by the student’s advisor.

Environmental Engineering:
Of the credits in the Option Coursework noted above, 12 credits from the following subset of courses are required, with no more than 6 credits at the 400 level. Equivalent courses from prior MS degrees may be used to satisfy this requirement.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREN 441 – Natural Treatment Systems ..........3</td>
<td></td>
</tr>
<tr>
<td>ENVE443 – Air Pollution Control ...............3</td>
<td></td>
</tr>
<tr>
<td>ENVE444 – Hazardous Waste Management ..........3</td>
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<tr>
<td>ENVE445 – Hazardous Waste Treatment ..........3</td>
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<tr>
<td>CES29 – Groundwater Contamination .............3</td>
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<tr>
<td>ENVE534 – Environmental Engineering Investigations ..........3</td>
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<tr>
<td>ENVE560 – Environmental Engineering Processes ..........3</td>
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<tr>
<td>ENVE601 – Environmental Engineering Reactor Theory ..........2</td>
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<tr>
<td>ENVE620 Water Treatment Processes and Design ..........3</td>
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<tr>
<td>ENVE63 – Waste Water Treatment Processes and Design .................3</td>
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<tr>
<td>ENVE64 – Environmental Engineering Applications Lab ..........3</td>
<td></td>
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<tr>
<td>ENVE65 – Chemical Sensors &amp; Instrumentation for Env. Bio Tech ..........2</td>
<td></td>
</tr>
<tr>
<td>ENVE66 – Fundamentals of Biofilm Engineering ..........3</td>
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</tbody>
</table>

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.
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 other than English and are encouraged to apply; however, they may be required to take additional English courses as a condition of their acceptance.

Required Core Courses

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENGL 510 Studies in Critical Theory and Practice</td>
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<tr>
<td>ENGL 530 Studies in Writing Theory and Practice</td>
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<tr>
<td>ENGL 540 Studies in Theory and Practice of Literary History</td>
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<tr>
<td>ENGL 575 Professional Paper</td>
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OR

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>ENGL 590 Master’s Thesis</td>
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</tbody>
</table>

(Plan A Only)
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.

Electives:
- ENGL 550 Focused Research Seminar Max 6
- ENGL 570 Individual Problems Max 6
- ENGL 576 Internship 1-12
- ENGL 580 Special Topics Max 9

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 Reidy

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; American Women, American West, Labor.
- Lynda Sexson; Religion and Culture, Literature, Nature, Gender, Text and Image.
- Billy G. Smith (College of Letters and Science Distinguished Professor); Early America, Class, Race, Slavery.
- Brett L. Walker (Regents Professor); Japan, East Asian Civilizations, Environmental, Science and Medicine.

Associate Professors
- Prasanta S. Bandyopadhyay; Philosophy of Science, Epistemology, Philosophy.
- Robert B. Campbell; U.S. Environmental, Nineteenth Century U.S. History, American Indian History.
- 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.
- Timothy LeCain; History of Technology and Environment, Modern U.S., American West.
- Sanford Levy; Ethics, Biomedical Ethics.
- Michelle Maskiell; Modern South Asia, Asian Women.
- Michael Reidy; Science, Britain.
- Sara Waller; Philosophy of Mind and Cognitive Science, Neurology and Cognitive Ethology.

Assistant Professors
- Kristen Intemann; Ethics, Applied Ethics, Philosophy of Science, Feminist Philosophy.
- James Meyer; Turkish History, Ottoman Empire, Russian History.

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.

Course Requirements: MA 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.

Required Core Courses
- HIST 502 Public History and Material Culture................3
- HIST 503 History of America Before 1860.....................3
- HIST 512 Topics in World History.............................3
- HIST 540 Historical Methods..................................3

Course Requirements: PhD in History
The PhD in History requires a minimum of 24 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: a. History of Science and Technology; b. Environmental History; c. U.S. History. Minor Fields include a. gender; b. race; c. class, labor and economy; d. religious studies; e. imperialism; f. historical theories and methodologies; g. comparative frontiers; h. science and technology; i. environmental studies; j. philosophy of science; k. museum studies; l. American west.

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 25 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@montana.edu

Degree Offered
• Master of Arts (MA) in Native American Studies
• M.A. in Native American Studies

Online Graduate Certificate

Native American Studies offers a 12-credit graduate-level certificate available fully on-line. Montana State University’s online graduate certificate in Native American Studies is the only program of its type in the world. Students from all backgrounds and professions will gain a deeper insight into the American Indians of Montana, the region, and the nation through courses on current and historical aspects of Native American art, law, culture and contemporary issues. From locations throughout the world, students can share experiences, ideas and personal cultures to create an exciting and interactive learning environment. Credits earned may be transferred to Montana State University’s master’s degree program in Native American studies (at present, the master’s program is not wholly available online).

Staff
• Jim Burns: American Indian Student Advisor
• Jennifer Woodcock: Assistant Graduate Student Coordinator
• Lisa Stevenson Administrative Associate III
• Rita Sand: American Indian Academic Advisor

Montana State University has an American Indian enrollment of approximately 380 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 counselors for Native students who provide academic advising, counseling, and mentoring. The Student Center offers tutorial assistance, telephone and fax access, and a computer lab

Admission for Masters

Admission for the Certificate Program is identical for the Masters except no letters of recommendation are required.

Admission for Masters

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 April 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 for whom 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 1 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 admis-
- sibility 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
- 3 credits (minimum) Registrar Registration required for continuous enrollment. Continuous enroll-ment 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 Courses

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<thead>
<tr>
<th>Course Title</th>
<th>Credits</th>
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<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 Assistantships sections for detailed information on appointment criteria.

Further Information
For further information regarding the program, contact Native American Studies at 406/994-3881 or e-mail Jennifer Woodcock at jwoodcock@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
  jdj@montana.edu

MPA Program Coordinator
- Dr. Eric Austin
  2-138 Wilson Hall, 406-994-5168, caustin@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.

Associate Professors
- Eric Austin - Organization Theory, Public Policy, Management, Administrative Ethics
- Linda Young - International political economy, globalization and politics, the politics of food and hunger, research methods.

Assistant Professors
- Elizabeth Shanahan - Public Administration Theory, Research Methods, Public Budgeting, Policy Analysis, and Environmental Politics.
- Sarah Rushing - Political Theory, feminist theory.
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.

Admission Requirements
To be admitted to the MPA program, prospective degree candidates must have completed a bachelor’s degree at an accredited college or university with a 3.0 GPA (grade point average) during the last two years of their undergraduate education. A score of 500 on the Verbal Aptitude or a combined score of 1000 on the Verbal and Quantitative sections of the Graduate Record Examination (GRE) is expected. Particular attention is given to the verbal score. Applicants must also submit three letters of recommendation and a personal statement of interest and intent.

Provisional admission may be granted to a student whose application shows reasonable potential for effective graduate work even though the student’s record may be deficient in some area. A decision to recommend provisional admission to the Division of Graduate Education for an applicant may be based on prior work, experience, success in another academic field, completion of supplemental coursework, or other criteria pertinent to academic success. A provisionally admitted student will be informed of any special requirements to be met in order to be granted full academic status. Upon meeting the specified requirements, recommendations of the Political Science Department, and with approval of the Dean of Graduate Education, a student on provisional status may be advanced to full graduate standing. Full graduate standing is usually considered only after completion of nine or more credits of satisfactory graduate coursework.

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 552: Public Policy Processes
POLS 554: Foundations of Public Administration
POLS 555: Human Resources Management
POLS 557: Public Budgeting and Finance
POLS 558: Organization Theory
POLS 520: 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 and tuition waivers 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 173400
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. Callix: physical chemistry, quantum chemistry, biophysical chemistry, electronic structure and photo-physical processes in molecules, solvent-solute interactions.
• T. Douglas: Biominalization, 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. Gricco: 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
• B. Bothner: proteomics, protein dynamics, supramolecular complexes
• M.J. Cloninger: bioorganic and macromolecular Chemistry, organic synthesis.
• V. Copie: biophysical chemistry, protein structures and dynamics as probed by nuclear magnetic resonance.
• C.M. Lawrence: membrane protein structure and function, protein/RNA interactions, macromolecular X-ray crystallography, structure assisted design of ligands and inhibitors.
• L.H. Spangler: physical chemistry and materials, spectroscopy.
• R. Szilagyi: synchrotron-bases spectroscopic and computational studies of bioinorganic and organometallic systems.
division of graduate education

- M. Teintze; Biochemistry of membrane proteins, protein-protein interactions, protein engineering, HIV vaccines.

Assistant Professors
- B. Kohler; Ultra fast laser spectroscopy, DNA photophysics and photochemistry, solar energy conversion.
- T. Rainey; Natural product synthesis, methodology, organometallic chemistry, catalytic enantioselective synthesis.
- R. Walker; Optical spectroscopy, hard to see places.

Degree 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.

Admission (M.S. and Ph.D.)
An entering graduate student is expected to have had a solid chemistry background, including general, analytical, organic, and physical chemistry courses; Mathematics through calculus; and college level physics. A student less well prepared may be provisionally admitted provided he or she can attain an acceptable background proficiency within one year. Applicants are strongly encouraged to take the GRE subject test appropriate to their area.

Please contact the Chemistry Department Graduate Coordinator to request a formal application. Applicants must be formally admitted to the Division of Graduate Education. See the Admission Policies and Application Requirements sections for additional information.

Please note that, although you can apply through the MSU Division of Graduate Education, we prefer that you send your application directly to the Department of Chemistry and Biochemistry. This saves time in the review process (as the Division of Graduate Education immediately reroutes your application to us anyway) and allows us to waive the $50.00 application fee. Along with your application form, you’ll also need to arrange for your GRE scores, three letters of recommendation and an official transcript to be sent to the address given above. International applicants must also submit an iBT or IELTS score report and the International Student Financial Certificate (ISFC) along with the documents required on the ISFC. Application requirements and a no-fee online application may be found on our web site; www.chemistry.montana.edu

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/CHMY 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.

Biochemistry
BCH 524 Mass Spectrometry .................................. 3
BCH 526 NMR Spectroscopy ................................. 3
BCH 534 Proteins ................................................. 3
BCH 544 Molecular Biology .................................. 3
BCH 545 Advanced Physical Biochemistry .................. 3
BCH 547 Bioorganic Chemistry ............................. 3
BCH 559 X-ray Crystallography ............................. 3

Inorganic
CHMY 515 Structure and Bonding in Inorganic Chemistry .......................... 3
CHMY 516 Mechanism and Dynamics in Inorganic Chemistry ......................... 3
CHMY 547 Bioinorganic Chemistry ........................... 3

Organic
CHMY 525 Organic Reaction Mechanisms ...................... 3
CHMY 533 Physical Organic Chemistry ....................... 3
CHMY 553 Organic Synthesis .................................. 3
CHMY 551 Organic Structure Elucidation ...................... 3
CHMY 554 Organometallic Chemistry ......................... 3

Physical/Analytical
CHMY 557 Quantum Mechanics ................................ 3
CHMY 558 Classical and Statistical Thermodynamics .......................... 3
CHMY 559 Kinetics and Dynamics ........................... 3
CHMY 564 Advanced Quantum Chemistry .................... 3

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, 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 ablation 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.

The National NSF 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 and those listed below.

Center for Computational Biology (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 http://www.erc.montana.edu.

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 http://www.montana.edu/~wwoptec.

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 http://tbi.montana.edu/index.html
Center for Bio-inspired Nanomaterials

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 biomaterials (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 http://www.cbin.montana.edu/index.html

NASA Astrobiology Biogecatalysis 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

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ecology@montana.edu
Tel: (406) 994-4548
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Department Head

• Dr. David Roberts

Professors

• Scott Creel Ph.D.; Behavioral endocrinology; conservation biology; population biology; social evolution; and biology of carnivores.
• Robert Garrott Ph.D.; Ecology, population dynamics, management and conservation of mammalian species.
• Daniel Goodman Ph.D.; Applied Mathematical demography; evolutionary demographic 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.
• Steven Kalinowski Ph.D.; Conservation and evolutionary genetics.
• Billie L. Kerans Ph.D.; Behavior, ecology and evolution of freshwater macro invertebrates; and assessing the impact of human disturbances on freshwater ecosystems.

Assistant Professor

• Wyatt Cross Ph.D.; Aquatic food webs and ecosystem; ecological stoichiometry; cross-ecosystem material subsidies.

Degree Offered

• M.S. in Biological Sciences
• M.S. in Fish and Wildlife Management
• M.S. in Land Rehabilitation (Intercollege: Land Resources & Environmental Science)
• M.S. in Ecological & Environmental Statistics (Interdepartmental: Mathematical Sciences)
• PhD in Fish and Wildlife Biology
• PhD in Biological Sciences
• PhD in Ecology and Environmental Sciences (Intercollege: Ecology, LRES, ESCI, ARNR, and PSP). See LRES for details.

The department offers advanced work leading to Master of Science degrees in biological sciences, fish & wildlife management, land rehabilitation, and ecological and environmental statistics. 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. 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 course work 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 course work 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 2009/10 the stipend was a total of $5134 per semester 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.

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, postglacial 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

- 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.
Adjoint Assistant Professors
• S.R. Challender; geographic information science instruction, data base structures, geographic information analysis.

Research Associate Professors
• 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 Professors
• 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)

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. Although we are a small department, 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 paleobiology to applied hydrogeology and from dinosaur taphonomy and stratigraphy to geomorphology. Our Geobiology faculty have research Interests in vertebrate paleontology, paleoecology, biogeography, paleoecology, and geobiology. Our program strengths are in basin analysis and energy resources, dinosaur paleontology, geography 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, geol-
ogy 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 include 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/geochanical 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, pCARS/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 photo-electron 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

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Office Number 406-994-3601

Department Head

• Dr. Kenneth Bowers

Professors

• M.M. Barge; dynamical systems.
• J.J. Borkowski; experimental design, response surface methodolgy sampling, quality control.
• K.L. Bowers; applied mathematics, numerical analysis.
• M.J. Burke; mathematics education.
• J.D. Dockery; applied mathematics.
• T. Gedeon; applied dynamical systems.
• I. Klapper; applied mathematics.
• J. Kwapisz; dynamical systems, ergodic theory.
• T. 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.
• E. Burroughs; mathematics education.
• J.S. Cherry; spatial statistics, linear models ecological and environmental statistics.
• L.G. Davis; sensitivity analysis, optimal design, numerical analysis.
• L. Geyer; dynamical systems, complex analysis.
Assistant Professors
- M.C. Pernarowski; applied mathematics
- 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
- B.J. Lindoman; mathematics education

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. 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 twenty (20) 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 Mathematics
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 (M 333) and Advanced Calculus (M 381-82). 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 20 credits must be numbered 500 or higher. Regardless, all of the following core courses must be completed:
- M 503 Advanced Linear Algebra (every Spring)
- M 504 Abstract Algebra (every Spring)
- M 505 Mathematical Analysis (every Fall)
- M 511 General Topology (every Fall)

Additionally students must fulfill a breadth requirement by completing at least two of the following courses:
- M 441 Numerical Linear Algebra & Optimization (every Fall)
- M 450 Applied Math I (Fall odd numbered years)
- M 454 Dynamical Systems I (Fall even numbered years)
- STAT 421 Probability (every Fall)
- STAT 422 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: M 581 (numerical analysis), M 560 (applied mathematics), M 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. in Mathematics

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

The other two required components may be from the list above or from the following list:
- Numerical Analysis (M 441-442)
- Applied Mathematics (M 450-451)
- Dynamical Systems (M 454-455)
- Probability and Statistics (STAT 421, 422)

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 MSMME 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 MSMME 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

All students must present (1) a capstone project and (2) pass a follow-up oral examination in order to complete the MSMME program. These requirements are intended to give the student the opportunity to synthesize a significant body of knowledge based on their work in the program.

Part 1: The capstone project is an action research project, based upon a classroom topic relevant to the student and presented as a series of web pages. The underlying goals of the capstone project are to improve student achievement in the teacher’s classroom or improve the teacher’s understanding of the teaching and learning process. The first step of a capstone project is a capstone proposal, which must be approved by the student’s graduate committee. The results of the work are presented in a seminar or other suitable forum approved by the student’s committee.

Part 2: The oral examination allows the student and his/her graduate committee to reflect on the theoretical foundations, methodology, and results of the capstone project. This exam is normally taken immediately following the capstone presentation. A notification of intent to take the examination must be filed with the Department of Mathematical Sciences and the Division of Graduate Education in accordance with the “Dates and Deadlines” posted in the MSU Graduate Catalog.

Course & Credit Hour Requirements

The capstone project represents a significant component of the MSMME program. As a result, the capstone project comprises seven (7) credit hours of the student’s entire 30-credit program of study. Specifically, each student intending to complete a capstone project must include the following three courses on their program of study:
- M 571 Action Research in Mathematics Education. 2 credits, on campus, offered each summer.
- M 572 Improving Mathematics Education: Capstone Proposal. 2 credits, distance, offered each fall through the Burns Technology Center.
- M 577 Improving Mathematics Education: Capstone. 3 credits, on campus/distance, offered each summer through the Burns Technology Center.

Most students will complete 571 during a summer session, 572 during the subsequent fall semester, and 577
during the subsequent summer session. Please note that the Division of Graduate Education mandates that 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 (M 273), Linear or Matrix Algebra, Probability (STAT 421), and Mathematical Statistics (STAT 422). 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:

Stats 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 consists of two segments. First, four-hour written exam over material from STAT 501, 501, and 505 plus two electives selected by the student and approved by the student’s graduate committee. Second, a 24 hour take-home section over STAT 506.

1. M.S. Core Courses for the M.S. Comprehensive Exam (12 semester credits)
   b. STAT 505 – Linear Models
   c. STAT 506 – Advanced Regression

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 Ph.D. level mathematics topic as described above; (2) current theory in mathematics curriculum, assessment, and instruction; and (3) educational statistics and research methods.

The student’s graduate committee determines additional requirements. Degree candidates are expected to be familiar with both departmental and Division of Graduate Education degree requirement.
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 read and assess the dissertation.

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 M 500 seminar series.

Typically, a Ph.D. student takes 18 credit hours 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 re-take 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 time.
   d. The candidate must pass the following “required” components:
      i. M 547, M 551 Real and Complex Analysis
      ii. M 511-512 Topology
      iii. M 595-596 Dynamical Systems
      iv. M 584-585 Functional Analysis
      v. M 581-582 Numerical Analysis
      vi. M 544-545 Partial Differential Equations
      vii. M 560-561 Applied Mathematics
      viii. M 547, 586 Probability
   f. At most one “nonstandard” component not from (i)-(viii) may be taken. To take such a component a 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 an 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 Ph.D. 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 Ph.D. core. Each area should include an amount of material (and at an appropriate depth) equivalent to two or three 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 6 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 (M 547)
- Biostatistics/Generalized Linear Models (STAT 524 & STAT 539)
- Time Series (STAT 554 and I & ME 558).

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 exam.

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 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
109 Lewis Hall
Bozeman, MT 59717
Tel: (406) 994-2902
www.montana.edu/wwwmb

Professors

- A.K. Camper (affiliate); bacterial attachment to surfaces, biological treatment of drinking water and microbial regrowth in drinking water distribution systems.
- M.J. Franklin; molecular genetics, biofilms, microbial exopolymer production, physiology of sessile bacteria, alginate biosynthesis.
- 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.
- Z. Lewandowski (affiliate); environmental engineering, microelectrodes and chemistry of biofilms • 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. • B. Peyton (affiliate); extremophilic bioprocessing, in situ biocatalyzed heavy metal biotransformations.
- 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
- H.M. Miettinen (research): signal transduction in leukocytes, inflammation, cell adhesion and migration, function of inflammatory receptors.
- 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
- M. Dlakic; 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.
- B.L. Granger (research): DNA vaccines, intracellular membrane traffic, host-parasite interactions.
- S. Halonen; intracellular protozoan parasites, immunobiology of Toxoplasma gondii in the central nervous system, cell biology of intracellular G-protein coupled receptors, enzymology, protein chemistry.

Instructors
- K.L. Cargill (adjunct); general microbiology, instruction.
- R. Craver (adjunct); Assoc. Director Montana Medical Laboratory Science Program.
- B.K. Hudson (adjunct); Director Montana Medical Laboratory Science Program, science education.
- L.M. Sherwood (adjunct); microbial genetics, science education.

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 Assistantships sections for detailed information on appointment criteria.
• Steve Eiger
• Thomas Hughes; biophysics.

Assistant Professors
• Christa Merzdorf; developmental neurobiology.
• Steve Stowers; Genetic analysis of neural circuits.

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 http://www.montana.edu/cbn/ 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, CHMistry, Physics, Applied M 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/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.

Required courses include:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 611</td>
<td>Neuroscience I</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 612</td>
<td>Neuroscience II</td>
<td>4</td>
</tr>
<tr>
<td>VTMB 424</td>
<td>Ethical Practice of Science</td>
<td>3</td>
</tr>
<tr>
<td>STAT 524</td>
<td>Biostatistics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 500 Seminar</td>
<td>1 Credit-Each Term</td>
<td></td>
</tr>
</tbody>
</table>

Plus a minimum of 4 courses from the following list:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 510</td>
<td>Topics in Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 522</td>
<td>Genes and Cancer</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 525</td>
<td>Sensory Neurophysiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 526</td>
<td>Neuroethology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 538</td>
<td>Developmental Mechanisms</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 553</td>
<td>Biomimetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 554</td>
<td>Cognitive Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 566</td>
<td>Gene Construction</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 567</td>
<td>Molecular Medicine</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 570</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>BIOL 580</td>
<td>Special Topics</td>
<td>1-4</td>
</tr>
<tr>
<td>MEDS 532</td>
<td>Medical Neuroscience</td>
<td>6</td>
</tr>
</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 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
Montana State University
P.O. Box 173840
Bozeman, MT 59717-3840
http://www.physics.montana.edu

Tel: (406) 994-3614
Fax: (406) 994-4452
Location: EPS Building, Rm 264
physics@montana.edu

Department Head
• Dr. Richard J. Smith

Professors
• W.R. Babitt; laser and solid-state physics.
• J.L. Carlsten; laser physics.
• R.L. Cone; laser and solid-state physics.
• G.E. Francis; physics education.
• Y. Ilzerda; magnetic nanostructures; spin electronics.
• B. Link; theoretical astrophysics.
• D. Longcope; solar physics.
• 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.
• G. Malovichko; defects in optical materials.

Assistant Professors
• J. Qiu; solar physics.
• A. Vorontsov; solid state theory

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. Klumpp; space science.
• P. Martens; solar physics

Research Assistant Professors
• M. Drobiyev; laser physics.
• D.E. McKenize; solar physics.
• R. Leamon; 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:
Coursework: A minimum of 20 credits of acceptable course work is required, which shall include the following.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 500 Teaching Seminar</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 500 Research Introduction Seminar</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 501 Advanced Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 506 Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 519 Electromagnetic Theory I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 566 Mathematical PHSXics</td>
<td>3</td>
</tr>
<tr>
<td>XXX Electives</td>
<td>6</td>
</tr>
<tr>
<td>Thesis</td>
<td>10</td>
</tr>
</tbody>
</table>

Plan-B Requirements:
Coursework: A minimum of 30 credits of acceptable course work is required, which shall be distributed as follows.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 500 Teaching Seminar</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 500 Research Introduction Seminar</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 501 Advanced Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 506 Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 507 Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 519 Electromagnetic Theory I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 520 Electromagnetic Theory II</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 566 Mathematical PHSXics</td>
<td>3</td>
</tr>
<tr>
<td>XXX Electives</td>
<td>10</td>
</tr>
</tbody>
</table>

Thesis Requirements: None

Examinations:
A written comprehensive examination is required.

Program Information - Ph.D.
Coursework: A minimum of 60 credits of acceptable course work and research is required, which shall include the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 500 Teaching Seminar</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 500 Research Introduction Seminar</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 501 Advanced Classical Mechanics</td>
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</tr>
<tr>
<td>PHSX 506 Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 507 Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 519 Electromagnetic Theory I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 520 Electromagnetic Theory II</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 535 Statistical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 566 Mathematical PHSXics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 567 Mathematical PHSXics</td>
<td>3</td>
</tr>
<tr>
<td>XXX Electives</td>
<td>14</td>
</tr>
</tbody>
</table>

Thesis:
An acceptable thesis is required. A minimum of 20 credits of PHSX 690 Research is required in addition to the courses listed above

Examinations:
A written and oral comprehensive examination is required. A final oral examination is also required, covering the thesis and related areas.

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 Biochemistry, Electrical and Computer Engineering, the Center for Biofilm Engineering and others. Research collaborations with local industries are also actively pursued. Collectively, our research groups foster interactions among the faculty, undergraduate and graduate students, research scientists, visiting scientists and other departments. Details of the research, as well as other aspects of the physics graduate program, are described on the Physics home page (http://www.physics.montana.edu).

Astrophysics, Relativity, and Cosmology (ARC):

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 Beams 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 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 non-linear 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 embraces 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 Box 173440
Bozeman, MT 59717-3440
Tel: (406) 994-3801
http://www.montana.edu/wwwpy/msprogram.htm

Department Head
- Dr. Ruth Striegel-Moore

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; cerebral 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.
- I. 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 individualized 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>
</tr>
</thead>
<tbody>
<tr>
<td>PSY 501</td>
<td>Advanced Research Design &amp; Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PSY 509</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>
<td>3</td>
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<td>PSY 543</td>
<td>Memory</td>
<td>3</td>
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<td>PSY 544</td>
<td>Social Psychology</td>
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<td>PSY 546</td>
<td>Social Cognition</td>
<td>3</td>
</tr>
<tr>
<td>PSY 590</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.

Assistant Professors
- Yoshiko Colclough
- Sandra Kuntz
- Laura Larsson
- Maryann Prawdzienski
- Carolyn Wenger

Adjunct Faculty
- Sharon Andros
- Deanna Babb
- Leslie Boor
- Carolyn Collis
- Carolyn Dewey
- Laurie Glover
- Steven Glow
- Janice Hausauer
- Brett Holli
- Kimberly Kusak
- Elisabeth Lincoln
- Carolyn Mack
- Debbie Peterson
- Barbara Prescott
- Julie Pullen
- Susan Raph
- Karrin Sax
- Jane Scharff
- Jennifer Sofie
- Angela St. John
- Carolyn Schmidt
- Linda Torma
- Teresa Wicks
- Maria Wines

Degree Offered
- Master of Nursing (MN)

Options:
- Clinical Nurse Leader (CNL)
- Family Nurse Practitioner (FNP)
- Family Psychiatric Mental Health Nurse Practitioner (PMHNP)

The College of Nursing’s 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 people living in rural areas. It is fully accredited by the Commission on Collegiate Nursing Education (CCNE).

The College provides the educational preparation for many exciting opportunities to practice in rural and frontier areas of Montana. Nursing faculty are recognized nationally for their expertise in rural cultural values and health beliefs. Clinical experiences with Native American populations are available and provide students with
opportunities to make a real difference in health practices of Native American and rural clients.

Admission
For admission, a student must be a graduate of a nationally accredited, upper division baccalaureate program in nursing that 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.

Program Requirements
Students select one of the MN degree program specialty options (CNL, FNP, or FPMHN). Each student completes courses in research, advanced health assessment, advanced physiology, 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).

Financial Assistance
Limited financial assistance is available to degree seeking graduate nursing students. Federal Advanced Education Nursing Traineeship awards, which help defray tuition costs, may be available to students who are U.S. citizens. Nurse Faculty Loan Program funds may be available to students interested in teaching. 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 Catalog for appointment criteria).

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

EXTENDED UNIVERSITY
Kim Obbink, Ed.D., Director

Extended University works closely with campus colleges, departments and Montana’s K-12 and business communities to nurture and grow 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.science-teacher.org

Graduate Programs 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

Dean
• Larry J. Baker
(406) 994-6752
lbaker@montana.edu

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 requirement, 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/montanag-pidea/faq.htm.

Program Requirements: (subject to change - check with program contact)
The interdisciplinary IGERT program in Geobiological Systems Science involves over 25 faculty at MSU in 7 different departments and 3 colleges, as well as additional national and international collaborators. Consequently, the following individuals can serve as initial contacts for questions, advice and additional information.

**IGERT: Geobiological Systems**
- Dr. Bill Inskhip
  IGERT Director, Thermal Biology Institute and Department of Land Resources and Environmental Sciences
  Research Interests: Geomicrobiology, environmental genomics
  binskeep@montana.edu
- Dr. Anne Camper
  Associate Dean, College of Engineering
  Center for Biofilm Engineering
  Research Interests: Waste-water treatment, biofilms
  anne_c@erc.montana.edu
- Dr. John Peters
  Director, Thermal Biology Institute
  Center for Biofilm Engineering
  Department of Chemical and Biological Engineering
  Research Interests: Bioremediation, bioenergy
  bpeyton@erc.montana.edu
- Dr. Brent Peyton
  Associate Director, Thermal Biology Institute
  Cold Regions Research, Department of Chemical and Biological Engineering
  Research Interests: Enzyme structure-function
  john.peters@chemistry.montana.edu
- Dr. Mark 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 microorganisms, and brings together expertise in hydrodynamics, geochemistry, microbial ecology, 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 comprehensive understanding of the important interfaces between the biosphere and geosphere. This novel Ph.D. training program encompasses research scientists focused on the microbiology of extreme thermal, psychrophilic, 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 integrated within the IGERT program include the geomicrobiology of thermal, psychrophilic 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 from 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 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 2-2.5 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

Collaborating Departments and Faculty

Mathematical Sciences

http://www.montana.edu/ecology/2-214 Wilson

• John Borkowski
• Steve Cherry
• Mark Greenwood
• Megan Higgs
• Kathryn Irvine
• Jim Robison-Cox

Ecology

http://www.math.montana.edu/310 Lewis

• Scott Creel
• Daniel Goodman
• Steven Kalinowski
• David Roberts
• Jay Rotella
• Mark Taper

Land Resources and Environmental Sciences

http://landresources.montana.edu/334 Leon Johnson

• Rick L. Lawrence
• Lucy Marshall
• Bruce Maxwell
• Lisa Rew
• Catherine Zabinski

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 those 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
• Minimum of 30 postbaccalaureate units as stated in the Graduate Catalog.
• No more than 9 units duplicated in other MSU degrees (see Graduate Catalog).
• Minimum of 21 units in statistics (400 level or higher) or other approved quantitative courses. Unless equivalent previously taken, these must include:
  - STAT 410/511 Data Analysis I
  - STAT 412/512 Data Analysis II
  - STAT 421 Probability
  - STAT 422 Mathematical Statistics
  - STAT 446 Sampling
  - Six graduate credits in statistics as approved by committee
  - Six graduate credits in ecology/environmental science as approved by committee
  - Committee may require additional coursework depending on background
• 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).
• Comprehensive exam in Statistics:
  - 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.
  - 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.
• Demonstration of the following:
  - Technical knowledge of participating substantive field. Requirements to be determined by collaborating department. Requirements may include:
    - Comprehensive exam.
    - Course work.
    - Undergraduate degree.
  - Competence in scientific writing, satisfied by:
    - A graduate course in scientific writing and a professional paper.
    - 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:
    - Presentation at a scientific meeting.
    - Or a seminar course requiring presentation.
    - Research satisfied by:
      - Research thesis in statistical ecology.
      - Or research thesis of collateral degree.
      - Or a research paper suitable for publication (with approval).
• Philosophy of science, one course such as:
  - PHIL 345 Philosophy of Science
  - BIOL 525 Research Methods and The Scientific Process
  - HIST 506 Topics In History Of Science And Technology

Potential statistics and approved quantitative courses:
- STAT 410/511 Data Analysis I
- STAT 412/512 Data Analysis II
- STAT 421 Probability
- STAT 422C Mathematical Statistics
- STAT 451 Nonparametric and Resampling Methods
- STAT 456/556 Time Series Analysis
- STAT 457 Introduction to Applied Multivariate Analysis
- STAT 459 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
- 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&WL 502 Analysis of Population & Habitat Data
- LRES 545 Watershed Analysis
- LRES 426 Remote Sensing
  - and Digital Image Processing
- LRES 535 Techniques of Spatial Analysis
- GPHY 484 Applied Gis and Spatial Analysis
- GPHY 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 course work may be substituted for LRES courses.

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
- 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
DIVISION OF GRADUATE EDUCATION

Chemistry & Biochemistry
- J. Amend; inorganic Chemistry, Chemistry education
- C. Bahn; inorganic Chemistry
- S. Holmgren; Chemistry education
- C. McLaughlin; Chemistry
- J. Peters; Chemistry
- A. Sower; Biochemistry

Earth Science
- S. Custer; geology, hydrology
- F. Jackson; dinosaur paleontology
- D. Lageson; structural geology and tectonics
- C. Shaw; geology, hydrology
- J. Schmitt; geology, relationships between tectonics & sedimentation

Education
- E. Brunsell, 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
- S. Carrithers; soil science and water resources
- S. Kelly; Big Sky Institute
- B. Maxwell, land and environmental science

Mathematics
- M. Burke; M education
- J. Luebeck; M 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 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; at least two years of science teaching; 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 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

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EDCI 504</td>
<td>Evaluation and Measurement</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 505</td>
<td>Foundation of Action Research</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 509</td>
<td>Implementing Action Research</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 575</td>
<td>Capstone Project and Presentation</td>
<td>3</td>
</tr>
</tbody>
</table>

Further information
For additional information and application forms, contact: 406-994-5679 (voice), dianap@montana.edu (email), www.montana.edu/msse (website), 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
- Dr. 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 BioInspired 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](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 sciences 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 sciences 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.

**WWAMI Medical Program**

WWAMI Medical Program
Linda E. Hyman, Ph.D., Director and Vice Provost for Health Sciences 310 Leon Johnson Hall 994-4411 lhymnan@montana.edu www.montana.edu/dhs/

**Director**

- Linda E. Hyman, Ph.D.

**Professors**

- R. Baricos (adjunct); pathology
- R. Flaherty (adjunct); medical science
- A. Goodman (adjunct); microbiology
- J. Hensold (adjunct); medical science
- M. Herring (adjunct); medical science
- M. Jutila; immunology
- E. Lefcourt; cell biology
- D. Phillips; cell biology.

**Associate Professors**

- V. Copie; Biochemistry/Chemistry
- S. Eiger; cell biology
- M. Teinize; 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

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, pathology, infectious diseases, behavioral systems, nervous system, and anatomy of the head and neck. 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 2008), 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</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MedS 510 Anatomy - Microscopic</td>
<td>3</td>
</tr>
<tr>
<td>MedS 511 Anatomy - Gross</td>
<td>4</td>
</tr>
<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>
</tr>
<tr>
<td>MedS 514 Molecular and Cellular Biology</td>
<td>5</td>
</tr>
<tr>
<td>MedS 516 Clinical Preceptorship</td>
<td>1</td>
</tr>
<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>
</tr>
<tr>
<td>Total</td>
<td>23</td>
</tr>
</tbody>
</table>

Further Information
Contact the Montana WWAMI Director at MSU or the URL http://www.montana.edu/wwami for complete application, admission, and program requirements.
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 Division of Graduate Education.

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.

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.

The following applications are for both degree-seeking and non-degree students.

- **Graduate Online Application**: [https://apply.embark.com/grad/montana-state/19/](https://apply.embark.com/grad/montana-state/19/). 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.

- **Graduate Paper Application**: [pdf](http://www.montana.edu/wwtdg/newforms/application.pdf). 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.

**Supplemental Application Forms**

- Grade Point Average Calculation sheet [pdf](http://www.montana.edu/wwwdg/newforms/GPA%20Calculation%20Sheet.pdf)
- Financial Certificate [pdf](http://www.montana.edu/wwwdg/pdf_files/fin_cert.pdf)

Please note that viewing and printing the application forms requires Adobe Reader.

### 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 form;
- a nonrefundable application fee payment of $50 for online applications or $60 for paper applications;
- official transcripts reflecting all baccalaureate work including bachelor’s degree and post-baccalaureate work;
- three letters of recommendation;
- official entrance exam scores (contact department for requirements);
- a letter of intent or essay, if required by the academic department.

### Entrance Exam Requirements

Please contact the department to which you are applying for information regarding their entrance exam requirements.

If 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 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.

### 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 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 Application Deadlines

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

Degree-Seeking International 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 $50 for online applications or $60 for paper applications;
- official transcripts reflecting all baccalaureate and post-baccalaureate work with official English translation;
- official degree certificate from each college or university from which a degree was received with official English translations;
- 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 specific 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 $50 for online applications or $60 for paper applications;
- official transcripts and bachelor’s degree certificate with official English translation;
- 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.

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 coursework 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 and Fees

University and Graduate Student Fees
Refer to the Estimated Expenses-Fee Schedules, 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.

Residency Requirements for Fee Purposes
Residency for fee purposes is determined by the regulations of the Board of Regents. The Division of Graduate Education reviews the residency status of each newly accepted graduate student and follows the general guidelines outlined by the Office of the Registrar’s Residency Policy. If a student is unemancipated and normally resides with a parent who is a Montana resident, the Division of Graduate Education will apply resident status.

Training and Development Fee

Welcome Dinner
Each semester, the Division of Graduate Education hosts a dinner for all new graduate students. This event offers 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. The dinner is highlighted by a guest speaker who is familiar with graduate education at MSU, and can offer great insight and words of advice to graduate students across all disciplines.

Graduate Seminars
The Division of Graduate Education offers Professional Development seminars. These seminars are designed to assist graduate students in pursuit of their career. The presentations are delivered by a diverse and highly knowledgeable pool of MSU staff, faculty, and outside experts.

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
A non-waivable training and development fee of $50 is assessed to each degree-seeking graduate student the first term of registration. Students not assessed this fee are those registered for Extended University courses only, or are those who are non-degree graduate students only.

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. A minimum of 20 credits of coursework are required and no more than nine (9) credits of coursework can be 4XX level.

2. Only those courses listed in 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 or thesis defense is taken. (Plan A only)
Students must register for a minimum of three (3) credits the semester of intended graduation.

Course Limitations for Master's Degrees

1. Undergraduate (MSU 4XX) courses: Up to 9 credits at the 400-level are allowed on a graduate Program of Study under two circumstances:
   - They were taken as a graduate student, or
   - 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 of Individual Problems courses for which a student may register is not limited.
6.限 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 or Undergraduate Seminars (400) 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.

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/wwwdg/forms.shtml

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 non-academic 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. For Master’s students, only changes to the committee chair 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.

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.

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 semes-
ter 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 or
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 pro-
grams. 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 (usu-
ally no later than fourteen (14) work-
ing 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 cor-
crections/changes before the first day of
the following academic term and be eli-
gible for a one-credit extension for the
following term (instead of the manda-
tory 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.

Thesis approval requirements
The thesis must meet all require-
ments set forth in the Division of
Graduate Education ‘Guide for
Preparation of Theses, Dissertations
and Professional Papers’. Final author-
ity 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 http://
www.montana.edu/wwdg/forms.
shuml. 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.
shuml.

Copy quality, punctuation and spell-
ing, 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 gradu-
ate 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 com-
plete 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 con-
tepts 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 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 automati-
cally 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
GraduateVice Provost. The Division of
Graduate Education will make every
effort to keep thesis information
confidential.
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.

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
The last day to take the comprehensive examination (for Plan A options only) 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., the time 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 14th 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.

**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, and June 10 for Summer Semester.

The form is available at www.montana.edu/wwedg/forms.shtml

**“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.

**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

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**Summary of Procedures for a Master’s Degree**

<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pre-application form.</td>
<td>If required by the academic department, submit before obtaining application packet.</td>
<td>Send pre-application form to appropriate department.</td>
</tr>
<tr>
<td>2. Graduate Record Examination or alternative</td>
<td>May be required for admission.</td>
<td>Take exam at a testing center in your area and have results sent to MSU-Bozeman (code 4488).</td>
</tr>
<tr>
<td>3. Admission to department and Division of Graduate Education.</td>
<td>Per departmental and Division of Graduate Education deadlines.</td>
<td>Request application packet from appropriate department or apply on-line.</td>
</tr>
<tr>
<td>4. Selection of advisor and committee.</td>
<td>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>
</tr>
<tr>
<td>5. Graduate Program of Study.</td>
<td>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>
</tr>
<tr>
<td>6. Qualifying Examination</td>
<td>As required by the department.</td>
<td>Consult and schedule through the academic advisor.</td>
</tr>
<tr>
<td>7. Thesis outline (if thesis option is chosen)</td>
<td>As early as possible.</td>
<td>Submit outline to thesis committee for approval.</td>
</tr>
<tr>
<td>8. 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>9. Final Changes to the Program of Study.</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>10. Comprehensive examination.</td>
<td>Must be passed at least 14 days before the end of the semester in which graduate work is completed.</td>
<td>Make arrangements with advisor.</td>
</tr>
<tr>
<td>11. Defense of thesis.</td>
<td>At least 14 days before the end of the semester in which graduate work is completed.</td>
<td>Make arrangements with advisor. This examination may be part of the comprehensive examination.</td>
</tr>
<tr>
<td>12. Approval of thesis.</td>
<td>After the defense-of-thesis examination and at least 14 working days before the end of the semester in which graduate work is completed.</td>
<td>Approval by the Graduate Vice Provost.</td>
</tr>
</tbody>
</table>
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.

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.

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 degree program.
2. Individual Problems (570): Not more than six credits of Individual Problems (570) courses may be included on a doctoral Program of Study.
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 18-28 (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.

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 graduate committee, and acts as a channel of communication within the major department.

The department head or graduate coordinator may act as the advisor during the first term or until a major professor is selected. In the event that the student does not select a major professor within the first term of attendance as a doctoral student, the department head must appoint a temporary advisor. The faculty member will advise the student until a major professor is selected.

The selection of a major professor must be completed and approved by the department head and the Graduate Vice Provost no later than the third term the doctoral student is in attendance.

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. The 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.

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.

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 the 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.

If a student wishes to sit for the dissertation defense during the intersession (i.e., the time 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.

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:

1. the name of the candidate,
2. title of the doctoral dissertation,
3. time and place of defense, and
4. 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.

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.

Commencement
Diplomas are dated the last day of the semester in which the requirements for the degree are completed. Degrees are conferred once a year at May commencement.

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 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.

<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>Procedure</th>
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</thead>
<tbody>
<tr>
<td>1. Pre-application form.</td>
<td>If required by the academic department, the pre-application must be submitted before obtaining application packet.</td>
<td>Send pre-application form to appropriate department.</td>
</tr>
<tr>
<td>2. Graduate Record Examination</td>
<td>May be required for admission.</td>
<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 on-line.</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>
</tr>
<tr>
<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. * Extra fees apply for this form</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. * Extra fees apply for this form</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 the semester in which graduate work is completed.</td>
<td>Approval by the Graduate Vice Provost.</td>
</tr>
</tbody>
</table>
Auditing Credits
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.

Challenging A Course
Challenge provides the opportunity to earn college credits and grade point without formal course enrollment. A graduate student accepted into a degree program may challenge a graduate course through their department or program. A student may challenge a course only if the prerequisites for the course have been met.

- Master’s students may challenge no more than a total of six (6) semester credit hours and apply those credits to a degree program.
- Doctoral students may challenge no more than a total of nine (9) semester credit hours, including those hours successfully challenged for a master’s degree.

Continuous Enrollment Policy
To maintain graduate status, a student must be enrolled in three (3) or more credits (including thesis or dissertation) each semester, excluding summer semester.

Continuous enrollment policy is applicable for:
- Master’s students
  - after completion of required content course work 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
- 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, excluding 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.

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.

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 during the academic year and during the summer term. Graduate Student Assistants (GRAs) may be enrolled in 3-5 credits during the academic year. They may be enrolled for less than six credits during the summer and can be at zero credits if they are continuing from spring 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 requires 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 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.

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**Grades, Course Loads and Special Courses**

**Grades**

Grade Point Average (GPA) standards: A student must maintain a minimum 3.0 semester GPA, a minimum 3.0 GPA in the entire Program of Study and a cumulative 3.0 GPA overall. Any student whose cumulative or Program of Study grade point average 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 either 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" grad 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 duration, 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. 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

General Guidelines

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) 994-2311.

Final Semester Registration:

One Credit Extension

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.

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 of 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; and
• 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 not 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.

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 at a 3.0 GPA in 4XX-level and higher courses taken during non-degree status.

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.

Transferring Credits
Transfer credits are defined as credits coming from an outside institution, credits taken in the non degree status at MSU, and credits reserved for graduate credit at MSU while pursing a bachelor’s degree. A total of nine (9) transfer credits as defined can be applied to a degree seeking graduate 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 coming from an outside institution 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”;
- (including non degree courses and reserved credits taken at MSU)
- 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.

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
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., 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.

Scheduling the thesis defense

The last day to defend a thesis is on or before the published deadline (generally on or before the fourteenth 14th 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 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 taking 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:

- the name of the candidate,
- title of the doctoral dissertation,
- time and place of defense, and
- 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.

**Commencement**

Diplomas are dated the last day of the semester in which the requirements for the degree are completed. Degrees are conferred once a year at May commencement.

**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.

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/wvwr.

Brief descriptions of MSU’s Research Centers & Programs are available through the Research Creativity and Technology Transfer web site at www.montana.edu/wwwvr/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**

**General Information**

Graduate assistantships are available in many academic departments. Prospective graduate students should contact their department of choice for information regarding assistantship availability. Non-degree graduate 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 teaching and research assistants (GTA and GRA) must be enrolled for at least 6 credits.
- Graduate assistants must be enrolled by the 20th of the month that they begin their appointment in order to receive a paycheck the following pay period.
- Student Assistants (GSA) must be enrolled in 3-5 credits per semester during the academic year.
- GSAs, are not exempt from payroll taxes and must meet the same deadlines as GTAs and GRAs.
- Graduate Assistants work a minimum of 10 hours per week and a maximum of 20 hours per week during Fall and Spring semester.
- All GTAs and GRAs must carry a minimum of six 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:**
- GTAs and GRAs must be enrolled for 6 credits during the Summer semester.
- GSAs can be enrolled in 0-5 credits during the Summer semester as long as they are continuing their graduate program from the Spring Semester.
- Summer Graduate Assistants appointed as GRAs, GTAs, or GSAs may work up to 40 hours per week. The minimum appointment is 10 hours per week.

**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:**
- International students must also meet the minimum score requirements for the TOEFL or IELTS as listed below:
  - Classroom teaching in charge of a class or section:
    - 580 TOEFL paper-based test or;
    - 257 TOEFL computer-based test or;
    - 93 TOEFL internet based test or;
    - 7.0 IELTS total band score.
  - Lab assistant or discussion leader with another qualified GTA, or with a regular faculty member present in the classroom:
    - 565 TOEFL paper-based test or;
    - 225 TOEFL computer-based test or;
    - 86 TOEFL internet based test or;
    - 7.0 IELTS total band score
  - Test/paper grader, assisting with lab set up, or other non-student contact duties:
    - 550 TOEFL paper-based test or;
    - 213 TOEFL computer-based test or;
    - 80 TOEFL internet based test or;
    - 7.0 IELTS total band score

**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 advisor’s 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.
Graduate Student Assistants (GSA)
Graduate students appointed as Graduate Student Assistants may be involved in instruction and/or research usually in their area of expertise. GSAs assist faculty, departments, or other units in a variety of activities that are closely related to the student’s area of academic study and interest. Specific duties of GSAs may be similar or identical to GTAs and GRAs.

Tuition Waiver General Information
- Tuition Waivers do not waive the various fees attached to a student’s tuition and fee statement.
- Tuition waivers are available on a limited basis, and eligibility does not guarantee a tuition waiver.
- The Division of Graduate Education is not obligated to award tuition waivers based on promises made by departments.

Student Deadlines for Tuition Waivers Awarded
- Must be enrolled for all credits that will be waived no later than 5th class day.
- Must confirm attendance with student accounts no later than 5th class day, http://www.montana.edu/wwbu/studentaccts.html

Late Awarding Waivers
Tuition waivers awarded after the fifth class day are not guaranteed, and students may have to pay full tuition.

Other Student Employment
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).

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 at Residence Life, University Food Services, ASMSU Tutoring, or apply for classified, professional and adjunct positions.

Ethical and Professional Standards
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.
COURSE DESCRIPTIONS

For the most up-to-date catalog information:

www.montana.edu/wwwcat

Course Description Information

Course offerings are subject to the availability of staff and adequate enrollment. Check the Schedule of Classes for the courses actually offered each semester.

Numbering System

- 001-099 - courses below college level. No college credit given. Credits may not be counted toward a degree.
- 100-199 - Freshman - Lower Division
- 200-299 - Sophomore - Lower Division
- 300-399 - Junior - Upper Division
- 400-499 - Senior - Upper Division
- 500-599 - Graduate Courses
- 600-699 - Graduate Courses

Core 2.0 Courses

Core 2.0 courses are designated by a letter following the course number (e.g., CLS 101US). The following letters are used to specify the core groups:

- US - University Seminar
- W - College Writing
- Q - Quantitative Reasoning
- D - Diversity
- CS - Contemporary Issues in Science
- IA - Inquiry Arts
- IH - Inquiry Humanities
- IN - Inquiry Natural Science
- IS - Inquiry Social Science
- R - Research
- RA - Research Arts
- RH - Research Humanities
- RN - Research Natural Science
- RS - Research Social Science

Classification of Courses

In the second line of each course description, following the number of credits for the course, there appears a course classification designation which indicates the mode of instruction for that course. In some cases two classifications are listed along with the number of credits in each.

Following is an explanation of course classifications.

- LEC - Lecture: Presentation of course material by the instructor, utilizing the lecture method.
- LAB - Laboratory: Instructing and supervising students in laboratory investigations.
- STU - Studio: Instructing and supervising students in studio investigations.
- RCT/DIS - Recitation-Discussion: Presentation of course materials designed to involve students in recitation and/or discussion.
- SEM - Seminar: Students share, with the instructor, responsibility for preparation and presentation of course material.
- IND - Independent Study: Directed study and/or research on an individual basis, under supervision of instructor.

Graduate Credit

Courses which may be taken for graduate credit are designated by a 500 or 600 number. 400 level courses may also be for graduate credit with the approval of student’s program committee.

Uniform Course Numbers

Uniform numbers are used in all departments at the graduate level.

- 570 - Independent Study
- 575 - Graduate Research - Paper (professional paper or professional project)
- 576 - Internship
- 580 - Special Topics
- 588 - Professional Development
- 589 - Graduate Consultation
- 590 - Master’s Thesis
- 689 - Reading and Research
- 690 - Doctoral Thesis

Undergraduate and graduate courses may be repeated for credit. Specific titles of Special Topics courses are listed in the Schedule of Classes, on the Class Rolls and the student’s permanent record. Courses such as Special Topics, Independent Study and Internship are offered for varying amounts of credit, e.g. 1-5. A maximum number of credits is also imposed e.g., Maximum 6 cr.

A student may repeat such courses to earn the maximum number of credits by registering for two or more projects with the credits for each project totaling the maximum allowed. If there is no stated maximum for Internship, then all earned credits will count toward graduation, but these credits will only count toward meeting degree requirements as determined by the student’s department. Credits earned beyond the stated maximum cannot be applied toward graduation.

Special Topics and Independent Study Courses

The maximum number of credits allowed toward graduation in special topic courses in each rubric is 12, and the maximum number of independent study credits in each rubric is six. Some departments have established lower limits than these, and the student is responsible for checking the specific course listings to see that he or she does not exceed the allowable number of credits. The maximum number of graduate independent study credits is applicable to a graduate degree; the student is responsible for checking the specific course listings to see that he or she does not exceed the allowable number of credits. The maximum number of graduate independent study credits is applicable to a graduate degree. No undergraduate independent study credits are applicable to a graduate degree.

Courses Offered on Demand

A course designated as “On demand” with a specific semester (i.e., F, S, Su) preceding this phrase means that the course will be offered that semester if there is sufficient demand.

Undergraduate courses designated as given “On demand” may be offered any semester in which there is a sufficient number of students who wish to register for the course. Usually undergraduate courses are offered at the request of 10 or more students.
Graduate courses listed “On demand” will be offered when a sufficient number of students have requested the course and faculty availability and budgets permit.

Courses Offered Alternate Years

Certain courses for which there is a small demand are offered every other year. The designation for such a course is: Semester (Alternate years will be offered...dates...).

Undergraduate Course Prerequisites

Courses beyond the freshman year usually have “prerequisites.” This means that certain lower-level courses must be taken before the student may register for the advanced course. A grade of “C” or better must be earned in all prerequisite courses to satisfy the requirement.

The prerequisite for undergraduate courses may be “consent of instructor.” The student must secure the consent of instructor of the course before registering for it. “Consent of instructor” is usually required for courses in which there is limited laboratory space and/or skills are required.

The Department of Mathematical Sciences enforces prerequisites. By University policy, in order for any course to serve as the prerequisite you must earn a “C” or better. In addition to the specific prerequisite courses listed, students in 100 level math courses may also meet the prerequisite with the appropriate Math ACT, Math SAT, or Math Placement Exam score. Specific levels and scores for these courses can be found at: www.math.montana.edu/undergrad/documents/MHierarchy.pdf.

Graduate Course Prerequisites

Courses at the 500 and 600 levels may be taken only by qualified students. Unless otherwise stated the courses are open only to:

1. Students with graduate standing (post baccalaureate students admitted to the College of Graduate Studies, enrolled in non-degree status or second bachelor’s degree candidates).

2. Seniors with a cumulative grade-point average of 3.25 or higher, and

3. Other seniors who have a petition approved by the head of the student’s major department, and the Dean of the College of Graduate Studies.

Some courses are limited to students with graduate standing or certain levels of graduate standing. These specific conditions are indicated within the course prerequisite or description statements.

Students below senior standing are not eligible to take graduate-level courses.

Course Descriptions by Subject Area

Listings in this section are grouped according to subject area and listed alphabetically. In addition to an actual description of the course, each listing includes course credit, mode of instruction and prerequisite, if any. While the semesters each course is offered are also shown (Fall semester, Spring semester, Su-summer session), you should consult the Schedule of Classes, published prior to pre-registration each semester for the most up-to-date information on course availability.

ACTG Accounting

College of Business
(406) 994-4423

ACTG 201 PRINCIPLES OF FINANCIAL ACCOUNTING
F, S, Su 3 cr. LEC 3
PREREQUISITE: M 121 or Math Placement level 4 or higher.
- An introduction to the principles of financial accounting for students of all business curricula. Specific topics include key accounting concepts, accounting transaction recording, financial statement preparation, accounting systems overview, business entity structures and financial statement analysis.

ACTG 202 PRINCIPLES OF MANAGERIAL ACCOUNTING
F, S, Su 3 cr. LEC 3
PREREQUISITE: ACTG 201, and BUS 211 as pre-or co-requisite.
- An introduction to the principles of managerial accounting. Managerial accounting provides information to managers for use in planning, control, and decision making. Topics include product costing, cost-volume-profit analysis, budgeting, variance analysis, and decision analysis tools.

ACTG 220 SURVEY OF ACCOUNTING
On Demand 3 cr. LEC 3
- A survey of the basic accounting model, accounting records, recording business transactions, preparation and analysis of financial statements, and elementary income tax issues in a small business environment. This course is intended for non-business majors and may not substitute for any required business course.

ACTG 223 PRINCIPLES OF FINANCIAL ACCOUNTING II
F, S 3 cr. LEC 3
PREREQUISITE: ACTG 201.
- A continuation of the financial accounting topics introduced in ACTG 201. The course helps students learn how to prepare and analyze financial statements, and understand the role that accounting plays in business decisions. Additional topics include: stock and bond investments, cash flow reporting, and a study of the conceptual framework and process by which accounting standards are established.

ACTG 290B UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND. May be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ACTG 291 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACTG 292 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of Associate Dean.
- Directed research and study on an individual basis. Not to be used as a substitute for a required course.

ACTG 321R ACCOUNTING INFORMATION SYSTEMS I
S 3 cr. LEC 3
PREREQUISITE: ACTG 223 or consent of instructor.
- For business majors: Formal admission to the College of Business.
- A study of how organizations capture, record, store, protect, analyze, and report accounting information. Topics include business processes, transaction processing, internal controls, data security, systems documentation, information technology, and software applications.

ACTG 327 INTERMEDIATE FINANCIAL ACCT & REPORTING I
F, S 3 cr. LEC 3
PREREQUISITE: ACTG 223 or consent of instructor.
- For business majors: Formal admission to the College of Business.
- An in-depth study of the theory of financial accounting and reporting and its application to: cash, current and long-term receivables, inventories, plant assets, natural resources, intangible assets, asset impairments, current liabilities, long-term debt, and contingencies. Fair value concepts, present value measurements, and comparisons between US and international accounting standards will be incorporated.

ACTG 328 INTERMEDIATE FINANCIAL ACCT & REPORTING II
F, S 3 cr. LEC 3
PREREQUISITE: ACTG 327. For business majors: Formal admission to the College of Business.
- The theory and practice of financial accounting and reporting. A study of stockholders’ equity, dilutive securities, earnings per share, investments, revenue recognition, deferred income taxes, pensions, leases, accounting changes, error analysis, the statement of cash flows and full disclosure in financial accounting.
ACTG 401 PRINCIPLES OF FED TAXATION/INDIVIDUALS
F 3 cr. LEC 3
PREREQUISITE: ACTG 292 or ACTG 223. For business majors: Formal admission to the College of Business.
- This course focuses on federal income taxes as applied to individuals and businesses with emphasis on income and expense recognition, individual taxation, property transactions, tax research and tax return preparation.

ACTG 410 COST/MGMT ACCT I
F 3 cr. LEC 3
PREREQUISITE: ACTG 327 and ACTG 292. For business majors: Formal admission to the College of Business.
- Focus on cost accounting concepts, with emphasis on developing and evaluating information that management needs to plan, make key decisions, and monitor business performance. Key topics include cost typology and behavior and how each impacts decision-making process and product costing, cost-volume-profit analysis, flexible budgeting, incremental decision analysis, and performance evaluation.

ACTG 411 AUDITING I
F 3 cr. LEC 3
PREREQUISITE: ACTG 328 or consent of instructor. For business majors: Formal admission to the College of Business.
- Practice and theory of auditing financial statements. A study of most of the major activities performed during the conduct of a financial statement audit, from client acceptance to issuance of an audit report.

ACTG 415 GOVERNMENT & NONPROFIT ACCOUNTING I
S 3 cr. LEC 3
PREREQUISITE: ACTG 328. For business majors: Formal admission to the College of Business.
- A study of the accounting principles and financial reporting unique to the governmental and not-for-profit sectors of the U.S. economy.

ACTG 420 COST/MGMT ACCT II
S 3 cr. LEC 3
PREREQUISITE: ACTG 410 For business majors: Formal admission to the College of Business.
- Advanced topics in cost/managerial accounting. This course examines cost and managerial accounting issues from both the technical and applied perspectives. Students will utilize cost accounting and decision analysis tools to evaluate the impacts of managerial decision making.

ACTG 421 ACCOUNTING INFORMATION SYSTEMS II
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and completion of ACTG 321 or BUS 311. For business majors: Formal admission to the College of Business.
- Contemporary issues in information systems. Emphasis on the practical application of information technology to improve business efficiency and effectiveness.

ACTG 431 TAX ASSISTANCE
S 1 cr. LAB 1
PREREQUISITE: ACTG 401. For business majors: Formal admission to the College of Business.
- Development of knowledge and skills needed to prepare federal and state income tax returns. Preparation of income tax returns for low-income clients through the Volunteer Income Tax Assistance program.

ACTG 436 ADVANCED ACCOUNTING
On Demand 3 cr. LEC 3
PREREQUISITE: ACTG 328. For business majors: Formal admission to the College of Business.
- The theory and practice of financial accounting and reporting pertaining to business combinations and consolidated financial statements, accounting for partnerships and related business forms, foreign currency transactions and financial statement translations, and other advanced accounting topics.

ACTG 441 FINANCIAL STATEMENT ANALYSIS
F 3 cr. RCT 3
PREREQUISITE: ACTG 327. For business majors: Formal admission to the College of Business. Cross-listed with FIN 453.
- Analysis with emphasis on how managers’ investing and financing decisions have financial statement implications. Coverage includes: revenue-recognition methods, cash flow analysis, ratios, inventory analysis, capitalizing vs. expensing, depreciation, leasing vs. buying, and overall financial health and earnings quality of the firm.

ACTG 491 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering. For business majors: Formal admission to the College of Business.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACTG 492 INDEPENDENT STUDY
On Demand 1-4 cr. IND May be repeated. Maximum 12 cr.
PREREQUISITE: For business majors: Formal admission to the College of Business.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Not to be used as a substitute for a required course.

ACTG 493 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering. For business majors: Formal admission to the College of Business.
- Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

ACTG 498 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum 12 cr.
PREREQUISITE: Formal admission to the College of Business and consent of the instructor.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ACTG 500 SEMINAR
On Demand 1 cr. SEM 1
PREREQUISITE: Admission to the MPAc Program.
- Topics offered at the graduate level that are not covered in regular graduate courses. Students participate in preparing and presenting discussion material.

ACTG 514 FRAUD EXAMINATION
On Demand 3 cr. LEC 3
PREREQUISITE: ACTG 411 and admission to MPAc Program or consent of instructor.
- An overview of fraud examination, including the extent and nature of fraud, motivations of perpetrators, fraud symptoms, legal issues, as well as methods of detection, investigation, and prevention of various asset misappropriation schemes and fraudulent financial statements.

ACTG 515 PROFESSIONAL SERVICES MANAGEMENT
On Demand 3 cr. LEC 3
PREREQUISITE: Admission to the MPAc program or consent of instructor.
- This course is designed to expose students to the internal operations and client management efforts of professional services organizations and providers, with a particular focus on accounting firms. Topics include managing service relationships, service firm structure and the service-profit chain.

ACTG 521 ADVANCED AUDITING
S 3 cr. LEC 3
PREREQUISITE: ACTG 411 and admission to MPAc Program.
- An in-depth analysis of contemporary auditing and assurance theory, statistical sampling, internal control, and audit evidence.

ACTG 524 INTERNATIONAL ACCOUNTING
On Demand 3 cr. LEC 3
PREREQUISITE: ACTG 328 and admission to MPAc Program.
- This course introduces students to international accounting with special emphasis on four major topics: 1) accounting systems as expressions of cultural, political, and ideological forces, 2) comparative international accounting patterns, 3) efforts to harmonize international accounting standards worldwide, and 4) accounting issues faced by multinational corporations.

ACTG 525 ACCOUNTING THEORY AND COMPLEX ISSUES IN ACCOUNTING
F 3 cr. LEC 3
PREREQUISITE: ACTG 328 and Admission to MPAc Program.
- A study of complex financial accounting issues and the underlying theoretical rationale. Key topics include derivative financial instruments, hedge accounting, elements of the other comprehensive income, sale-leaseback transactions, consignment accounting, and troubled debt restructuring.

ACTG 526 ADVANCED TAXATION
S 3 cr. LEC 3
PREREQUISITE: ACTG 401 and admission to MPAc Program or consent of instructor.
- Students develop knowledge of how tax laws affect partnerships, corporations, and other business entities. In addition, the tax laws applicable to not-for-profit entities, estates, trusts and multi-jurisdictional issues are explored. Tax reporting, tax planning, and tax research skills are emphasized.

ACTG 527 ESTATE & GIFT TAXATION
On Demand 5 cr. 3 LEC
PREREQUISITE: ACTG 401 and admission to MPAc Program or consent of instructor.
- Study of the federal tax law and incidental property and probate law as it relates to the taxation of gifts and estates. Emphasis is placed upon planning techniques for minimizing estate and gift taxes and providing liquidity for their payment.
COURSE DESCRIPTIONS: ACTG 528 - AGEC 337

ACTG 528 LEGAL ISSUES FOR ACCOUNTANTS
S 3 cr. LEC 3
PREREQUISITE: BUS 361 or equivalent and admission to MPAc Program.
- Analysis of legal issues for accounting students, including debtor/creditor law, bankruptcy, securities regulation, antitrust, employment regulation, uniform commercial code and real property.
Course includes significant written work and oral presentations.

ACTG 529 RESEARCH IN ACCOUNTING
F 3 cr. LEC 3
PREREQUISITE: ACTG 328 and admission to MPAc Program.
- A project-oriented seminar that focuses on developing tools for researching, developing and communicating defensible solutions to accounting issues and problems of the type likely to be encountered throughout a professional career in accounting.

ACTG 530 TAX RESEARCH AND PLANNING
F 3 cr. LEC 3
PREREQUISITE: ACTG 401 and admission to MPAc program or consent of instructor.
- Study and application of research methodologies related to tax compliance and tax planning work commonly performed by accountants.

ACTG 531 TAX PRACTICUM
S 3 cr. LEC 3
PREREQUISITE: ACTG 401 and concurrent enrollment in ACTG 528 or consent of instructor.
- This course emphasizes how the broad principles of taxation affect individuals, corporations, partnerships, S corporations, estates, and trusts. Students apply their knowledge by assisting low income individuals with their tax returns as part of the Volunteer Income Tax Assistance Program.

ACTG 532 GOVERNMENT AND NONPROFIT ACCOUNTING II
On Demand 3 cr. LEC 3
PREREQUISITE: ACTG 415 and admission to MPAc Program or consent of instructor.
- An in-depth study of the uniquely different characteristics of accounting and financial reporting for the governmental and not-for-profit sectors of the U.S. economy.

ACTG 536 ADVANCED ACCOUNTING
F 3 cr. LEC 3
PREREQUISITE: ACTG 328 and admission to MPAc Program or consent of instructor.
- The theory and practice of financial accounting and reporting pertaining to business combinations and consolidated financial statements, accounting for partnerships and related business forms, foreign currency transactions and financial statement translations, and other advanced accounting topics.

ACTG 570 INDEPENDENT STUDY
On Demand 1-3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ACTG 575 INDEPENDENT STUDY
On Demand 1-3 cr. IND
PREREQUISITE: Graduate standing and consent of instructor.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ACTG 580 SPECIAL TOPICS
On Demand 1-4 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACTG 589 GRADUATE CONSULTATION
F, S 1-3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and Thesis if on a Thesis Plan) but who need additional faculty or staff time or help.

AG Agriculture

College of Agriculture
(406) 994-5744

AG 101 INTRODUCTION TO AGRICULTURAL & ENVIRONMENTAL RESOURCES
F 1 cr. LEC 1
PREREQUISITE: Freshman or New Transfer Students.
- This course is optional but all freshmen in the College of Agriculture are strongly encouraged to enroll. Students taking this course will be introduced to all areas of the very broad field of agriculture, including all department programs and areas of specialty, career opportunities, professionalism, history, and ethics.

AG 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

AG 290R UNDERGRADUATE RESEARCH
F, S, Su 1 - 8 IND
PREREQUISITE: Consent of instructor.
- Intended for lower division undergraduate research/undergraduate scholars program. The student will work closely with the supervising faculty. Course will address responsible conduct of research.

AG 300 SEMINAR
F, S 1 - 2 cr. SEM 1 - 2
PREREQUISITE: Junior standing.
- Current agricultural problems and writings of people in the profession. Topics vary each semester; check with the department before registering.

AGEC 315 AGRICULTURE IN A GLOBAL CONTEXT
S, to be offered alternate years, 2010 3 cr. Lec 2
SEM 1
PREREQUISITE: ECNS 204 or PSPP 102 or ARNR 290 and consent of instructor.
- The primary goal of this course is to provide students with an integrated view of the science, technology, production practices, product handling, product marketing system, and end uses for agricultural products produced in Montana.

AGEC 321 ECONOMICS OF AGRICULTURAL MARKETING
F 3 cr. LEC 3
PREREQUISITE: ECNS 204 or ECNS 251.
- Issues in marketing agricultural products and the economic principles that assist in analysis of these issues. Factors affecting market prices, and topics associated with methods of marketing are considered. Emphasis on Montana products.

AGEC 337 AGRICULTURAL LAW
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing.
- Application of general principles of law to ownership and operation of farming business and its relations with other agribusiness firms, government agencies and people.
AGEC 341 FARM & RANCH MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: ECNS 204 or ECNS 251 and ECNS 309.
- Basic tools of economic decision making useful to farm and ranch managers are examined.

AGEC 345 AGRICULTURAL FINANCE & CREDIT ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: ECNS 204 or ECNS 251.
- Alternatives available to farmers for acquiring and maintaining control over resources used in agriculture production. Emphasis is on the management of cash, credit, debt, taxes, and interest in relation to agricultural price levels and general economic conditions.

AGEC 421 ADVANCED AGRICULTURAL MARKETING
S 3 cr. LEC 3
PREREQUISITE: AGEC 341.
- Principles needed in developing agricultural experiences associated with agricultural education will be presented.

AGEC 445 AGRIBUSINESS MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: ECNS 301, STAT 216, and either AGEC 345 or FIN 352.
- Students are expected to use tools and concepts developed in earlier course work to address typical problems faced by agribusiness and agricultural producers. Case studies modified from actual situations are used extensively.

AGEC 451R ECONOMICS OF AGRICULTURAL POLICY
F 3 cr. LEC 3
PREREQUISITE: ECNS 301.
- Senior capstone course. Consideration of the economic problems of American agriculture and of alternative solutions. Rigorous analysis of the causes and consequences of government programs (both past and present) on consumers, producers, and taxpayers.

AGEC 467 QUANTITATIVE METHODS IN ECONOMICS
F 3 cr. LEC 3
PREREQUISITE: ECNS 301, M 221 and approval of instructor.
- Static and dynamic optimization models in economics. Nonlinear and dynamic programming models are introduced. Emphasis on formulating economic and management problems in terms of quantitative models.

AGEC 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

AGEC 480 SPECIAL TOPICS
On Demand 1 - 4 cr. LEC Maximum 12 cr.
PREREQUISITE: Course prerequisites are dependent on the offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AGEC 498R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
PREREQUISITE: AGEC 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

AGEC 499R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 8 cr. IND
PREREQUISITE: ECNS 204, junior standing, and approval of instructor.
- Intended for upper division undergraduate research/undergraduate scholars program. The student will work closely with the supervising faculty. Course will address responsible conduct of research.

AGEC 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

AGEC 580 SPECIAL TOPICS
On Demand 1 - 4 cr. LEC Maximum 12 cr.
PREREQUISITE: Upper division courses, and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AGEC 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

AGEC 590 MASTER’S THESIS
F, S, Su 10 cr. IND May be repeated.
PREREQUISITE: Master’s standing.

AGED AGRICULTURAL EDUCATION

AGED 105 MICROCOMPUTERS IN AGRICULTURE
S 3 cr. LEC 1 LAB 2
- Utilizing and selecting microcomputer software for the broad field of agriculture. Decision aid software, spreadsheets, database, telecommunication and financial records are emphasized. Application of computers to control, monitor, and calibrate devices in addition to aiding management decisions. IBM.

AGED 293 URBAN ELECTRIFICATION
S 3 cr. LEC 2 LAB 1
- This course will cover the basic wiring requirements for farm buildings and agricultural electrical motors. An emphasis is placed on application and trouble shooting. Alternative power generation methods are also discussed.

AGED 309 PHILOSOPHY AND PROGRAMS IN EXTENSION
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDGI 209.
- Designed to introduce prospective county extension educators to fundamental philosophy, activities, and educational and planning methods underlying the Cooperative Extension Service. Identification of educational and program needs in order to provide instructional programs for rural and urban youth and adults.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGED 312R COMMUNICATING A CULTURE TO THE PUBLIC</td>
<td>S alternate years, to be offered even years</td>
<td>3 cr. LEC 2 LAB 1 - A study of internal combustion engine systems and the electronic control of these systems. Emphasis on power service, fuel, electrical, ignition, and emission systems used on modern engines. Lab activities include testing, adjusting, and servicing the various systems.</td>
</tr>
<tr>
<td>AGED 314 POWER SYSTEMS OPERATION &amp; CONTROL</td>
<td>F 3 cr. LEC 2 LAB 1 - Various construction systems that are used to construct structures on site. Includes all aspects of the construction industry such as basic planning, materials, estimating, building techniques, managing, and the actual construction of building projects.</td>
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</tr>
<tr>
<td>AGED 333 CONSTRUCTION TECHNOLOGY</td>
<td>F 3 cr. LEC 1 LAB 2 - Various construction systems that are used to construct structures on site. Includes all aspects of the construction industry such as basic planning, materials, estimating, building techniques, managing, and the actual construction of building projects.</td>
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</tr>
<tr>
<td>AGED 335 COOPERATIVE BUSINESS PRINCIPLES AND PRACTICES</td>
<td>F 3 cr. LEC 3</td>
<td>The course will acquaint students with cooperative- and the cooperative way of doing business. Students will learn the role of cooperatives in marketing, bargaining, purchasing, and service. Cooperative business decision making will be emphasized throughout the course.</td>
</tr>
<tr>
<td>AGED 355 TEACHING PRACTICES</td>
<td>F 1 cr. LEC 1 LAB 1 COREQUISITE: To be taken concurrently with EDSN 452.</td>
<td>Offers additional experience in planning, teaching, and evaluating lessons in agricultural education.</td>
</tr>
<tr>
<td>AGED 400 SEMINAR</td>
<td>On Demand 1-2 cr. SEM Maximum 6 cr.</td>
<td>PREREQUISITE: Junior standing and as determined for each offering and consent of instructor. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.</td>
</tr>
<tr>
<td>AGED 417 CRITICAL THINKING FOR THE FOOD AND FIBER SYSTEM</td>
<td>S 3 cr. LEC 1 LAB 2</td>
<td>PREREQUISITE: Senior standing in AGED. Senior capstone course. Following an overview of current food and fiber system issues related to Montana, teams of students will select a problem to analyze, and will propose solutions to solve the problem. Application of prior knowledge, communication skills, and higher order thinking skills are required.</td>
</tr>
<tr>
<td>AGED 462 INTERNATIONAL EXTENSION SYSTEMS</td>
<td>S 5 cr. LEC 5</td>
<td>Senior capstone course. Focuses on a broad range of extension education topic areas that impact agriculture and rural community development. The primary purpose is to further students’ understanding about extension systems influence on agricultural and rural development in the world.</td>
</tr>
<tr>
<td>AGED 463 INTERNATIONAL EXTENSION SYSTEMS-STUDY ABROAD</td>
<td>S 1 cr. SEM 1</td>
<td>Optional one-credit study abroad component to accompany AGED 462. Students must be enrolled in AGED 462 in the same semester.</td>
</tr>
<tr>
<td>AGED 470 INDEPENDENT STUDY</td>
<td>On Demand 1-6 cr.</td>
<td>PREREQUISITE: Senior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.</td>
</tr>
<tr>
<td>AGED 476 INTERNSHIP</td>
<td>On Demand 2-8 cr. IND</td>
<td>PREREQUISITE: Junior standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field of Agricultural Education.</td>
</tr>
<tr>
<td>AGED 480 SPECIAL TOPICS</td>
<td>On Demand 1-4 cr. Maximum 12 cr.</td>
<td>PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.</td>
</tr>
<tr>
<td>AGED 482 NON FORMAL TEACHING METHODS IN AGRICULTURE</td>
<td>F 3 cr. LEC 2 LAB 1</td>
<td>PREREQUISITE: Junior standing. Non-Formal Teaching Methods in Agriculture is a course designed for senior and graduate level students in Agricultural Relations and other majors who will be designing, implementing and evaluating learning through Cooperative Extension and/or other careers. Graduate teaching assistants may also take this course to aid in developing their teaching skills. Course covers theories, principles and practices associated with effective non-formal teaching and learning for adult education as well as non-adult educational settings such as 4-H meetings, conferences, and conventions. The lab provides additional experience in planning, teaching, and evaluating lessons/seminars in the non-formal educational setting.</td>
</tr>
<tr>
<td>AGED 488R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION</td>
<td>F, S, Su 1-2 cr. RCT May be repeated. Max 4 cr.</td>
<td>Classroom instruction associated with directed undergraduate research/creative activity projects.</td>
</tr>
<tr>
<td>AGED 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY</td>
<td>F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.</td>
<td>Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.</td>
</tr>
<tr>
<td>AGED 500 SEMINAR</td>
<td>On Demand 1 cr. SEM 1 Maximum 4 cr.</td>
<td>PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and present discussion material.</td>
</tr>
<tr>
<td>AGED 506 RESEARCH METHODS</td>
<td>F 3 cr. LEC 3</td>
<td>Principles and techniques of research appropriate for planning, conducting and reporting agricultural and extension education research.</td>
</tr>
<tr>
<td>AGED 507 PROGRAM PLANNING &amp; EVALUATION</td>
<td>S,Su 3 cr. LEC 3</td>
<td>PREREQUISITE: Graduate standing. A study of the literature on specific facets of program planning and evaluation applicable to agricultural and extension education. Application of program planning and evaluation concepts through individual and class projects.</td>
</tr>
<tr>
<td>AGED 510 THE SCIENCE OF NUTRITION: AGRICULTURAL LITERACY</td>
<td>S 3 cr. LEC 3</td>
<td>PREREQUISITE: Graduate standing and permission of instructor. This course focuses on a broad range of extension education topic areas which impact agriculture and rural community development. The primary purpose is to further students’ understanding about extension systems influence on agricultural and rural development in the world. An analysis of case studies in International Extension will be a focus of this graduate course.</td>
</tr>
<tr>
<td>AGED 520 INDEPENDENT STUDY</td>
<td>S, F, Su 1-6 cr. IND 1-6</td>
<td>PREREQUISITE: Graduate Standing, consent of instructor, approval of department head and Dean of Graduate Studies. Direct research and study on an individual basis.</td>
</tr>
<tr>
<td>AGED 525 PROFESSIONAL RESEARCH PAPER</td>
<td>On Demand 1-4 cr. IND Maximum 6 cr.</td>
<td>PREREQUISITE: Graduate Standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, the major advisor, and graduate committee.</td>
</tr>
<tr>
<td>AGED 562 INTERNATIONAL EXTENSION SYSTEMS</td>
<td>S 3 cr. LEC 3</td>
<td>PREREQUISITE: Graduate standing and permission of instructor. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.</td>
</tr>
<tr>
<td>AGED 570 INDEPENDENT STUDY</td>
<td>S, F, SU 1-6 cr. IND 1-6</td>
<td>PREREQUISITE: Graduate Standing, consent of instructor, approval of department head and Dean of Graduate Studies. Direct research and study on an individual basis.</td>
</tr>
<tr>
<td>AGED 575 PROFESSIONAL RESEARCH PAPER</td>
<td>On Demand 1-4 cr. IND Maximum 6 cr.</td>
<td>PREREQUISITE: Graduate Standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, the major advisor, and graduate committee.</td>
</tr>
<tr>
<td>AGED 576 INTERNSHIP</td>
<td>S, F, SU 1-6 cr. IND 1-6</td>
<td>PREREQUISITE: Graduate Standing, consent of instructor, approval of department head and Dean of Graduate Studies. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.</td>
</tr>
<tr>
<td>AGED 589 GRADUATE CONSULTATION</td>
<td>S, F, SU 2-12 cr. IND 2-12</td>
<td>PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan), but who need additional faculty or staff time or help.</td>
</tr>
<tr>
<td>AGED 590 MASTER’S THESIS</td>
<td>S, F, SU 1-10 cr.</td>
<td>PREREQUISITE: Master’s Standing.</td>
</tr>
</tbody>
</table>
AMST

American Studies
University College
(406) 994-3561

AMST101D INTRODUCTION TO AMERICAN STUDIES (Replaces AMST 201D Spr 2010)
F 3 cr. LEC 2 LAB 1
-Introduction to the field of American Studies and to major issues in American history, literature, and the arts.

AMST201D INTRODUCTION TO AMERICAN STUDIES
F 3 cr. LEC 2 LAB 1
-Introduction to the field of American Studies and to major issues in American history, literature, and the arts.

ANTH

Anthropology
Department of Sociology and Anthropology
(406) 994-4201

ANTH 101D ANTHROPOLOGY AND THE HUMAN EXPERIENCE
F S 3 cr. LEC 3
- Comparative focus on human behavior and human cultural systems from the local to global levels. The nature and sources of diversity associated with the human experience are explored and reinforced using examples from archaeology, biological anthropology, cultural anthropology, and linguistics.

ANTH 201S HUMAN PREHISTORY
F 3 cr. LEC 3
- Introduction to basic concepts and ideas about the biological and cultural evolution of human species. Topics include primate ancestors, human origins, evolutionary theory, genetics, archaeological interpretation, and cultural change from the earliest stone tools to the rise of ancient civilization.

ANTH 204S CULTURE & SOCIETY
F 3 cr. LEC 3
- The nature of culture through selected societies: symbolism and world view as related to cultural dynamics and representational forms. A survey of social practices, linguistic and cultural representations, exchange, identity, and the dynamics of power.

ANTH 221S MYSTERIES OF THE PAST
F 3 cr. LEC 3
- Focuses on archaeological thinking and the use of the scientific method in archaeology. Examines a variety of archaeological and pseudo archaeological claims from this perspective.

ANTH 225S BONES, APES, & ANCESTORS
S 3 cr. LEC 3
- Exploration of human biological evolution from an anthropological perspective, emphasizing scientific understanding through examination of important fossil discoveries and of the behavior and anatomy of living non-human primates, especially apes. Aimed particularly at students not majoring in anthropology.

ANTH 252D CONTEMPORARY SOCIAL ISSUES IN JAPAN
F alternate years, to be offered even years 3 cr. LEC 3
- Introduction to major political, economic, social and cultural issues in contemporary Japanese society. On-going legacy of WW II, re-emerging nationalism, and backlash against ideas and institutions of "post-war democracy". Citizen activism on these issues in and outside Japan.

ANTH 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ANTH 295R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY IN ANTHROPOLOGY
S 1-3 cr. RCT. May be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ANTH 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F S 1-6 cr. IND. May be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ANTH 303 BIOLOGICAL ANTHROPOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 201
- Human evolution and biology from an anthropological perspective: the fossil record, nonhuman primates, osteology, biological variation, and basic techniques of physical anthropology.

ANTH 306 FORENSIC ANTHROPOLOGY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: Junior standing and consent of instructor.
- Detailed study of human cranial and post cranial skeletal anatomy. Analyses of skeletal materials for estimating sex, age at death, living stature, biological ancestry, cause of death, and other factors of forensic interest. Methods in the recovery of skeletal remains.

ANTH 310 NATIVE NORTH AMERICA
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 204
- An anthropological view of native North American cultures from the perspective of the ethnographic present. Continental-wide diversity in native adaptations and life ways are examined along lines of anthropologically-defined culture areas.

ANTH 315 DESCRIPTIVE LINGUISTICS
On Demand 3 cr. LEC 3
PREREQUISITE: ANTH 101 or ANTH 204 or permission of instructor.
- The anthropological use of linguistic materials; introduction to phonology, morphology, and syntax of human languages from a variety of languages.

ANTH 320 ARCHAEOLOGY OF NORTH AMERICA
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 204
- Prehistoric cultural adaptations and developments in North America from the earliest archaeological evidence through historic times; basic archaeological methods and theory.

ANTH 326 LANGUAGE & CULTURE
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 204.
- Language as a subsystem of culture, fundamentals of linguistic analysis and the use of language in social contexts. Also explores relationships between perception and conception, thought and representation.
ANTH 336 CONTEMPORARY PACIFIC SOCIETIES
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 101 and ANTH 204.
- Current ethnological and theoretical considerations of creative cultural processes in relation to classical adaptations and world views of Pacific Island peoples.

ANTH 340 ARCHAEOLOGY FIELD SCHOOL
Su On demand 1-9 cr. LEC 1
PREREQUISITE: ANTH 101.
- A summer of archaeological field work at a location away from the University; training in excavation and laboratory methods. (Offered when funding available.)

ANTH 347 SEX, GENDER, & SEXUALITY IN JAPAN
S, to be offered even years 3 cr. LEC 3
PREREQUISITE: ANTH 204 or SOC 326 or HISTR 145.
- Dominant constructions of sex, gender and sexuality in contemporary Japanese society, and how such constructions are reinforced, contested or resisted by women in Japan. Interaction with race, ethnicity, class and other social and historical factors (e.g., colonialism, globalization).

ANTH 350 OLD WORLD PREHISTORY
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 101.
- This course provides an understanding of the origins and development of human culture in the Old World (Africa, Europe, Asia, and Australia) over the past three million years. The emphasis is on key theoretical and methodological developments in the archaeology and paleoanthropology of the Old World.

ANTH 353 POPULAR CULTURE IN/OUT OF JAPAN
S to be offered even years 3 cr. LEC 3
PREREQUISITE: ANTH 204 or SOC 303 or HISTR 145.
- Examines socio-historical and political meanings of mass/popular culture in our everyday lives in personal, local and global contexts. Focus on materials originating from or related to Japan including manga, anime, music, performance arts, food, fashion, the internet, toys and television.

ANTH 360 PEOPLES AND PREHISTORY
On demand 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 201, ANTH 204.
- The study of ancient and extant cultures of a selected world region with a comparative focus between the archaeology and ethnography of ancient and extant societies. Explores theoretical and methodological implications associated with the linkages between archaeology and ethnography.

ANTH 370 MEDICAL ANTHROPOLOGY
On demand 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 201, ANTH 204.
- Anthropological research materials, their methodological treatment and theoretical grounding as applied to health-related practices in local and trans cultural contexts. Cultural constructions of diseases, intervention and treatment strategies, and the analysis of health concerns associated with globalization and accelerated culture change.

ANTH 400 SEMINAR
On Demand 1 - 3 cr. SEM Maximum 4 cr.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ANTH 405 MYTH, MAGIC, & RELIGION
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 204.
- Forms of religious representation and practice in cultural and historical context; from animality and symbolic innovation to mythic charters and social transformations, cosmological scenarios and ritual forms are explored in this course.

ANTH 412 CONTEMPORARY ISSUES IN ARCHAEOLOGY
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: ANTH 101, ANTH 201.
- Examination of current methodological and theoretical issues in archaeology and how they are applied to our understanding of the past.

ANTH 422 ANTHROPOLOGICAL THEORY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 204.
- Senior capstone course. An analysis of theories of anthropological science within their social context of development; exploration and critique of representative classics.

ANTH 425R SOCIAL ORGANIZATION
S alternate years, to be offered even years 3 cr. SEM 3
PREREQUISITE: Junior standing, ANTH 204.
- Senior capstone course. An analysis of culturally relevant components of the social order in small-scale and complex societies, and local constructs of personal and group identity. Considers classical and recent approaches to interpersonal relationships and the organization of social life.

ANTH 437 ANALYSIS OF STONE TECHNOLOGY
S 3 cr. LEC 5
PREREQUISITE: ANTH 101, ANTH 201, and Junior standing, or consent of instructor.
- This course examines prehistoric stone technology and the methodological and theoretical underpinnings of archaeological interpretation. The course material is conveyed through hands-on activities, individual analyses, and discussions of the theoretical foundations for archaeological interpretations.

ANTH 440 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: ANTH 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.
COURSE DESCRIPTIONS: ARAB 201 - ARCH 322IA

ARAB 201 INTERMEDIATE MODERN ARABIC I
F 4 cr. LEC 4
PREREQUISITE: ARAB 102 or equivalent, or a minimum three years of high school Arabic or placement interview.
- Intensive, methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate-level readings and discussions. Increased emphasis on written communication.

ARAB 202 INTERMEDIATE MODERN ARABIC II
S 4 cr. LEC 4
PREREQUISITE: ARAB 201 or equivalent, or placement interview.
- Continuation of ARAB 201. Students who successfully complete this course will have ‘survival’ skills for daily life in the Arab world, and will be ready for more advanced course work using authentic materials. Expansion of cultural knowledge.

ARAB 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARCH

Architecture
School of Architecture
(406) 994-4255

ARCH 121IA INTRODUCTION TO DESIGN
F, S, Su 3 cr. LEC 2 RCT 1
PREREQUISITE: For majors and non-majors.
- Introduction to the design and creative process through global architecture and allied professions. Exploration of the history of design and the creative thinking that led to it. Emphasis on 20th and 21st century architecture with an introduction to sustainability issues. Individual projects where students apply and explore creative process are required.

ARCH 151A DESIGN FUNDAMENTALS I
F, S 4 cr. LEC 2 STU 2
PREREQUISITE: Consent of director. Restricted enrollment. Must be admitted into pre-environmental design program or be a landscape design major.
- A study of the creative design process with emphasis on two-dimensional design, basic three dimensional design concepts and introduction to the essential tools for graphic communication. Development of students’ self-critical skills.

ARCH 152 DESIGN FUNDAMENTALS II
S, Su 4 cr. RCT 2 STU 2
PREREQUISITE: ARCH 151 or advanced placement based on approved portfolio; pre-environmental design and landscape design majors only.
- A continuation of the study of the design process introducing to architectural principles and architectural graphic skills and further understanding of the creative process. Continued development of student’s ability to make critical and analytical judgments.

ARCH 200 SEMINAR
F, S, Su 1-2 cr. SEM Maximum 4 cr.
PREREQUISITE: Determined for each offering.
- Topics offered at the lower division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ARCH 221 WORLD ARCHITECTURE MODERN/CONTEMPORARY
On Demand 3 cr. LEC 3
- This course will examine the historical development of architecture from the 19th century to the present. Within an historical context, the course will focus on the impact of cultural and philosophical trends, technological changes and innovations and the globalization of the digital revolution on our built environment. Students will be introduced to seminal theoretical approaches professed by architects and thinkers of the 20th and early 21st centuries.

ARCH 223 INTRODUCTION TO ARCHITECTURAL THEORY
On Demand 3 cr. LEC 3
- Introduction to theoretical approaches advocated by architects during the second half of the 20th century. Emphasis is placed on comparing modern and post-modern philosophies of European, Asian, and American architects and their impact on early 21st century architecture.

ARCH 241 BUILDING CONSTRUCTION I
F, S cr. LEC 3
- Introduction to the materials of construction and an overview of building construction systems. Emphasis upon an understanding of materials and systems as a means to effective and creative design utilization.

ARCH 243 ARCHITECTURAL STRUCTURES I
F 4 cr. LEC 3 RCT 1
PREREQUISITE: PHYS 205, admission into environmental design program.
COREQUISITE: ARCH 261.
- Introduction to structural design/analysis of horizontal and vertical members as applied to architectural works; basic statics, moment and shear of rigid bodies and architectural forms; strength concepts using stress and strain assessment; application of analytical and intuitive structural concepts in a design context; introduction to wood design project.

ARCH 244 ARCHITECTURAL STRUCTURES II
S 4 cr. LEC 3 RCT 1
PREREQUISITE: ARCH 243.
- Design of structural elements in wood, steel, masonry, and concrete. Lateral considerations and calculations including environmental and seismic loads. Understanding of building systems; diagrams; connections; structural engineer-architect communications. Complete structural design/drawings for small commercial building/group project. Notebook computer required.

ARCH 253 ARCHITECTURAL DESIGN I
S 5 cr. LEC/RCT 2 STU 1
PREREQUISITE: ARCH 152, ARCH 261. Admission into the environmental design program.
COREQUISITE: ARCH 262.
- Small-scale infill design projects requiring integration of spatial, visual concepts, emphasizing relationship of architecture to its context with principles of order, constituents of form, light, structural awareness, nature of materials, architectural coherence. Includes inclusive orthographic graphics design drawing conventions.

ARCH 261 ARCHITECTURAL GRAPHICS I
F 5 cr. LEC 1 STU 2
PREREQUISITE: Admission into the environmental design program.
COREQUISITE: ARCH 243.
- Basic techniques in architectural graphic expression. Course utilizes observation drawing studio supplemented by design drawing lecture/demonstration sessions. Topics include freehand, multi-view, paraline, perspective and shade/shadow drawing. Hand and digital applications focus on image manipulation and desktop publishing. Notebook computer required.

ARCH 282 ARCHITECTURAL GRAPHICS II
S 3 cr. LEC 1 STU 2
PREREQUISITE: ARCH 261. Admission into the environmental design program.
COREQUISITE: ARCH 253.
- Basic techniques in architectural graphic expression. Course emphasizes observation drawing studio supplemented by design drawing lecture/demonstration sessions. Topics include freehand, perspective, and shade and shadow drawing techniques. Two and three-dimensional digital applications introduced. Notebook computer required.

ARCH 270 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed study and research on an individual basis.

ARCH 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARCH 289R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ARCH 290R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ARCH 313 PROFESSIONAL PRACTICE
S 3 cr. LEC 1 STU 2
COREQUISITE: ARCH 355
- Architecture as a social practice, emphasis includes developmental strategies: political, managerial, legal, economic, interdisciplinary relations, community relations and client relations. Topics include marketing, business planning, project management, delivery methods, technology, regulation, accessibility and trends of practice. Notebook computer required.

ARCH 322IA WORLD ARCHITECTURE I
F 3 cr. LEC 3
PREREQUISITE: Junior standing for non-majors, WRIT 101W.
- A survey of world architectural history from primitive developments to the Gothic.
ARCH 323IA WORLD ARCHITECTURE II
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing for non-majors, WRIT 101W.
- A survey of world architectural history from the Renaissance to Industrial Revolution.

ARCH 331 ENVIRONMENTAL CONTROLS I
F 4 cr. LEC 4
PREREQUISITE: M 160.
- Architectural and site responses to climate at a regional, community, and small building scale including passive solar energy and heat flow fundamentals. Analysis and design of the heating, ventilating, and air-conditioning systems used in architecture. Analysis and design of water supply and sanitation systems. Notebook computer required.

ARCH 332 ENVIRONMENTAL CONTROLS II
S 4 cr. LEC 4
PREREQUISITE: M 160.
- Analysis and design of lighting systems, electrical systems, fire protection systems, and HVAC systems. Issues of visual and perceptual comfort and day lighting are developed. Notebook computer required.

ARCH 340 BUILDING CONSTRUCTION II
F, S 4 cr. LEC 2 STU 2
PREREQUISITE: ARCH 241, ARCH 244 and ARCH 331 or permission of instructor.
COREQUISITE: ARCH 355
- Development and integration of building materials and assemblies, construction costs and building systems into the construction documents, specifications and design of a small project. Building systems to be investigated include: structural environmental and enclosure, life safety and sustainability. Notebook computer required. Cross listed with ARCH 440.

ARCH 354 ARCHITECTURAL DESIGN II
F 5 cr. LEC 1 RCT 1 STU 5
PREREQUISITE: ARCH 253.
COREQUISITE: ARCH 241, and ARCH 363.
- Small-to medium-size projects extending the development of the design process to site and adjacency analysis, diagramming, fundamental relationship to landscape and context. Topics include hybrid uses of hand and digital graphic communication including 2D and 3D drawing, and modeling.

ARCH 355 ARCHITECTURAL DESIGN III
S 5 cr. LEC/RCT 2 STU 5
PREREQUISITE: ARCH 354.
COREQUISITE: ARCH 313 and ARCH 340.
- Further exploration of ecologically-sound design with emphasis on the integration of structures, building envelope service systems, and building materials, including design for life safety and accessibility. Building scale and program complexity increases, utilizing long-span structural systems. Notebook computer required.

ARCH 363 ARCHITECTURAL GRAPHICS III
F 3 cr. LEC 1 STU 2
PREREQUISITE: ARCH 262.
COREQUISITE: ARCH 354.
- Advanced principles of computer-aided design and hand applications in architectural practice, including three-dimensional computer-aided design, hand and digital delineation, and presentations. Topics provide foundation for graphic applications in ARCH 354 design studio. Notebook computer required.

ARCH 400 SEMINAR
F, S, Su 1-3 cr. SEM.
Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ARCH 414 ARCHITECTURAL STUDY ABROAD
F, S 9 cr. LEC 6 IND 3
PREREQUISITE: ARCH 355.
COREQUISITE: ARCH 428.
- A study in foreign countries under the direction of an architecture faculty member to obtain an understanding of modern and historical architecture and the forces shaping them. Holistic study of urban environments combines design, urban design, architectural history, drawing, and pre-travel design and research. Itineraries include opportunities for additional destinations and independent travel. Notebook computer required.

ARCH 424 CONTEMPORARY ARCHITECTURAL HISTORY AND THEORY
On Demand 3 cr. LEC 3
PREREQUISITE: ARCH 322 and ARCH 325.
- Critique and discussion of architectural projects built and ideology proposed in writings, drawings, and models since the turn of the century, including the simultaneous social and technical context, in order to examine the architectural issues of today.

ARCH 425 WESTERN ARCHITECTURAL HISTORY
On Demand 3 cr. SEM 3 Maximum 6 cr.
PREREQUISITE: ARCH 322 and ARCH 325.
- A study of events and influences that led to the development of western architectural styles, ideology, and forms of individual expression.

ARCH 426 IDENTITY OF CONTEMPORARY PLACES
On Demand 3 cr. LEC 3 Maximum 6 cr.
PREREQUISITE: ARCH 322 and ARCH 325.
- A course in applied architectural history and theory. Lectures, discussions, and student projects investigate characteristics which convey a sense of place based on historical development, architectural styles, and urban design.

ARCH 427 NON-WESTERN ARCHITECTURAL HISTORY
On Demand 3 cr. SEM 3 Maximum 6 cr.
PREREQUISITE: ARCH 322 and ARCH 325.
- A study of events and influences that led to the development of non-western architectural styles, ideology, and forms of individual expression.

ARCH 428 FOREIGN STUDY HISTORY
F, S 5 cr. LEC 2 IND 1
PREREQUISITE: ARCH 322 and ARCH 325.
COREQUISITE: ARCH 414.
- An on-site study in a foreign country of the social, cultural, and historic influences on architectural design. This course is only offered in conjunction with the foreign study program within the School of Architecture. Course shall include research and on-site visits documented in a written report.

ARCH 444 COMPUTATIONAL DESIGN FOR STRUCTURES
On Demand 3 cr. LEC 2 STU 1
PREREQUISITE: ARCH 245 and ARCH 263.
- Introduction to spreadsheets and blackboard computational software; spreadsheet and blackboard developments for typical structural computations used in architecture; introduction to structural design/analysis software; and development of a library of computational software tools for the application of structural architectural design. Notebook computer required.

ARCH 450 COMMUNITY DESIGN CENTER
On Demand 5 cr. LEC 1 STU 4
PREREQUISITE: ARCH 355.
- The CDC assists public and non-profit groups by providing planning, programming, and conceptual design ideas. Emphasis and scope of projects are determined by the community needs. Projects are intended to complement and promote the professional practice of architecture in the State of Montana.

ARCH 451 DESIGN FOR THE COMMUNITY
On Demand 3 cr. IND 3 Maximum 6 cr.
PREREQUISITE: ARCH 355.
- Students will be engaged in architecturally-related activities with government and non-profit agencies. This will enable students to be involved in a service learning academic experience.

ARCH 456 ARCHITECTURAL DESIGN IV
F, S 5 cr. LEC/RCT 2 STU 3
PREREQUISITE: ARCH 355.
- Senior capstone course. Architectural design integrating building, landscape, and urban context using multi-story projects of medium scale and complexity with particular focus on mixed-use. Integrated topics include programming, structural and mechanical integration, ecologically-sound design, building envelope systems and building codes. Field trip required.

ARCH 457 ARCHITECTURAL DESIGN V
On Demand 5 cr. LEC 1 STU 4
PREREQUISITE: ARCH 356.
- Advanced architectural design projects integrating site analysis, programming, building systems, and contemporary design theory. Emphasis placed on the inclusive synthesis of conceptual processes, analysis, preliminary design investigation, and design development. Notebook computer required.

ARCH 458 ARCHITECTURAL DESIGN VI
On Demand 5 cr. LEC 1 STU 4
PREREQUISITE: ARCH 355.
- A continuation of the holistic design synthesis encountered in ARCH 457 with emphasis on development of student’s emerging design values and theoretical perspective. Field trip possible. Notebook computer required.

ARCH 464 INTERMEDIATE COMPUTER APPLICATIONS
On Demand 3 cr. RCT 1 STU 2
PREREQUISITE: ARCH 263 or ARCH 363.
- The investigation of two-dimensional computer-aided design and drawing as applied to architectural practice. Lectures and projects will explore the use of two-dimensional CAD programs to create design drawings and construction documents.
ARCH 465 ADVANCED COMPUTER APPLICATIONS  
On Demand 3 cr. RCT 1 LAB 2  
PREREQUISITE: ARCH 464, or consent of instructor.  
- The investigation and application of advanced two-dimensional and three-dimensional computer-aided design, modeling, and presentation techniques for architectural practice. Lectures and projects may include topics of three-dimensional modeling, animation, delineation, or CNC milling. Notebook computer required.

ARCH 470 INDEPENDENT STUDY  
F, S, Su 1 - 3 cr. IND  
Maximum 6 cr.  
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.  
- Directed research and study on an individual basis.

ARCH 471 DIRECTED RESEARCH/CREATIVE ACTIVITY  
F, S 1-3 cr. IND  
Maximum 3 cr.  
PREREQUISITE: ARCH 472  
- Directed research/creative activity which may culminate in a research paper, journal article, or design project.

ARCH 472 DIRECTED RESEARCH/CREATIVE ACTIVITY INSTRUCTION  
F, S 1-2 cr. RCT  
May be repeated.  
Maximum 4 cr.  
COREQUISITE: ARCH 471  
- Classroom instruction associated with directed research/creative activity projects.

ARCH 476 INTERNSHIP  
F, S 3-12 cr. IND  
Maximum 12 cr.  
PREREQUISITE: ARCH 315, ARCH 340, ARCH 355 and all other architectural courses through the third year.  
- Students arrange for employment in an architectural office for a continuous period of twenty-four weeks. Students will participate in a structured work/study professional practice experience and are required to present the content of this experience upon their return to campus. Specific course requirements determined by credit loads.

ARCH 480 SPECIAL TOPICS  
On Demand 1 - 4 cr. Maximum 12 cr.  
PREREQUISITE: Course prerequisites as determined for each offering.  
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARCH 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION  
F, S Su 1-2 cr. RCT  
May be repeated.  
Maximum 4 cr.  
COREQUISITE: ARCH 490  
- Classroom instruction associated with directed undergraduate research/creative activity projects.  
Will not count toward graduate credit.

ARCH 499R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY  
F, S Su 1-6 cr. IND  
May be repeated.  
Maximum 12 cr.  
COREQUISITE: ARCH 489  
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

ARCH 512 ARCHITECTURAL THEORY  
F 3 cr. SEM 3 Maximum 9 cr. May be repeated.  
PREREQUISITE: Graduate standing or seniors by petition.  
- Specific architectural, urban, planning and preservation theories, their application and context within contemporary practice will be investigated through the study of essays, drawings, models and built projects.

ARCH 522 HISTORICAL ISSUES IN ARCHITECTURE AND URBAN DESIGN  
On Demand 3 cr. SEM 3 Maximum 9 cr. May be repeated.  
PREREQUISITE: ARCH 322, ARCH 323, Graduate standing or seniors by petition.  
- Close examination of historic periods and individuals. Emphasis upon in-depth studies of particular personalities and the social, cultural, artistic and scientific developments that influenced the progress of architecture, urban design and city planning.

ARCH 523 ISSUES IN CITY PLANNING  
On Demand 3 cr. RCT/DES 3  
PREREQUISITE: Graduate standing or seniors by petition.  
- Problems and issues, processes and regulations in planning, urban design, and historic preservation.  
Field trip possible.

ARCH 524 DESIGN COMPETITION  
On Demand 3 cr. LAB/STU 3 Maximum 6 cr.  
PREREQUISITE: ARCH 355 or consent of instructor. Admission to graduate program or seniors by petition.  
- Students will work under the direction of a faculty member in the research, design, development and presentation of a project in response to a design competition.

ARCH 525 SPECIAL DESIGN TOPIC  
F, S 3 cr. LAB/STU 3 Maximum 9 cr. May be repeated as topics.  
PREREQUISITE: ARCH 355 and consent of instructor. Admission to graduate program or seniors by petition.  
- Students will work under the direction of a faculty member in the research, design, development and presentation of a design, research, or historic preservation project.

ARCH 533 ADVANCED ENVIRONMENTAL CONTROLS  
On Demand 3 cr. SEM 3.  
PREREQUISITE: ARCH 331 and ARCH 332.  
- Admission to the graduate program or seniors by petition.  
- Advanced architectural lighting design explored through experimental exercises, calculations, physical modeling and computer simulations. Includes an in-depth study of new lamps, luminaries, electrical lighting design and daylighting design.

ARCH 545 ADVANCED STRUCTURES  
On Demand 3 cr. LEC 2 STU 1  
PREREQUISITE: ARCH 244 or ARCH 344 and graduate standing or seniors by petition.  
- Advanced structural topics, load path, performance design, structural system planning, connection design; computer software for structural analysis/design; structural restoration; complete design/analysis/structural issues for a medium sized multi-use building (class project). Notebook computer required.

ARCH 551 ADVANCED ARCHITECTURAL STUDIO  
On Demand 6 cr. LEC 2 STU 4.  
PREREQUISITE: ARCH 456 and graduate standing.  
- Building and/or urban design projects which explore a specific theoretical position with regard to contemporary architectural, urban design or historic preservation issues. Research and analysis of theoretical positions. Utilization of methods and models and techniques for analysis.

ARCH 552 ARCHITECTURAL STUDIO RESEARCH  
On Demand 3 cr. LEC 1 RCT 2  
PREREQUISITE: Graduate standing.  
- Graduate research and analysis of a major theoretical position advocated through the writings, drawings and models of architectural theorists.

ARCH 553 ARCHITECTURAL STUDIO-THEORETICAL APPLICATION  
On Demand 3 cr. LEC 1 RCT 2  
PREREQUISITE: Graduate standing.  
- Graduate research and analysis of the formal manifestations of the specific theoretical positions advocated and illustrated through the design work of significant architectural practitioners. Notebook computer required.

ARCH 554 URBAN DESIGN STUDIO  
On Demand 3 cr. STU 3.  
PREREQUISITE: Graduate standing.  
- Urban design projects that develop an understanding of public planning goals and constraints, urban infrastructure, formal urban fabric, historic preservation, and socio-cultural issues. Notebook computer required. Field trip required.

ARCH 555 URBAN DESIGN RESEARCH  
On Demand 3 cr. LEC 1 RCT 2  
PREREQUISITE: Graduate standing.  
- Methods, models, and techniques for analyzing the city as an artifact of social, cultural, historical, economic and physical significance. Notebook computer required. Field trip required.

ARCH 556 URBAN DESIGN THEORY  
On Demand 3 cr. LEC 1 RCT 2  
PREREQUISITE: Graduate standing.  
- Graduate research and analysis of contemporary and historic design theory. Notebook computer required. Field trip required.

ARCH 557 ARCHITECTURAL DESIGN STUDIO  
On Demand 6 cr. LEC 2 STU 4  
PREREQUISITE: Graduate standing.  
- Advanced architectural design projects integrating site analysis, programming, building systems, and contemporary design theory. Emphasis placed on the inclusive synthesis of conceptual processes, analysis, preliminary design investigation, and design development. Notebook computer required.
ARCH 558 ADVANCED BUILDING STUDIO
On Demand 6 cr. RCT 1 STU 5
PREREQUISITE: Graduate Standing.
- Graduate studio with an underlying theoretical approach that will guide the design of a programmatically complex building type on a challenging site. Mastery of the theoretical, humanistic, systemic and tectonic aspects of a sophisticated building is required.

ARCH 564 ADVANCED ARCHITECTURAL GRAPHICS
F, Su 5 cr. LAB/STU 3. Maximum 6 credits. May be taken more than once as topics vary. PREREQUISITE: ARCH 262, admission to graduate program or seniors by petition.
- Advanced architectural presentation strategies for exploring visual perception and design development through graphic exploration.

ARCH 565 ADVANCED COMPUTER APPLICATIONS II
On Demand 3 cr. RCT 1 LAB 2.
PREREQUISITE: ARCH 263 or ARCH 464.
- Computer-aided design and theory for architecture. Lectures and projects may include topics of three-dimensional modeling, animation, delineation or CNC milling. Notebook computer required.

ARCH 570 INDEPENDENT STUDY
On Demand 1-4 cr. IND Maximum 8 cr.
PREREQUISITE: Admission to graduate program.
- Directed graduate research and study of architectural, urban design or historic preservation issues on an individual basis.

ARCH 589 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Courses for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARCH 590 MASTERS THESIS
F, S, Su 1-3 cr. IND 1-5.
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work but who need additional faculty or staff time or help.

ARNR Animal and Range Sciences
Department of Animal & Range Sciences
(406) 994-3721

ARNR 100 INTRODUCTION TO ANIMAL SCIENCE
S 3 cr. LEC 3
- Introductory Animal Science includes basic principles of animal genetics, nutrition, live animal evaluation, reproduction, and their application to the production of beef and dairy cattle, sheep, swine, horses, and poultry.

ARNR 101 NATURAL RESOURCE CONSERVATION
F 3 cr. LEC 3
- An overview of soils, water, rangelands and wildlife conservation from the global to the local level. Impacts of human population growth, economics, ethics and agriculture on the sustainability of natural resources will be examined using basic principles of ecology.

ARNR 102 MONTANA RANGE PLANTS LAB
F 1 cr. LAB 1
COREQUISITE: ARNR 101
- The laboratory exercises are designed to complement the lectures of ARNR 101. Rangeland inventory and classification methods will be reviewed. Sixty common native and introduced plants will be identified in the field and the classroom.

ARNR 110 WESTERN EQUITATION
F, S 2 cr. LAB 2
- Western equitation techniques including introductory training techniques.

ARNR 114 BEGINNING ENGLISH EQUITATION
F, S 2 cr. LAB 2
- Beginning English equitation technique, including horse behavior, horse handling, equipment and basic horse anatomy.

ARNR 125 NATURE OF YELLOWSTONE
F 3 cr. LEC 1 RCT 1 LAB 1
- Introduction to field ecology of the Yellowstone. Emphasis will be on plant animal relationships on the Northern Range. A three day field trip during the semester will be required.

ARNR 205 INTRODUCTION TO MEAT EVALUATION
F 2 cr. LAB 2
PREREQUISITE: ARNR 100
- Techniques for the evaluation of carcasses. Procedures include U.S. grading standards, introduction to carcass pricing and objective carcass measurements.

ARNR 207 INTERMEDIATE ENGLISH EQUITATION
S 2 cr. LAB 2
PREREQUISITE: ARNR 114.
- Advanced English equitation techniques including collection, lateral movements and beginning jumping.

ARNR 208 INTERMEDIATE WESTERN EQUITATION
F 2 cr. LAB 2
PREREQUISITE: ARNR 110 or permission of instructor.
- Students will learn advanced movements and maneuvers such as collection, roll-backs, turn-arounds, and lead changes. Students must have secure seat and hands. Training methods for the green horse and tuning techniques for the older broke horse will be covered.

ARNR 211 COLT BREAKING AND TRAINING
F 2 cr. LAB 2
PREREQUISITE: ARNR 208.
- Principles and techniques of breaking and training young horses.

ARNR 213 SPECIALIZED HORSE TRAINING
S 2 cr. LAB 2
PREREQUISITE: ARNR 108.
- Advanced techniques and training for either reining, cutting, or working cow horses. For experienced riders.

ARNR 215 CALVING MANAGEMENT
S 2 cr. LEC 1 LAB 1
PREREQUISITE: ARNR 100 and ARNR 230 or consent of instructor.
- Procedures to correctly identify calving problems and subsequently assist the birthing process and application of techniques to maximize calf survival.

ARNR 230 RANGE LIVESTOCK PRODUCTION
S 3 cr. LEC 3.
PREREQUISITE: ARNR 100, ARNR 101.
- Principles of beef and sheep production in rangeland environments. Breeding, reproduction, nutrition, marketing, and distribution.

ARNR 231 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT
F alternate years, to be offered odd years 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Animal management practices associated with swine production.

ARNR 232 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-SHEEP
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Management practices associated with farm flock and range sheep enterprises.

ARNR 233 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-HORSES
F 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Handson laboratories to familiarize students with the principles of beef cattle handling and management.

ARNR 235 RANGE AND PASTURE MONITORING
F 1 cr. LAB 1
PREREQUISITE: ARNR 100, ARNR 101, ARNR 102 or permission of the instructor.
- Methods which can be used by private operators as well as state and federal land managers to identify site potential, inventory forage resources, evaluate range and pasture condition, estimate stocking rates, and measure forage utilization by wildlife and livestock.

ARNR 236 SMALL PASTURE MANAGEMENT
S 1 cr. LEC 1
PREREQUISITE: ARNR 100, ARNR 101, ARNR 102.
- Management of small acreages (< 50 acre) to produce forage for horses and non-commercial livestock. Topics include determination of site productivity, plant and animal response to grazing, forage production, protection of water quality and controlling invasive plants. Field trips include operations with successful grazing programs and problem areas.

ARNR 240 NATURAL RESOURCE ECOLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 101.
- Focus on the role of physical and biotic processes on ecosystem function, including natural and managed ecosystems. Emphasis on rangelands, wildlife habitat, watersheds, and disturbed environments.
ARNR 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

ARNR 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None, but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARNR 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ARNR 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ARNR 301 LIVESTOCK INDUSTRY STUDY TRIP
On Demand 1 cr. LAB 1
PREREQUISITE: ARNR 100 and junior standing.
- Exposure of students to livestock operations and related business enterprises in different geographical locations. One three-day field trip. Graded P/F.

ARNR 305 ADVANCED MEAT EVALUATION
F 2 cr. LEC 2
PREREQUISITE: ARNR 205 or consent of instructor.
- Advanced skills in carcass evaluation, U.S. grading and functionality.

ARNR 309 INTRODUCTION TO LIVESTOCK EVALUATION
F 2 cr. LAB 2
PREREQUISITE: ARNR 100 and ARNR 205, or consent of instructor.
- Techniques and experience in live animal evaluation. Practical use of production data and other evaluation techniques.

ARNR 314 EQUESTRIAN INSTRUCTION
F, S 2 cr. LEC 1 LAB 1 Maximum 2 cr.
PREREQUISITE: ARNR 110, ARNR 208, or consent of instructor.
- The object of this course is to develop competent riding instructors who can communicate effectively and motivate students to higher riding skills.

ARNR 316 MEAT SCIENCE
S 4 cr. LEC 3 LAB 1
PREREQUISITE: ARNR 100 and BIOL 102 and CHMY 121.
- The meat industry within North America and beyond will be discussed. Live animal evaluation, pricing and carcass evaluation will be discussed. The class will include an explanation of muscle structure and function and its effect on tenderness and functionality.

ARNR 320 ANIMAL NUTRITION
F 4 cr. LEC 3 LAB 1
PREREQUISITE: ARNR 250 and CHMY 125 and VTMB 271 or consent of instructor.
- Digestion and metabolism of nutrients, nutrient requirements, feed composition, diet formulation, and practical feeding of various classes of domestic animals.

ARNR 321 PHYSIOLOGY OF REPRODUCTION
F 4 cr. LEC 3 RCT 1
PREREQUISITE: VTMB 271.
- A study of the anatomy and physiology of reproduction with major emphasis on domestic animal species. This class introduces students to emerging concepts and current technologies for improving reproductive efficiency in domestic animals.

ARNR 322 PRINCIPLES OF ANIMAL BREEDING AND GENETICS
S 3 cr. LEC 3
PREREQUISITE: ARNR 100, BIOL 102, and either STAT 216 or STAT 332 or IPSS 318.
- Genetic improvement of farm animals through performance testing, methods of selection, and application of mating systems such as crossbreeding.

ARNR 325 WILDLIFE-LIVESTOCK RANGE NUTRITION
S 3 cr. LEC 3
PREREQUISITE: ARNR 100 and ARNR 101 and ARNR 102, and ARNR 250.
- Nutrition of free ranging ungulates including deer, elk, antelope, bison, sheep, cattle and feral horses. Topics will include digestive systems, intake, food habits, feeding behavior and management.

ARNR 327 EQUINE LAMENESS
F 3 cr. LEC 3
(Change in credit effective Fall 2005)
PREREQUISITE: VTMB 271.
- This course is structured to familiarize students with the many types of lameness in the horse. Students will be instructed on the correlation between anatomy, conformation, locomotion and lameness. Selected diseases of the bones, joints, and soft tissue will be discussed. Significant time will also be spent on lameness diagnosis, treatment, prognosis, as well as shoeing principles for sound and lame horses.

ARNR 331 SWINE PRODUCTION
F alternate years, to be offered odd years, 5 cr. LEC 3.
PREREQUISITE: ARNR 100 and Junior standing.
- Principles of swine production and the swine industry will be discussed. Topics include management of the swine herd, nutrition, reproduction, economics, breeding, and health related to efficient swine production; pork quality, nutrient management plans.

ARNR 337 DISEASES OF DOMESTIC LIVESTOCK
S 3 cr. LEC 3.
PREREQUISITE: VTMB 271.
- This course is structured to familiarize students with the common diseases of domestic livestock. Infectious and non-infectious diseases of horses, cattle, sheep and swine will be covered. Particular emphasis will be placed on regional diseases.

ARNR 345 RIPARIAN ECOLOGY AND MANAGEMENT
S 5 cr. LEC 2 LAB 1
PREREQUISITE: LRES 201 and ARNR 240 or LRES 244 or ERTH 303 or BIOL 303.
- This course will provide an overview of one of the most ecologically diverse ecosystems in western North America. Students will have the opportunity to study the physical and biological processes which shape and maintain riparian ecosystems. A field laboratory will provide experience in biological and physical monitoring methodologies that are central to land management decisions.

ARNR 347 EQUINE FORM TO FUNCTION
F 5 cr. LEC 2 LAB 1
PREREQUISITE: VTMB 271 and Junior standing.
- Development of methods for analyzing a horse’s conformation along with a good understanding of anatomy and its relationship to performance.

ARNR 350 VEGETATION OF WESTERN WILDLANDS
S 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 240, BIOL 250, and either BIOL 434 or BIOL 436.
COREQUISITE: ARNR 351.
- Identification of commonly occurring plants of western North America biomes. Important ecological and management relationships of the plants will be emphasized.

ARNR 351 BIOMES OF WESTERN WILDLANDS
S 2 cr. LEC 2
PREREQUISITE: ARNR 240, BIOL 250.
COREQUISITE: ARNR 350.
- Climatic, physical, and biological interactions of natural biomes. The structure of western North America biomes will be considered in detail.

ARNR 353 GRAZING ECOLOGY AND MANAGEMENT
S 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 101, ARNR 102, and ARNR 250 or ARNR 240.
- Ecological perspectives of livestock grazing in the major biomes of the western United States and southern Canada. Impacts on soils, individual plants, plant communities, livestock, wildlife, and hydrology will be reviewed in the scientific literature.

ARNR 354 FIRE ECOLOGY AND MANAGEMENT
F 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 101 or ARNR 240 or BIOL 305.
- This course covers the wildfire patterns that shape and define western rangeland and forest ecosystems. Discussions on the historical role of fire will provide the background for using prescribed fire to accomplish a broad range of habitat management goals.

ARNR 355 WILDLIFE-LIVESTOCK HABITAT RESTORATION
F 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 101 or LRES 110 or F&WL 301, and BIOL 230, and ARNR 240 or BIOL 305.
- Improvement and rehabilitation of habitats used by wildlife and free-ranging livestock in the western United States. Topics include methods used to improve wildlife habitat as well as livestock forage. Design criteria for stock ponds, off-site water development, construction of bird/small mammal guzzlers, use of prescribed fire, mechanical, chemical and biological techniques to rehabilitate and improve wildlife and livestock habitats.

ARNR 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.
ARNR 409 ADVANCED LIVESTOCK EVALUATION  
F, S 3 cr. LEC 3  
PREREQUISITE: ARNR 309 or equivalent.  
- Advanced skills in evaluation of animals and data associated with growth and genetic improvement.  
- Develop decision making and oral communication skills.

ARNR 410 VETERINARY ENTOLOGY  
S alternate years, to be offered even years  
2 cr. LEC 2  
PREREQUISITE: BIOL 101, BIOL 204.  
- This course will provide an overview of the importance of arthropods and their effects on human and animal health. Topics covered will include classification and identification of insects, mites, and ticks, basic biology, behavior and ecology, feeding mechanisms, pathogen transmission, vector competency, production impacts, integrated management and prevention.

ARNR 415 EQUINE REPRODUCTION  
S 4 cr. LEC 3 LAB 1  
PREREQUISITE: VTMB 271, ARNR 321.  
- This course is designed to familiarize students with the reproduction in horses. Students will be instructed on the appropriate methods for management of the stallion, mare and foal. The curriculum will also include equipment and facilities use, as well as management of a breeding facility.

ARNR 416 MEAT PROCESSING  
F 3 cr. LEC 2 LAB 1  
PREREQUISITE: ARNR 316 or instructor approval.  
- Students will learn to manufacture processed meat products such as fresh sausage, ham, bacon and cold cuts. They will also be developing new flavor profiles and new products that will be presented to a panel with proposed marketing plans.

ARNR 421 ASSISTED REPRODUCTIVE TECHNOLOGIES  
F 4 cr. LEC 2 LAB 2  
PREREQUISITE: ARNR 321.  
- Reproductive management programs applying physiological knowledge to increase meat and milk production in cattle. Experience in the techniques of artificial insemination and pregnancy evaluation in cattle.

ARNR 422 TOPICS IN BEEF CATTLE NUTRITION  
S alternate years, to be offered even years  
2 cr. LEC 2  
PREREQUISITE: ARNR 320 and Junior standing or consent of instructor.  
- Critical evaluation of current issues and related scientific literature in beef cattle nutrition; application to decision making and problem solving.

ARNR 423 EQUINE NUTRITION  
S alternate years, to be offered odd years 2 cr. LEC 2  
PREREQUISITE: ARNR 320 and Junior standing or consent of instructor.  
- Critical evaluation of current issues and related scientific literature in equine nutrition; application to designing effective feeding programs.

ARNR 426 WILDLIFE HABITAT MANAGEMENT  
S 3 cr. LEC 3  
PREREQUISITE: ARNR 240 or BIOL 305 or consent of instructor.  
- Emphasis placed on wildlife habitat management in coordination with other land uses (i.e. agriculture, recreation, and development). Students gain insight into the details of wildlife habitat management by delving into the historical and current literature on the subject. Real world issues and solutions based on case study examples are emphasized.

ARNR 430 HORSE MANAGEMENT  
S 4 cr. LEC 3 LAB 1  
PREREQUISITE: ARNR 320, ARNR 321, ARNR 322, VTMB 271.  
- Horse management and problems with emphasis on behavior, nutrition, reproduction, and management programs.

ARNR 432 SHEEP MANAGEMENT  
S 3 cr. LEC 2 LAB 1  
PREREQUISITE: ARNR 320, ARNR 232, and ARNR 321 or consent of instructor.  
- Management of the ewe flock, nutrition, reproduction, economics, breeding, and health related to efficient sheep production will be discussed. Production preparation and wool marketing in U.S. and world markets and economics of Montana wool production will be covered.

ARNR 434B BEEF CATTLE MANAGEMENT  
F 4 cr. LEC 2 LAB 2  
PREREQUISITE: ARNR 290, ARNR 240, ARNR 320, ARNR 321, ARNR 324 and AGEC 210 or AGEC 541.  
- Integration of the principles of nutrition, genetics, physiology, range ecology, and economics into practical and profitable ranch management and business plans. Utilization of performance and financial records, budgeting, feed resource planning, marketing strategies, breeding plans, computer applications, and case studies.

ARNR 438 WILDLIFE HABITAT ECOLOGY  
S 3 cr. LEC 3  
PREREQUISITE: ARNR 240 or BIOL 305 or consent of instructor.  
- Principles of habitat importance and management. Habitat requirements within wildlife populations constraints will be emphasized with consideration of other natural resource demands.

ARNR 453 HABITAT INVENTORY & ANALYSIS  
F 3 cr. LEC 2 LAB 1  
PREREQUISITE: ARNR 240 or BIOL 305, STAT 216 or FSP 318, and Junior standing.  
- Focus on collecting, analyzing, and interpreting measures of rangeland resources including plant, animal, soil, and watershed components. Emphasis on sampling objectives, field procedures, monitoring, and evaluation.

ARNR 470 INDEPENDENT STUDY  
On Demand 1 - 5 cr. IND Maximum 6 cr.  
PREREQUISITE: Junior standing, consent of instructor and approval of department head.  
- Directed research and study on an individual basis.

ARNR 476 INTERNSHIP  
On Demand 2 - 12 cr. IND  
PREREQUISITE: Junior standing, consent of instructor and approval of department head.  
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ARNR 480 SPECIAL TOPICS  
On Demand 1 - 4 cr. Maximum 12 cr.  
PREREQUISITE: Course prerequisites as determined for each offering.  
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARNR 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION  
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.  
COREQUISITE: ARNR 490.  
- Classroom instruction associated with directed undergraduate research/creative activity projects. Course will address responsible conduct of research.

ARNR 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY  
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.  
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

ARNR 500 SEMINAR  
On Demand 1 cr. SEM 1 Maximum 4 cr.  
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.  
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ARNR 507 RESEARCH METHODS  
F, S 1 cr. SEM 1 Maximum 5 cr.  
PREREQUISITE: Graduate standing.  
- Application of scientific method and research techniques, including design of experiments and use of appropriate statistical procedures.

ARNR 520 NUTRIENT METABOLISM OF DOMESTIC ANIMALS  
F alternate years, to be offered odd years 3 cr. LEC 3  
PREREQUISITE: ARNR 320, and either CHMY 123 or BCHM 340 or consent of instructor.  
- Biochemistry of animal nutrition with emphasis on integration of biochemical principles to animal production systems. Nutrients emphasized are proteins, carbohydrates and lipids.

ARNR 521 ADVANCED RUMINANT NUTRITION  
F alternate years, to be offered even years 3 cr. LEC 2 LAB 1  
PREREQUISITE: ARNR 320 or consent of instructor.  
- Physiological and microbiology aspects of ruminant digestion and their influence on the metabolism of extraruminal tissues.

ARNR 523 ADVANCED PHYSIOLOGY OF REPRODUCTION  
S alternate years, to be offered odd years 3 cr. LEC 3  
PREREQUISITE: BIOL 411, BCHM 340, ARNR 321 or consent of instructor.  
- Study of the basic concepts of reproductive processes of mammals with special emphasis on the application of recent techniques in solving reproductive problems associated with fertility and infertility.

ARNR 524 ADVANCED ANIMAL BREEDING  
S alternate years, to be offered even years 3 cr. LEC 3  
PREREQUISITE: ARNR 322.  
- Quantitative genetics applied to the improvement of animals. Biometrical relationships among relatives, methods of estimating genetic parameters, application of crossbreeding systems and selection techniques.
ARNR 525 MUSCLE AND GROWTH BIOLOGY
S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: BCHM 360 AND BIOL 102N.
- Growth and development of muscle, muscle structure and how growth is controlled by hormones and DNA will be studied. The impact of growth manipulation on the final product, meat, will also be evaluated.

ARNR 541 RANGE ECOPHYSIOLOGY
S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: ARNR 240 or BIOL 305 or BIOL 450.
- Lectures and selected readings on the response of range plants and animals to daily and seasonal changes in their environment, including physiology, animal behavior, and plant population biology.

ARNR 543 RIPARIAN PROCESSES AND FUNCTION
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ARNR 345, BIOL 305 and LRES 352 or ESCH 432.
- This course involves an in depth investigation of the geomorphological physical and biological parameters unique to riparian areas of the Northern Rocky Mountains and Great Plains. Emphasis will be placed on how these parameters interact to create the biotic communities associated with riparian areas.

ARNR 544 ADVANCED GRAZING MANAGEMENT AND ECOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ARNR 240 or ARNR 350 or ARNR 351 or BIOL 305.
- Review of management principles for livestock grazing grasslands and shrub lands and their ecological relationship to other areas. Study design and scientific results will be examined to critically review information.

ARNR 570 INDEPENDENT STUDY
On Demand - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ARNR 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ARNR 580 SPECIAL TOPICS
On Demand - 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARNR 589 GRADUATE CONSULTATION
F, S 3 cr. IND Maximum credits unlimited
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ARNR 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

ARNR 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND
PREREQUISITE: Doctoral standing.

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ART 110RA 2-D ART FUNDAMENTALS
F 4 cr. RCT 1 STU 3
- The development of basic two-dimensional technical and aesthetic concepts through an emphasis on design elements and principles. Visual problem-solving in 2D pictorial construction and color theory. Critiques develop student’s ability to formulate and verbalize knowledgeable responses to visual production. Required weekly lecture on various aspects of visual arts practice.

ART 111RA 3-D ART FUNDAMENTALS
S 4 cr. RCT 1 STU 3
- The development of basic three-dimensional technical and aesthetic concepts through an emphasis on design elements and principles. Visual problem-solving in 3D form and space through various processes and materials. Critiques develop student’s ability to formulate and verbalize knowledgeable responses to visual production. Required weekly lecture on various aspects of visual arts practice.

ART 112RA DRAWING FUNDAMENTALS
F, S 3 cr. STU 3
- The development of basic drawing skills and concepts through an emphasis on observation and visual problem-solving. Representation and expression are explored through black and white drawing media. Critiques develop student’s ability to formulate and verbalize knowledgeable responses to visual production.

ART 140RA WEB DESIGN
F 3 cr. LEC 2 LAB 1
- Basic design principles and how these principles apply to web site construction. HTML, HTML editors and Cascading Style Sheets. Laboratory projects reflect practical usage of course concepts. Crosslisted with CS 140.

ART 202IA ANCIENT THROUGH MEDIEVAL ART HISTORY
F 4 cr. LEC 3 RCT 1
- This course examines the visual arts from their beginnings to ancient Egypt, Greece, and Rome through the Medieval period. It focuses on an understanding of art as the nonverbal expression of universal cultural concepts.

ART 203IA RENAISSANCE THROUGH MODERN ART HISTORY
S 4 cr. LEC 3 RCT 1
- A survey of Renaissance, Baroque, and 19th and 20th century art which focuses on the evolution of humanistic expression and the emergence of the artist as an individual responding to the impact of modern society.

ART 204IA EXPLORE ARTISTS ON FILM
F 3 cr. LEC 3
- Analyzes a variety of portrayals of art and artists throughout history in Hollywood and foreign feature films. Artists and their works will be studied in their historical context, and in terms of how history is mediated by fictional depiction in film.

ART 205 PAINTING
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 110, ART 112.
- Introduction to oil and/or acrylic painting. Exploration of basic aesthetic and technical concepts in painting. Primarily representational subject matter. Understanding and developing individual stylistic tendencies. Individual and group critiques.

ART 206 METALSMITHING
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 111.
- A beginning course in basic metalsmithing techniques and three-dimensional design skills. Design concepts, small metal fabrication methods and practical demonstrations.

ART 207 SCULPTURE
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 111.
- Introduction to three-dimensional form through projects involving plaster, woodworking, welding, and non-traditional materials. Introduction to tools, materials, processes, and safety procedures with a conceptual approach to problem solving.

ART 208RA CERAMICS
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 111.
- Contemporary ceramics - the history, development, and aesthetics of ceramic vessels and sculpture. The technical aspects of clay, glazes, and the firing of ceramic objects. Problem solving and the development of ideas.

ART 209 PRINTMAKING
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 110.
- A beginning course in which multiple original prints are made from a variety of blocks and plates. Emphasis on relief and intaglio history and processes including woodcut, lino cut, engraving, etching, and aquatint.

ART 230RA REPRESENTATIONAL DRAWING
F, S, Su 4 cr. LEC 2 STU 2
PREREQUISITE: ART 110, ART 112.
- Introduction to the basic vocabulary of drawing, observation, problem solving, and personal expression. Critiques develop student’s ability to formulate and verbalize informed analysis of the completed projects.

ART 270 INDEPENDENT STUDY
On Demand - 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of the director.
- Directed research and study on an individual basis.

ART 280 SPECIAL TOPICS
On Demand - 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
ART 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ART 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ART 302 SURVEY OF ASIAN ART
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ART 202 or ART 203.
- The purpose of this course is to offer students a broad exposure to art and architecture produced in China, Japan, Southwest Asia and India from the Neolithic period through the 20th century with special emphasis placed on Chinese developments.

ART 308 HISTORY OF PRINTMAKING
(1450-1945)
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ART 203.
- This course introduces students to the vocabulary, techniques and history of printmaking in the western world from the mid-fifteenth century to the end of World War II.

ART 312 DECORATIVE ARTS & ENVIRONMENT
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: ART 203.
- This course introduces students to the history of decorative arts in western Europe and the United States from the Renaissance through the early 20th Century. Emphasis will be placed on major media and stylistic trends. Attention will also be given to the use of objects in their original spatial environments.

ART 315 CERAMICS II
F S 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 208.
- Advanced problems in ceramics.

ART 325 METALSMITHING II
F S 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 206.
- Advanced course designed around a specific problem and demonstrations for advanced jewelry and metal forming concepts. Emphasis will be placed on technical development and personal imagery.

ART 327 PRINTMAKING-LITHOGRAPHY
F alternate years, to be offered even years 5 cr.
PREREQUISITE: ART 209 and ART 238.
- An intermediate course in which multiple original prints are made from hand-drawn images on lithographic limestone. Etching in black and multicolor using crayon, tusche, transfer, and photo methods.

ART 333 SCULPTURE II
F S 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 207.
- Development of concept, creative thinking and problem solving in sculpture. Advanced experiences of materials and methods within three-dimensional form.

ART 338 ADVANCED DRAWING
F S Su 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 238.
- Advanced technical and aesthetic concepts in drawing with emphasis on the development of a personal artistic style. Use of traditional and non-traditional subject matter. Individual and group critiques.

ART 340 SURVEY OF ANCIENT ART
F alternate years, to be offered even years 5 cr.
- This course will examine the art and architecture of ancient civilizations surrounding the Aegean and Mediterranean seas. Beginning with the Aegean civilizations, the course will then examine the rise of the historical Greeks and will conclude with the Roman world.

ART 341 ADVANCED RELIEF PRINTMAKING
F alternate years, to be offered odd years 5 cr.
PREREQUISITE: ART 209.
- An advanced course in which multiple original prints are made using plack and end grain wood and plastic/rubber relief plates. Methods include reductive and multi-plate color, shaped and found object (collapgraph), color overlay, split fountain, roller and brush inking, and various hand and press printing methods.

ART 344 PRINTMAKING SERIGRAPHY
S alternate years, to be offered even years 5 cr.
PREREQUISITE: ART 209.
- An intermediate course in which multiple original prints are made using various water-based silk-screen processes. Stencil techniques include paper, screen filler, drawing fluid, and photo.

ART 348 ADVANCED INTAGLIO PRINTMAKING
S alternate years, to be offered odd years 5 cr.
PREREQUISITE: ART 209.
- Advanced course in which multiple original prints are made using engraved and/or etched copper, zinc, and/or plastic intaglio plates. Methods include spit bite, viscosity, a la poupee, multi plate color, collograph, and chine colle.

ART 350 PAINTING II
F S 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 205.

ART 355 WATER MEDIA
Su 5 cr. RCT 2 STU 3 Maximum 10 cr.
PREREQUISITE: ART 205.
- Painting with transparent watercolors. Introduction of materials, techniques, concepts, and a brief history of the process highlighting major artists. Individual and group critiques.

ART 360 YELLOWSTONE DIGITAL
Su 3 cr. LAB 3
PREREQUISITE: GDSN 224 or ART 238 or MTA 265 or ARCH 261.
- A field workshop located along the Yellowstone river using either 35mm or a Digital camera to create fine art digital prints. This course is designed for individuals with a working knowledge of photographic basics and a fundamental familiarity with their own equipment that desire to explore the new media of the fine art digital print.

ART 363 ALTERNATIVE PRINT MEDIA
S alternate years, to be offered even years 5 cr. LAB 3
PREREQUISITE: ART 209.
- An advanced course in which students are offered a wide range of printing processes. These may include monotype, photo techniques, experimental lithography, large format printing, multimedia, and digital printmaking. The structure of the course is based on technical demonstrations, studio assignments, and critiques.

ART 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ART 402 GREEK ART AND ARCHITECTURE
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ART 202 and ART 203.
- This lecture-based course will present a survey of the art and architecture of ancient Greece from its origins in the Dark ages through the Hellenistic period. Study begins with the Bronze Age of antecedents of Hellenic art and ends with the widespread dissemination of Greek material culture after the death of Alexander the Great.

ART 403 DRAWING
F S Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 258.
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of drawing. Written, signed contract required prior to registering for this course.
ART 406 ROMAN ART & ARCHITECTURE  
S 3 cr. LEC 3  
**PREREQUISITE:** ART 202.  
- This course is a survey of the public and private art and architecture of Republican and Imperial Rome. The study encompasses both the Etruscan and Republican foundations-cultural, political and artistic-of Rome and then moves on to the period when emperors ruled and the borders of the empire at its height ranged from Britain to North Africa.  
The course is arranged as a chronological survey moving from the prehistory of the Italic peninsula to the reign of the emperor Constantine in the fourth century CE.  

ART 410 CAREERS IN ART  
F 1 cr. LEC 1  
**PREREQUISITE:** Junior, Senior, or Graduate standing, or consent of instructor.  
- Senior capstone course for Liberal Arts Studio majors. Presentations by professional artists about important career elements such as resume writing, photographing and marketing your work, making presentations to galleries and design firms, starting a business, researching graduate schools, teaching as a career, and applying for grants and fellowships.  

ART 411 PAINTING  
F, S, Su 1 - 5 cr. IND Maximum 15 cr.  
**PREREQUISITE:** ART 350.  
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of painting. Written, signed contract required prior to registering for this course.  

ART 412 SCULPTURE  
F, S, Su 1 - 5 cr. IND Maximum 15 cr.  
**PREREQUISITE:** ART 333.  
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of sculpture. Written, signed contract required prior to registering for this course.  

ART 413 METALSMITHING  
F, S, Su 1 - 5 cr. IND Maximum 15 cr.  
**PREREQUISITE:** ART 325.  
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of metalsmithing. Written, signed contract required prior to registering for this course.  

ART 414 PRINTMAKING  
F, S, Su 1 - 5 cr. IND Maximum 15 cr.  
**PREREQUISITE:** ART 327 or ART 344, ART 341, ART 348, ART 363.  
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of printmaking. Written, signed contract required prior to registering for this course.  

ART 415 CERAMICS  
F, S, Su 1 - 5 cr. IND Maximum 15 cr.  
**PREREQUISITE:** ART 315.  
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of ceramics. Written, signed contract required prior to registering for this course.  

ART 417 INTERMEDIA  
F, S, Su 1 - 5 cr. IND.  
**PREREQUISITE:** ART 315 or 325 or 333 or 338 or 341 or 350 or 365.  
- Course in which the student will work on an individual basis with a faculty member in developing imagery and techniques combining various media including digital technology.  

ART 418 BEGINNINGS OF MODERN ART  
F alternate years, to be offered even years 5 cr. LEC 3  
**PREREQUISITE:** ART 203.  
- From Post-Impressionism to World War I. Major artists include Gauguin, Van Gogh, Cezanne, Matisse, Picasso, and the German Expressionists.  

ART 419 20TH CENTURY ART  
S 3 cr. LEC 3  
**PREREQUISITE:** ART 203.  
- Art from World War I to the present.  

ART 425 FIELD STUDY  
IN ART AND ART HISTORY  
S 2.5 cr. LAB 2.5  
**PREREQUISITE:** ART 110, ART 111 or ART 203, or consent of instructor.  
- Course will allow students to study at an off-campus location such as a foreign country under the direction of an art faculty member. Includes preparatory meetings, several hours per day of discussion on site, and writing or creative project which assimilates direct experience and research.  

ART 435 ART OF EGYPT & NEAR EAST  
S alternate years, to be offered every even years 3 cr. LEC 3  
**PREREQUISITE:** ART 202.  
- This course is an exploration of the art and architecture of ancient Egypt and the Near East (Anatolia, Mesopotamia and Persia). Due to the nature of the surviving material, the emphasis will be on the ideas and attitudes of these civilizations about the relationship between humans and divinities, the cult of the ruler/king, and funerary cult and the afterlife.  

ART 436 LATE GOTHIC PAINTING  
F alternate years, to be offered odd years 3 cr. LEC 3  
**PREREQUISITE:** ART 203.  
- This course will deal with the development of Gothic painting in Italy and its subsequent influence on the Northern tradition of painting in the Netherlands and Germany. Major masters include Giotto, Jan van Eyck, Bosch, Grunewald, Durer, and Bruegel.  

ART 440 ART IN THE AGE OF REVOLUTION  
S alternate years, to be offered even years 5 cr. LEC 3  
**ART 203.**  
- This course offers students an in-depth understanding of painting and sculpture in France and Britain in the 18th century. Through focused lectures, readings and discussions and writing assignments students will learn about the 18th century cultural, philosophical and scientific developments in their original contexts as well as their bearing on the present day.  

ART 442 MEDIEVAL ART  
F alternate years, to be offered odd years 3 cr. LEC 3  
**PREREQUISITE:** ART 202.  
- Early Christian, Byzantine, Romanesque, and Gothic periods.  

ART 445 19TH CENTURY ART  
F alternate years, to be offered even years 3 cr. LEC 3  
**PREREQUISITE:** ART 203.  
- This course is a study of painting, sculpture and architecture in Italy in the 15th century. Major artists include Donatello, Masaccio, Piero della Francesca and Botticelli, Michelangelo, and Giotto.  

ART 448 HIGH RENAISSANCE AND MANNERISM  
F alternate years, to be offered even years 3 cr. LEC 3  
**PREREQUISITE:** ART 202.  
- This course will focus on issues in contemporary painting, sculpture, and related radical art forms. Students are responsible for discussions of assigned readings and presentations of research projects.  

ART 457 BAROQUE IN ITALY & N. EUROPE (1600-1700)  
F alternate years, to be offered even years 3 cr. LEC 3  
**PREREQUISITE:** ART 203.  
- This course is a history of painting, sculpture, and architecture produced in Italy during the 17th century. Emphasis will be placed on major artists and stylistic trends as well as the various social, political and religious contexts for viewing art.  

ART 459 BAROQUE ART IN NORTHERN EUROPE  
F alternate years, to be offered odd years 3 cr. LEC 3  
**PREREQUISITE:** ART 203.  
- The purpose of this course is to offer students a more in-depth study of art in the Baroque period in Europe (1600-1700) by focusing on cultural developments in the Republic of the Netherlands and its colonies.  

ART 463 19TH CENTURY ART  
F 3 cr. LEC 5  
**PREREQUISITE:** ART 203.  
- This course examines the major artists of the 19th century in Europe and America and the development of the styles of Neoclassicism, Romanticism, Realism, and Impressionism.  

ART 470 INDEPENDENT STUDY  
On Demand 1 - 3 cr. IND Maximum 6 cr.  
**PREREQUISITE:** junior standing, consent of instructor, and approval of the director.  
- Directed research and study on an individual basis.
COURSE DESCRIPTIONS: ART 476 - BCHM 201

ART 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of the director.

- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ART 480 SPECIAL TOPICS
On Demand 1 - 5 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.

- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ART 489 UNDERGRADUATE RESEARCH / CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 5 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: ART 490.

- Senior capstone course. Classroom instruction associated with directed undergraduate research/creative activity projects. Graphic design students only.

ART 490 UNDERGRADUATE RESEARCH / CREATIVE ACTIVITY
F, S, Su 1 - 5 cr. IND May be repeated. Max 12 cr.

- Senior capstone course. Directed undergraduate research/creative activity which may culminate in a research paper, undergraduate thesis paper, or undergraduate thesis exhibition. Graphic design students must take this course in the spring. Course will address responsible conduct of research.

ART 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 6 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.

- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ART 501 PEDAGOGY AND PROFESSIONALISM IN ART HISTORY
F 2 cr. RCT 1 SEM 1

- Art historians are continually challenged to impart visual and critical thinking skills to a public audience, whether in the context of a university classroom or a scholarly conference. This graduate seminar is designed to provide graduate students with skills necessary for becoming effective instructors and professionals in academic or museum environments.

ART 505 PAINTING
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 411, graduate standing.

- Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of painting.

ART 506 ART HISTORY
F 3cr. SEM 3

- The discipline of Art History has had a remarkably complex development, from the formalist concerns of the late nineteenth century to the theoretical arguments of the late twentieth century. This graduate seminar will explore various art historical methods currently in use and diverse critical theories developed over the last few decades.

ART 512 ETRUSCAN ART
S 3cr. LEC 3

- The course focuses on the art and architecture produced by an important Italic civilization, the Etruscans, as well as their Iron Age ancestors. Villanovan civilization. The approach is contextual, with an examination of the social, economic, religious factors surrounding their artistic developments.

ART 515 CERAMICS
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 415, graduate standing.

- Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of ceramics.

ART 524 METALSMITHING
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 413, graduate standing.

- Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of metalsmithing.

ART 527 PRINTMAKING
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 414, graduate standing.

- Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of printmaking.

ART 529 SCULPTURE
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 412, graduate standing.

- Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of sculpture.

ART 530 INTERMEDIA
F, S, Su 3 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 333, ART 338, ART 350 and graduate standing.

- Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of intermedia.

ART 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, and Dean of Graduate Studies.

- Directed research and study on an individual basis.

ART 575 PROFESSIONAL PAPER
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.

- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

ART 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.

- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ART 585 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.

- Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

ART 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.

- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ART 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum 15 cr.
PREREQUISITE: Master’s standing.

BCHM
Biochemistry
Department of Chemistry & Biochemistry
(406) 994-4801

BCHM 100 UNDERGRADUATE SEMINAR I
F 1 cr. SEM 1

- For the new student. Integration into the department and its research and educational program. Scientific communication and chemical literature searching skills.

BCHM 104RN THE BIOCHEMISTRY OF HEALTH FOR NON-SCIENCE MAJORS
S 4 cr. LEC 3 LAB 1

- Introduction for non-science majors to the biochemical basis of nutrition, health, DNA, and the human genome. The class and laboratory includes training for in depth searching of Internet and library information resources, evaluating and presenting the information found, and an introduction to DNA fingerprinting.

BCHM 122 ORGANIC & BIOCHEMICAL PRINCIPLES
F, S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: CHMY 121, CHMY 141, or equivalent.

- An introduction into functional group organic chemistry and important biochemical structures, concepts, and processes. The laboratory is closely integrated with lecture coverage.

BCHM 201 UNDERGRADUATE SEMINAR II
PREREQUISITE: CHMY 194 or BCHM 100.
S 1 cr. SEM 1

- Introduction to faculty research through faculty mini seminars. Departmental research facilities. Research groups. Research planning decisions (MSU laboratory, summer internship, student exchange, REU, USP, etc).
Course Descriptions: BCHM 270 - BCHM 590

BCHM 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

BCHM 280 SPECIAL TOPICS
On Demand 1 - 4 cr. LEC Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BCHM 289R UNDERGRADUATE RESEARCH/CREATIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

BCHM 290R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY
F, S 1-4 cr. IND may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

BCHM 300 UNDERGRADUATE SEMINAR III
F 1 cr. SEM 1
PREREQUISITE: BCHM 270 or BCHM 201.
- Research techniques, procedures, and reports. Seminar reporting and presentation skills. Career planning and resume preparation. May be repeated once.

BCHM 340 GENERAL BIOCHEMISTRY
F, S, Su 5 cr. LEC 4 LAB 1
PREREQUISITE: BIOL 102, or BIOL 214, or BIOL 208; CHMY 325, or CHMY 335 or CHMY 211.
- Carbohydrates, lipid, protein, and nucleic acid structure and function; enzyme kinetics; energetic; major metabolic pathways for carbohydrates, lipids, and amino acids; photosynthesis; regulation of gene function.

BCHM 401 CAPSTONE SEMINAR
S 1 cr. SEM 1
PREREQUISITE: CHMY 300 or BCHM 300.
- Senior capstone course. Taught in collaboration with departmental Honors Thesis, CHMY 499. The chemistry/biochemistry research undergraduate experience constitutes a synthesis of our (bio) chemistry class room and laboratory education. The projects are orally presented in seminar form, discussed on the basis of acquired knowledge, and analyzed using stringent scientific methods and criteria. A complete personal resume is prepared. May be repeated once.

BCHM 441 BIOCHEMISTRY OF MACROMOLECULES
F 3 cr. LEC 3
PREREQUISITE: BCHM 340 (B or higher) or consent of instructor.
- Biochemical basis of modern molecular biology; structure and function of proteins, nucleic acids, and membranes; replication; transcription; translation; regulation of gene expression; and recombinant DNA.

BCHM 442 METABOLIC REGULATION
S 3 cr. LEC 3
PREREQUISITE: BCHM 340 (B or higher) or BCHM 441 (C or higher) or consent of instructor.
- In-depth biochemical treatment of metabolism and its regulation in cellular processes.

BCHM 444R BIOCHEMISTRY & MOLECULAR BIOLOGY METHODS
S 3 cr. LEC 1 LAB 2
PREREQUISITE: BCHM 441 (B or higher) or consent of instructor.
- This course focuses on molecular biology/biochemistry procedures integral to current research. Methods include PCR; gene cloning; DNA sequencing; and expression, isolation, purification, and characterization of the gene-encoded protein.

BCHM 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing; consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

BCHM 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BCHM 489R UNDERGRADUATE RESEARCH/CREATIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
PREREQUISITE: BCHM 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

BCHM 490R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

BCHM 500 SEMINAR
F S 1 cr. SEM 1 May be repeated.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

BCHM 524 MASS SPECTROMETRY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BCHM 301 or CHMY 323.

BCHM 526 ADVANCED PROTEIN NMR SPECTROSCOPY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHMY 323.
- This lecture-based course is designed to teach the fundamental principles of nuclear magnetic resonance (NMR) spectroscopy as it applies to the structural elucidations of proteins in solution. Prerequisites include familiarity with linear algebra and basic trigonometric functions and CHMY 325. Cross referenced with CHMY 526.

BCHM 543 PROTEINS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BCHM 441.
- Structure-function relationships of proteins and enzymes. Current literature stressed. Written student reports required.

BCHM 544 MOLECULAR BIOLOGY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: BCHM 441, BIOL 302, MB 449 or comparable course.
- Recent advances in understanding and research methods using both eukaryotic and prokaryotic systems.

BCHM 545 ADVANCED PHYSICAL BIOCHEMISTRY
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHMY 324 AND BCHM 441.
- Theoretical presentation of the molecular structures and interactions occurring in proteins and nucleic acids. Discussion of spectroscopy techniques used to study bio molecular structures and function. Includes concepts in: Nuclear Magnetic Resonance, X-ray Diffraction, Ultraviolet Absorption, Fluorescence, Circular Dichroism, Vibrational Spectroscopy, molecular motion and transport properties including diffusion, sedimentation, and viscosity.

BCHM 547 BIOINORGANIC CHEMISTRY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BCHM 441 AND BCHM 444.
- This course provides an introduction and overview of the field of bioinorganic chemistry, the chemistry of metals in biological systems, with a particular emphasis on metal trafficking, metal center assembly and metal clusters in biology.

BCHM 550 PRINCIPLES OF STRUCTURE DETERMINATION BY X-RAY CRYSTALLOGRAPHY
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: BCHM 441 and BCHM 442 or the equivalent and M 182M.
- This course focuses on theory and practice of molecular structure determined by X-ray crystallography. Topics include crystallography of macromolecules, molecular structure determination from X-ray data, and evaluation of the quality of the resulting macromolecular models.

BCHM 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

BCHM 575 PROFESSIONAL PAPER
F, S 1 - 6 cr. IND
PREREQUISITE: Consent of instructor.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

BCHM 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BCHM 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.
BIOL 100N ORGANISM FUNCTION
F 3 cr. LEC 3
- Provide students with an understanding of methods used to discover and create factual and theoretical knowledge of Organismal Biology. Emphasis on disciplinary methods, including kinds of questions asked, and methods used by biologists. Comparison of plant and animal systems with respect to structure and function, and examination of ecological adaptations.

BIOL 101N ORGANISAL BIOLOGY
F, S 4 cr. LEC 3 LAB 1
- This course examines the biology, ecology, and evolutionary relationships among living organisms. All forms of life will be considered, from single celled prokaryotes to multicellular eukaryotic plants and animals.

BIOL 102 MOLECULAR & CELLULAR BIOLOGY
F, S, Su 3 cr. LEC 3 LAB 1
PREREQUISITE: CHMY 121 or CHMY 141.
- Introduction to cellular organization and function. Topics covered include synthesis and function of macromolecules, cell organelles and structure, energy transformations in living systems, respiration, photosynthesis, the cell cycle, classical genetics, molecular genetics, and biotechnology.

BIOL 106CS ENVIRONMENTAL SCIENCE & SOCIETY
F, Su 3 cr. LEC 3
- The relationship between people and the environment using the earth as an ecosystem to show the effects of people's activities on natural ecosystems. Environmental issues such as wilderness, wolf reintroduction, global warming, fire ecology, whirling disease, and grizzly bears are covered.

BIOL 106CS INSECTS AND HUMAN SOCIETY
S 3 cr. LEC 2 RCT 1
- Ways in which research and advances in technology in the areas of insect biology and management have influenced people's lives throughout the world. Focus will be on insects as major factors affecting the areas of the world where humans live, crops and animals humans produce, and general quality of life on the planet. Interactions of insects and human cultures, technologically oriented and indigenous, non-technology based cultures, and concepts of pest management will also be explored. Students generate and test hypothesis and evaluate sources of scientific information on these topics.

BIOL 195 INTEGRATIVE PHYSIOLOGY I
F 4 cr. LEC 3 LAB 1
COREQUISITE: CHMY 141 or CHMY 151.
- How the human body works, for students planning to be health professionals. Designed to be taken before BIOL 213, includes basic cellular mechanisms, physiological control and communications. Major topics include muscle, nerve, respiratory, renal and cardiovascular systems. Cadaver labora-
tory will cover related human anatomy.

BIOL 204IN INSECT BIOLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: One of the following: BIOL 100, BIOL 101, or BIOL 102.
- General biology of insects including principles of morphology, physiology, behavior, ecology, and control. Includes identification of major orders and common families.

BIOL 207 ANATOMY & PHYSIOLOGY I
S, Su 5 cr. LEC 3 LAB 2
PREREQUISITE: BIOL 102, BIOL 207, BIOL 214 or MB 301 with a grade of "C" or better. Priority given to majors requiring this course.
- General principles of cell and tissue biology that apply to all living systems. Structure and function of skeletal, muscular, nervous, and endocrine systems. Homeostasis, control, and integration of the human body will be emphasized. Laboratory will cover related systems. This course is not repeatable without prior consent of instructor.

BIOL 208 ANATOMY & PHYSIOLOGY II
F 4 cr. LEC 3 LAB 1
PREREQUISITE: BIOL 102, BIOL 207, BIOL 214 or MB 301 with grades of "C" or better in each course. Priority given to majors requiring this course.
- Structure and function of digestive, cardiovascular, respiratory, reproductive, and urinary systems of humans. Principles of integration, metabolism, energy flow, and homeostasis will be emphasized. This course is not repeatable without prior consent of instructor.

BIOL 213 INTRODUCTORY BIOLOGY
S 4 cr. LEC 3 LAB 1
PREREQUISITE: BIOL 102, BIOL 207, BIOL 214 or MB 301 with a grade of "C" or better.
- Introduction to form and function in the animal and plant kingdoms. Topics will include circulation and gas exchange, chemical signals, reproduction, nutrition, and the animal nervous system. Laboratories will be inquiry-based with mathematical and computational applications to biological problems.

BIOL 214 INTRODUCTORY BIOLOGY: MOLECULES TO CELLS
F 4 cr. LEC 3 LAB 1
PREREQUISITE: STAT 216 and CHMY 141 and BIOL 213 and CHMY 143 with a grade of "C" or better.
- Introduction to biological macromolecules, cell structures and function, and gene structure and expression. The laboratory portion will include both wet lab and computer-based modules.

BIOL 215 INTRODUCTORY BIOLOGY: ORGANISMS TO POPULATIONS
S 4 cr. LEC 3 LAB 1
PREREQUISITE: BIOL 102 or BIOL 214, STAT 216 and M 161 or M 171.
- An introductory course in ecology and evolution with in-depth coverage of topics in micro- and macro-evolution, behavioral ecology, population ecology, community ecology, and biodiversity. The laboratory portion of the course will include material on biological diversity, evolutionary processes, and ecological processes.

BIOL 250 IDENTIFICATION OF SEED PLANTS
S 4 cr. LEC 2 LAB 2
PREREQUISITE: BIOL 101.
- Identification of conifers, trees and shrubs, and herbaceous seed plants; determination by use of manuals; vocabulary, classification and nomenclature; and preparation and collection of seed plant specimens.

BIOL 251 BOTANY: AN INTRODUCTION TO PLANT BIOLOGY
F 3 cr. LEC 3
PREREQUISITE: BIOL 101N.
- This course will provide a thorough overview of the fundamentals of plant and fungal biology from evolutionary, ecological, and physiological perspectives.

BIOL 252 BOTANY LAB
F 1 cr. LAB 1
COREQUISITE: BIOL 251.
- This lab will feature plant ecology and also plants that have been used as model organisms in studies of basic biological processes.

BIOL 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BIOL 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S 1.5 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

BIOL 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

BIOL 297 HUMAN PHYSIOLOGY I
S 3 cr. LEC 3
PREREQUISITE: CHMY 121 or CHMY 141 or CHMY 151 with grades of "C" or better in either course.
- General principles of cell and tissue biology; function of skeletal, muscular, nervous, and endocrine systems. Homeostasis, control, and integration of the human body will be emphasized.

BIOL 298 HUMAN PHYSIOLOGY II
F 3 cr. LEC 3
PREREQUISITE: BIOL 102 or BIOL 207 or BIOL 214 or BIOL 297 or MB 301 with grades of "C" or better in each course.
- Function of the human digestive, cardiovascular, respiratory, reproductive, and urinary systems. Principles of integration, metabolism, energy flow and homeostasis will be emphasized.
BIOL 301 PRINCIPLES OF GENETICS
F S 3 cr. LEC 3
PREREQUISITE: BIOL 102 or BIOL 214 or MB 301.
- Introduction to classical and molecular genetics of eukaryotes, with emphasis on transmission genetics, the structure and regulation of genes, and mechanisms of genetic change.

BIOL 302 ADVANCED CELL & MOLECULAR BIOLOGY
S 3 cr. LEC 3
PREREQUISITE: Biol 214 and BCHM 540 or consent of instructor.
- In-depth study of cell structure and function.

BIOL 303 PRINCIPLES OF ECOLOGY
S 3 cr. LEC 3
PREREQUISITE: BIOL 101 or BIOL 215; M 121 or M 160 or M 170; Recommended: STAT 216 or PSPP 318.
- Relation of organisms to their environment. The composition, structure, function and distribution of populations, communities, and ecosystems.

BIOL 310 COMPARATIVE VERTEBRATE ANATOMY
S 4 cr. LEC 2 LAB 2
PREREQUISITE: BIOL 101 or BIOL 215.
- A comparative study of organ systems of vertebrates. Laboratory utilizes representative vertebrate types.

BIOL 311 DEVELOPMENTAL BIOLOGY
S 4 cr. LEC 4
PREREQUISITE: BIOL 101 or BIOL 215, and BIOL 102 or BIOL 214, and BIOL 301.
- Developmental Biology: Introduction to cell signaling pathways and morphogenetic processes that establish the basic vertebrate body plan. Includes handson study of chicken and frog embryos.

BIOL 312 HISTOLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 102 or BIOL 214, senior standing and consent of instructor.
- Microscopic study of cells, tissues, and selected mammalian organs.

BIOL 313 NEUROPHYSIOLOGY
F 3 cr. LEC 3
PREREQUISITE: BIOL 213 and BIOL 214.
- Physiology of integrative mechanisms in nervous systems. Topics range from the mechanisms of synaptic transmission and action potential generation to the neural basis of learning and memory.

BIOL 316RN INTRODUCTION TO RESEARCH IN MOLECULAR BIOLOGY
S 3 cr. LEC 1 LAB 2
PREREQUISITE: BIOL 213 and BIOL 214 and CHMY 141 and CHMY 145.
- Introduction to research methodologies and techniques used in modern biological science research. This laboratory course will focus on wet-lab techniques including DNA purification and analysis, gene library screening and PCR, and cover modes of computer based analysis.

BIOL 309 HUMAN PATHOPHYSIOLOGY
S 3 cr. LEC 2 IND 1 SEM 1
PREREQUISITE: BCHM 540 or consent of instructor.
- Students will research two diseases of their own choosing and give a class presentation of their findings. The presentation normally includes diagnosis, pathophysiology, and treatment.

BIOL 400 SEMINAR
F S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students attend and discuss seminar presentations by professional biologists.

BIOL 401 BIOLOGY INSTRUCTING
F S 2 cr. LAB 2 Maximum 4 cr.
PREREQUISITE: Junior or senior standing, consent of instructor and department head.
- Provides deeper contact with a subject for those considering an academic profession. This provides experience in a teaching laboratory under detailed academic supervision in recognition that teaching enhances learning. Includes the preparation, organization, presentation of materials, and student evaluation.

BIOL 403 EVOLUTION
S 3 cr. LEC 5
PREREQUISITE: BIOL 301.
- For seniors in biology. Evolutionary theory is presented and takes two principle directions, the study of evolutionary history, and the study of natural selection.

BIOL 405 BEHAVIORAL & EVOLUTIONARY ECOLOGY
S 3 cr. LEC 3
PREREQUISITE: BIOL 303.
- Abundance and distribution of organisms in relation to their evolution, behavior, population biology and interactions with other organisms.

BIOL 406 ROCKY MOUNTAIN VEGETATION
F 2 cr. LEC 1 LAB 1
PREREQUISITE: Junior or senior status in biological sciences and consent of instructor.
- Field identification of major Rocky Mountain ecosystems; the composition, structure and function of climax and alternate communities; their environments, geography and history; and discussion of management alternatives. Includes introduction to field methods, statistical evaluations, remote sensing, and library use.

BIOL 407 ALPINE ECOLOGY
So 3 cr. LEC 1 LAB 2
PREREQUISITE: Junior standing, BIOL 101.
- The ecological characteristics of alpine areas. A three-day field trip will confirm and reinforce material presented in class and is a course requirement.

BIOL 410 ADVANCED HUMAN ANATOMY
S 4 cr. LEC 2 LAB 2.
PREREQUISITE: Senior standing, completion of at least two upper division courses in the biological sciences and consent of instructor.
- Dissection and projection of the detailed anatomy of the human thorax, abdomen and pelvis with special dissection emphasis on the extremities. Topographic, three-dimensional and detailed relationships of organs, nerves and vessels are emphasized. Can fulfill upper division honor credits.

BIOL 411 ANIMAL PHYSIOLOGY
F 3 cr. LEC 3
PREREQUISITE: BIOL 102 or BIOL 214, and one of the following: CHMY 211, CHMY 321, or CHMY 123.
- General homeostatic physiology of animals with emphasis on mammals. Selected body systems are covered with major emphasis on the integration of body processes.

BIOL 415 ICHTHYOLOGY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 310.
- Characteristics, classification, evolution, and life histories of major groups of marine and freshwater fishes, with an emphasis on North American freshwater fauna. Laboratory emphasizes identification, nomenclature, morphology, and distribution of Montana species.

BIOL 418 MAMMALOLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 310.

BIOL 419 ORNITHOLOGY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 310.
- Evolution, functional biology, distribution, and classification of birds. Montana species recognition is developed through laboratory use of a representative skin collection.

BIOL 420 FIELD ORNITHOLOGY
Su 3 cr. LAB 3
PREREQUISITE: Junior standing, and either BIOL 100 or BIOL 101.
- Field identification, habitat affinities and life histories of birds of the northern Rockies. Includes early morning field trips, 6:30-8:30 AM daily, and a Saturday full day field trip. Binoculars required.

BIOL 421 YELLOWSTONE WILDLIFE ECOLOGY
Su 3 cr. LEC 2 LAB 1
PREREQUISITE: Junior standing, and either BIOL 100 or BIOL 101.
- Basic ecology of the major animal species of the Yellowstone area and the ecological controversies surrounding their management.

BIOL 422 GENES AND CANCER
F 3 cr. LEC 3
PREREQUISITE: BIOL 302.
- This course will focus on the molecular and cellular mechanism of human cancer. The role of oncogenes and tumor suppressor genes in normal and cancerous cells will be examined, with an emphasis on how mutations in certain genes result in altered cell-cell signaling and cell proliferation. The role of genetic mutation in breast, colorectal and lymphoma cancers will be discussed, along with new technologies to detect and treat these cancers.

BIOL 424 FRESHWATER ECOLOGY
F 3 cr. LEC 5
PREREQUISITE: BIOL 305 or consent of instructor.
- This course examines relationships between freshwater organisms and their environment. Students learn about the ecology of rivers, lakes, reservoirs, and wetlands, with exposure to a wide diversity of organisms and processes. Emphasis is placed on linking basic concepts and real-world applications.

BIOL 425 SENSORY NEUROPHYSIOLOGY
S 3 cr. LEC 5
PREREQUISITE: BIOL 313.
- Neurophysiology of sensory cells and systems. Topics range from the mechanisms underlying sensory reception to the processing of sensory information at higher stages. The major focus will be on human sensory systems. Pathologies that effect sensory perception will be considered.
BIOL 426 NEUROETHOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: Consent of instructor.
– Neural and hormonal bases of animal behavior, including mechanisms underlying sensory perception and motor responses, learning and memory, spatial navigation, language, dominance hierarchies and aggression, mating systems, and parental behavior. Model systems from a variety of different animal species will be studied including humans.

BIOL 427 AQUATIC FIELD ECOLOGY
F 2 cr. LEC 1 LAB 1
PREREQUISITE: Prior or concurrent registration in BIOL 424.
– Optional laboratory for BIOL 424. Introduction to representative freshwater habitats, communities, organisms, and sampling methods through laboratory and field exercises and classroom discussions. Formal written reports are required after completed exercises.

BIOL 430 PLANT PHYSIOLOGY
S 3 cr. LEC 5
PREREQUISITE: Junior standing, BIOL 101 and one of the following: CHMY 211, CHMY 321, or CHMY 125.
– Physiological processes of higher plants, including photosynthesis, water relations, mineral nutrition, and development.

BIOL 435 INSECT IDENTIFICATION
S alternate years, to be offered odd years 4 cr. LEC 2 LAB 2
PREREQUISITE: ENTO 204N and one of the following: BIOL 100, BIOL 101, or BIOL 102.
– The identification of insects and related terrestrial arthropods. Evolutionary patterns reflected in modern insect diversity will be used to illustrate classification methods. Taxonomic methods will be used as an access to information retrieval.

BIOL 436 PLANT SYSTEMATICS
F alternate years, to be offered even years 3 cr. LEC 1 LAB 2
PREREQUISITE: BIOL 101 and BIOL 230.
– Introduction to the local vascular plant flora emphasizing characteristics of the common families and genera. Lab concentrates on plant identification of common angiosperm plant families in Montana; preparation of about 120 reference specimens taken from the local flora.

BIOL 437 PLANT DEVELOPMENT
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: BIOL 301.
– Cellular and molecular mechanisms of the development of multi cellular life forms that consist of walled cells, and primarily plants. Some topics include developmental differences between plants and animals, regulation of gene expression, environmental effects on plant development, and computer modeling of development.

BIOL 438 DEVELOPMENTAL MECHANISMS
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 302.
– This course will focus on the molecular and cellular mechanisms which drive developmental processes.

BIOL 443 CURRENT TOPICS IN BIOLOGY
S 2 cr. SEM 2
PREREQUISITE: Senior standing in Ecology Department, and prior or concurrent registration in BIOL 403.
– Senior capstone course. Discussion of topics that integrate evolutionary theory with ecology, genetics, medicine, behavior, or other subjects that are part of the biology curriculum.

BIOL 447 CONSERVATION BIOLOGY
F 3 cr. LEC 3
PREREQUISITE: BIOL 303.
– Examines issues relevant to conservation of wild populations, focusing primarily on animals. Emphasis is on approaches that use demography, population biology and genetics to address conservation questions. Readings are from the primary literature, rather than a textbook, including case studies.

BIOL 448 CONSERVATION GENETICS
F 3 cr. LEC 3
PREREQUISITE: BIOL 301 and STAT 216.
– Introduces the theory and practice of conservation genetics, focusing primarily on animals. Case studies will be used liberally, and emphasis will be placed on interpreting genetic data. Readings will include primary literature.

BIOL 449 POPULATION GENETICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: BIOL 301.
– Introduction to theory and empirical data on genetics of populations. Topics covered include modeling natural and artificial selection, nonrandom mating, gene flow and effective population size as factors influencing the maintenance of genetic variation in populations. The approach emphasizes the development of simple mathematical models to illustrate fundamental conceptual issues in the field.

BIOL 451 CELL BIOLOGY & NEUROSCIENCE DEPARTMENT CAPSTONE SEMINAR
F 3 cr. SEM 2
PREREQUISITE: Senior standing in the Cell Biology & Neuroscience Department.
– Senior capstone course. Students are expected both to present and to discuss advanced topics from the current biomedical literature. These topics will expand upon material presented in regular courses in the biomedical science curriculum. Students will write at least one major paper.

BIOL 453R BIOMIMETIC INTELLIGENT SYSTEMS
F 4 cr. LEC 1 LAB 3
PREREQUISITE: CAPP 120, M 170 or M 176 or M 182, STAT 216 or STAT 332, CORREQUISITE: BIOL 315 or CS 436 or EE 308.
– Students will study behaviors, structures and organs of simple biological organisms and model key aspects of these organisms in biomimetic robots. Students will gain hands-on experience with mathematical, engineering and software tools, all in the context of biological modeling.

BIOL 455 PLANT ECOLOGY
S 3 cr. LEC 5
PREREQUISITE: BIOL 101 or BIOL 215 and BIOL 303 or ARNR 240.

BIOL 466R GENE CONSTRUCTION
F 3 cr. LAB 3
PREREQUISITE: BIOL 302 or BCHM 340.
– The goals are to provide upper level students with the opportunity of designing and building their own genes. The goal of the course is to use this design experience to learn basic techniques in cell and molecular biology.

BIOL 467 MOLECULAR MEDICINE
S 3 cr. LEC 1 SEM 2
PREREQUISITE: BIOL 301 and BACHM 340.
– Lecture and seminar courses based on recent, original papers. Moves from human disease to molecular explanations. Intended for upper level students with a strong background in biology.

BIOL 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
– Directed research and study on an individual basis.

BIOL 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. IND May be repeated. Max 4 cr.
– Classroom instruction associated with directed undergraduate research/creative activity projects.

BIOL 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
– Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

BIOL 490 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition and course prerequisites as determined for each offering.
– Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

BIOL 501 EVOLUTIONARY GENETICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: BIOL 301.
– The operations of fundamental genetic principles in populations of living things. Emphasis on natural populations with a thorough consideration of factors of evolution, particularly at the species level and below.
BIOL 502 ADVANCED LIMNOLOGY
S alternate years, to be offered even years 4 cr.
LEC 2 LAB 2
PREREQUISITE: M 170, BIOL 404, BIOL 427, CHMY 120 or BCHM 540.
- Advanced quantitative study of the physical, chemical and biological dynamics of lakes and reservoirs.

BIOL 503 PALEOBIOLOGY
S alternate years, to be offered odd years 3 cr.
LEC 2 LAB 1
PREREQUISITE: BIOL 310, BIOL 403.
- A study of the fossil record as a means of inferring biological characteristics of extinct species. Current topics in palaeontology, phyllogenetic systematics, patterns of evolution, speciation and extinction and osteohistology will be examined.

BIOL 504 QUANTITATIVE BIOLOGY
F alternate years, to be offered even years 3 cr.
LEC 2 LAB 1
PREREQUISITE: BIOL 303, either STAT 216 or STAT 302, and one of the following: M 161, M 191, M 192.
- Applications of mathematical models to biological phenomena with examples drawn from physiology, ecology and bioengineering. The course is intended to develop facility with optimization techniques, numerical methods, matrix operations, complex variables and simple statistical ideas. Computer lab.

BIOL 505 ENVIRONMENTAL ANALYSIS
S alternate years, to be offered even years 3 cr.
LEC 2 LAB 1
PREREQUISITE: BIOL 303, either STAT 216 or STAT 302, and one of the following: M 161, M 191, M 192.
- Theory of ecological dynamics and introduction to multivariate methods for ecological analysis.
Computer lab.

BIOL 506 POPULATION DYNAMICS
S alternate years, to be offered odd years 3 cr.
LEC 2 LAB 1
PREREQUISITE: BIOL 303, either STAT 216 or STAT 302, and one of the following: M 161, M 171, M 172.
- Techniques for modeling the growth, regulation, harvesting and persistence of populations.
Computer lab.

BIOL 507 COEVOLUTION
F alternate years, to be offered even years 3 cr.
LEC 3
PREREQUISITE: BIOL 301, BIOL 303, or BIOL 403.
- Exploration of nature and dynamics of symbiotic relationships between and among plants, animals, fungi and bacteria.

BIOL 508 SCIENTIFIC WRITING
S 3 cr. LEC 2 LAB 1
PREREQUISITE: Graduate standing and permission of instructor.
- The course is designed to provide an intensive scientific writing experience for graduate students in the process of writing the first draft of their thesis or dissertation, including editing and critique sessions by both peers and the instructor.

BIOL 509 INTRODUCTION TO PRACTICAL MODELING
F 3 cr. LEC 2 LAB 1
PREREQUISITE: First courses in calculus and statistics or consent of instructor.
- With computers, the power of mathematical modeling is accessible to every biologist. We will discuss philosophies, strategies, techniques and pitfalls of modeling. After this course, students should be able to answer complex biological questions by formulating and analyzing mathematical/computational models.

BIOL 510 TOPICS IN NEUROBIOLOGY
S 3 cr. LEC 2 RCT 1 Maximum of 9 credits.
PREREQUISITE: Graduate standing and at least one upper division or graduate course in neurobiology.
- Recent advances in topics in neurobiology with emphasis in different years on either neurocytology, neuroendocrinology/neuroimmunology, or developmental neurobiology.

BIOL 513 TERRESTRIAL ECOLOGY OF PLAINS AND PRAIRIES
Su 1 cr. RCT 1
PREREQUISITE: Either BIOL 406 or BIOL 516, graduate standing, secondary teacher certification, two years teaching experience, and computer access.
COREQUISITE: Suggested: ESCI 513.
- Students will develop plant keys for classroom use, quantitatively analyze two riparian and two wetland areas, and develop classroom activities about ecology of those areas. Distance learning class offered by internet connection. This course is designed for secondary school teachers enrolled in the MSSE program and cannot be used in graduate programs in Biological Sciences.

BIOL 515 LANDSCAPE ECOLOGY AND MANAGEMENT
F alternate years, to be offered odd years 4 cr.
LEC 2 LAB 2
PREREQUISITE: Graduate standing or consent of instructor.
- Principles on landscape pattern, change, and function. Application of theory to conservation including population viability, reserve design, multiple-use landscapes. Lab introduces GIS, GPS, and simulation models. For graduate students and motivated undergraduates.

BIOL 516 TERRESTRIAL ECOLOGY OF THE NORTHERN ROCKY MOUNTAINS
Su 2 cr. RCT 1 LAB 1
PREREQUISITE: Graduate standing, two years of classroom teaching, undergraduate science degree, and one year of biology.
- Description and comparison of grassland, forest, and alpine ecosystems of the NRM with respect to composition, structure, and process such as productivity, decomposition and mineral cycling. We will use tools including keys to species and environmental types, dimension analysis, remote sensing, and statistics. This course is designed for secondary school teachers enrolled in MSSE Program and cannot be used in graduate programs in biological sciences.

BIOL 518 PARAMETER ESTIMATION FOR ECOLOGICAL MODELS
F alternate years, to be offered odd years 3 cr.
LEC 2 LAB 1
PREREQUISITE: BIOL 504 or equivalent.
- Statistical methods to quantify uncertainty, and to plan data collection for cost-efficient reduction in uncertainty, in application to ecological models where data are often sparse and processes are often noisy, and management decision must take account of uncertainty.

BIOL 519 BIOLOGY OF RIPARIAN ZONES AND WETLANDS
Su 2 cr. RCT 2
PREREQUISITE: Either BIOL 516 or BIOL 406, secondary teacher certification, two years teaching experience, and computer access.
COREQUISITE: Suggested: ESCI 512, ESCI 515.
- Students will develop plant keys for classroom use, quantitatively analyze two riparian and two wetland areas, and develop classroom activities about ecology of those areas. Distance learning class offered by internet connection. This course is designed for secondary school teachers enrolled in the MSSE program and cannot be used in graduate programs in Biological Sciences.

BIOL 520 ANIMAL BIODIVERSITY IN GYE
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: BIOL 303, FWL 301, BIOL 405, or equivalent and (a) 2 years science technology experience or (b) enrolled in MSSE.
- Exploration of biodiversity’s meaning, importance & determinants; key ecological features of the Greater Yellowstone Ecosystem and patterns of change in those features & possible strategies for maintaining biodiversity in the Greater Yellowstone Ecosystem.

BIOL 521 CONSERVATION BIOLOGY
F 3 cr. LEC 3
PREREQUISITE: BIOL 303, BIOL 405 and STAT 216, or equivalents.
- A broad survey of conservative biology, with studies spanning genetics, demography/population dynamics, and community/ecosystem/landscape ecology. Approaches include empirical field studies, mathematical models and conceptual discussion. Includes lab modeling exercises, extensive reading in primary literature, and writing a research paper. Cross-listed with BIOL 447.

BIOL 522 BIRDS OF PREY IN THE GREATER YELLOWSTONE ECOSYSTEM
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: BIOL 303, FWL 301, BIOL 405, or equivalent and 2 years science technology experience or enrolled in MSSE.
- Exploration of the ecology and habitat of avian raptors in the Greater Yellowstone Ecosystem (GYE). Application of the scientific method to the study of raptors. Field identification of raptors, investigation of species life histories, and inquiry methods of species-specific habitat needs. Student will develop methods and skills for classroom based research on wildlife. This course is designed for secondary school teachers enrolled in the MSSE program.
BIOL 523 WILDLIFE ECOLOGY OF THE NORTHERN ROCKY PLAINS
Su 2 cr. LEC 2
PREREQUISITE: BIOL 303, FWL 301, BIOL 405, or equivalent and 2 years science technology experience or enrolled in MSSE.
- Introduction to wildlife species and the range of habitats present in the Northern Rocky Mountain ecosystems. Emphasis on large carnivores and ungulates within montane terrestrial systems.
- Application of the scientific method to study interactions between predators, prey, and human impacts. This course is designed for middle and high school teachers.

BIOL 524 FRONTIERS IN LANDSCAPE ECOLOGY
F alternate years to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 305 or the equivalent.
- Students and instructor will write a scientific paper for publication that synthesizes an important question in landscape ecology. Students will select the topic, review and synthesize current knowledge on the topic, and write a scientific manuscript.

BIOL 525 RESEARCH METHODS AND THE SCIENTIFIC PROCESS
F 3 cr. LEC 2 RCT 1
PREREQUISITE: Graduate standing or consent of instructor.
- Application of the scientific method to answer biological questions and the development of skills needed to prepare research proposals, critique research studies and communicate research findings. For first year graduate students.

BIOL 532 PHYSIOLOGICAL PLANT ECOLOGY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BIOL 303.
- Outlines the plant’s Hutchinsonian niche through review of energy, material (water, nutrients and toxins) and mechanical (including animal) factors. Computer modeling of plant function in the environment is discussed.

BIOL 533 PHYSIOLOGICAL PLANT ECOLOGY LAB
F alternate years, to be offered odd years 1 cr. LAB 1
COREQUISITE: BIOL 532.
- A research project in physiological plant ecology will be chosen, carried out and reported in scientific journal format.

BIOL 534 VEGETATION ECOLOGY
F alternate years, to be offered even years 3 cr. LEC 5
PREREQUISITE: BIOL 303.
- Considers the composition, structure, function, distribution in time and space, ecology and classification of communities. Emphasizes universal methods, current studies and Rocky Mountain systems. Complementary field experience is available in BIOL 406.

BIOL 540 ANALYSIS OF ECOLOGICAL COMMUNITIES
F alternate years, 3 cr. LEC 2 LAB 1
- Multivariate statistical analysis of data from terrestrial or aquatic, plant or animal communities. Classification, ordination, and predictive modeling of species and communities, emphasizing a hands-on approach and practical problem solving in community ecology.

BIOL 542 COMMUNITY ECOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: At least one undergraduate or graduate course in each of the following: ecology (e.g., BIOL 176) and statistics (e.g., STAT 210) or consent of instructor.
- Focus on the origin, maintenance, and consequences of biological diversity within local communities by examining studies of natural patterns, explorations of mathematical models and direct experimentation. The complexities of species interactions are explored in multispecies assemblages.

BIOL 548 CONSERVATION GENETICS
F 3 cr. LEC 3
PREREQUISITE: BIOL 301, STAT 216 and STAT 217.
- Introduction to the application of genetics for the conservation of plant and animal populations. Emphasis will be placed on case studies from the primary literature and analyzing genetic data using mathematical models developed in class.

BIOL 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

BIOL 575 RESEARCH OR PROFESSIONAL PAPER PROJECT
F, S, Su 1 - 4 cr. IND
Graduate standing and Committee approval.
- A research or professional paper or project dealing with a topic in the field. The topic must be mutually agreed upon by the student and his or her major advisor and the graduate committee.

BIOL 576 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

BIOL 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Max 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BIOL 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Courses offered on a one time basis to fulfill professional development needs in service educators. A specific focus is given to each course which is appropriately subtitled.

BIOL 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

BIOL 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

BIOL 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

BREN
Bio-Resources Engineering
Department of Civil Engineering
(406) 994-2111

BREN 432 ADVANCED ENGINEERING HYDROLOGY
S 3 cr. LEC 3
PREREQUISITE: CE 331.
COREQUISITE: CE 332.
- Hydrology emphasizing engineering design. Topics include modern techniques for flow estimation, flood routing and sediment yield; design of conveyance structures; and water project development.

BREN 454 GROUND WATER SUPPLY AND REMEDIATION
S 3 cr. LEC 3
PREREQUISITE: EM 335.
- Contemporary groundwater topics including water supply, contaminant transport, and remediation technologies.

BREN 441 NATURAL TREATMENT SYSTEMS
S 3 cr. LEC 3
PREREQUISITE: CE 340.
- Planning, design, and operation of remediation facilities emphasizing natural versus mechanical elements. Specific topics include stabilization ponds, constructed wetlands, land treatment, and on-site domestic systems.

BREN 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 4 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head.
- Directed research and study on an individual basis.

BREN 490 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BREN 499R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: BREN 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

BREN 499R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.
BREN 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BSI
Big Sky Institute
Big Sky Institute
(406) 994-2374

BSI 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BSI 500 SEMINAR
F, S 1 cr. SEM 1
PREREQUISITE: Graduate status or seniors by petition.
- Presentations and discussion of current research by faculty, students, and guest lecturers on the biological, physical, cultural, economic, and social components of montana ecosystems. Participation required of all graduate students enrolling for multidisciplinary study in the Big Sky Institute.

BSI 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Graduate status or seniors by petition.
- Explores interactions between the natural (i.e., nonhuman) and human processes that drive mountain ecosystems. Weekly lectures present current research on relevant topics. Required of all graduate students enrolling for multidisciplinary study in the Big Sky Institute.

BUS 101US FIRST YEAR SEMINAR
F 3 cr. SEM 5
- Introduction to business concepts, careers, and the culture of professionalism. This freshman seminar introduces students to the principal areas of business including accounting, finance, management, and marketing, while emphasizing ethics, written and oral communication, teamwork, and critical thinking skills.

BUS 201 MANAGERIAL COMMUNICATION
F, S 3 cr. LEC 3
PREREQUISITE: Completion of University Seminar and Writing University Core Requirement.
- Strategies for written, oral, visual, and nonverbal communications in business organizations.

BUS 211 BUSINESS SOFTWARE APPLICATIONS
F, S 3 cr. LEC 3
PREREQUISITE: Placement exam or CAPP 120.
- Focuses on best business practices with word-processing, presentation, spreadsheet, and database software. Emphasis on producing and evaluating effective and efficient information designs with applications in finance, accounting, marketing, and management.

BUS 301 MANAGEMENT AND ORGANIZATION
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing and ECNS 202.
- Design and control of organizations, work groups, individual behavior, interpersonal relations, communication, leadership, organizational structure, decision making, planning, control, staffing, motivation, and international issues.

BUS 302 CAREER PERSPECTIVES
F, S 1 cr. LEC 1
PREREQUISITE: BUS 201. This course is limited to College of Business students.
- This highly interactive course helps students manage their career planning for business-related fields with an emphasis on pro-active career exploration and planning. Topics include self-assessment, researching career information, understanding the job search process, interviewing skills, and professionalism.

BUS 311 INFORMATION SYSTEMS
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing, BUS 211, and ACTG 201.
- A survey of the uses of information in organizational management, with emphasis on strategic systems and systems to support managerial decision making. Students apply concepts in practical application projects using currently available software.

BUS 331 OPERATIONS MANAGEMENT
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing and BUS 211.
- Introduction to the topics and methods of production and operations management. Emphasis is given to critical thinking, business analyses and computer modeling. Application areas include accounting, finance, marketing, and management.

BUS 341 PRINCIPLES OF MARKETING
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing and ECNS 202.
- Marketing management decision-making in the product, price, promotion, and distribution areas. The behavioral, legal, ethical, competitive, technological, and economic environments as they affect decisions in the domestic and international organization.

BUS 351 FINANCE
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing and ECNS 204; and M 170 or STAT 216; and ACTG 201 or ACTG 220.
- Study of the principles of finance with emphasis on the application and integration of financial concepts in decision making.

BUS 361 INTRODUCTION TO LAW
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing.

BUS 474 BUSINESS SENIOR SEMINAR
F, S, Su 4 cr. LEC 1 SEM 3
PREREQUISITE: Senior standing. Formal admission to the College of Business, and completion of BUS 201, BUS 302, BUS 311, BUS 331, BUS 341, BUS 351, and BUS 361. This course is taken the last or next-to-last semester prior to graduation.
- Senior capstone course. Policy, strategy, and ethics will be addressed in this integrative senior capstone course.

CIA
College of Arts and Architecture
College of Arts and Architecture
(406) 994-4405

CIA 290R COLLABORATIVE RESEARCH/CREATIVE ACTIVITY
F, S 1-4 cr. ND May be repeated. Max 8 cr.
COREQUISITE: Freshman or sophomore standing and consent of instructor.
- Intended for lower division undergraduate research and creative projects undertaken in an interdisciplinary team format. The student will work closely with students and faculty colleagues seeking creative project solutions while exploring innovative methods of collaborative problem solving. Course will address responsible conduct of research.

CIA 310IA HISTORY OF FILM MUSIC
F 3 cr. LEC 3
PREREQUISITE: Junior standing or permission of instructor.
- A composer and director trace the development of film music. Key concepts in the development of the film soundtrack will be examined. Various musical styles, as well as technological developments applicable to soundtrack/music production, will be studied.

CIA 490R COLLABORATIVE RESEARCH/CREATIVE ACTIVITY
F, S 1-4 cr. ND May be repeated. Max 8 cr.
COREQUISITE: Junior or higher standing and approval of instructor.
- Intended for upper division undergraduate research and creative projects undertaken in an interdisciplinary team format. The student will work closely with students and faculty colleagues seeking creative project solutions while exploring innovative methods of collaborative problem solving. Course will address responsible conduct of research.

CIA 501 INTRODUCTION TO DIGITAL MEDIA
F cr. STU
- This course provides an introduction to the creation, management and uses of digital media with a focus on publishing web based creative work. Adobe Illustrator and Photoshop in conjunction with Digital Photography will be applied to personalized media environments.
CE
Civil Engineering
Department of Civil Engineering
(406) 994-2111

CE 101 INTRODUCTION TO CIVIL ENGINEERING
F 1 cr. LEC 1
PREREQUISITE: Must be taken within your freshman year.
- This course is optional for students entering civil engineering but is encouraged for freshmen wanting to learn about the breadth of the discipline. Students choosing to take the course will be introduced to civil engineering, including department programs and areas of specialty, civil engineering career options, professionalism, history, and ethics.

CE 201 SURVEYING
F, S alternate years, 3 cr. LEC 2 LAB 1
PREREQUISITE: M 165 or M 171.
- Surveying field practice, error propagation analysis, survey for project design.

CE 202 APPLIED ANALYSIS & TECHNICAL COMMUNICATION
F, S alternate years, 2 cr. LEC 2
PREREQUISITE: M 165 or M 171.
- Computer applications in civil engineering using M-based software and a programming language. Introduction to engineering communication.

CE 220CS CIVIL ENGINEERING & CONSTRUCTION – FROM THE ANCIENT TO THE MODERN
Su On Demand 3 cr. LEC 3
- Through the lenses of civil engineering and construction, follow the advancement of civilizations. Assess and evaluate decisions that we must make as a society with respect to protecting the health of the public and the environment with our finite resources.

CE 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CE 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CE 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

CE 307 CONSTRUCTION ESTIMATING & BIDDING
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 202 and CE 308.
- Preparation of cost estimates and bids for construction projects. Introduction of computer estimating software and procedures.

CE 308 CONSTRUCTION PRACTICE
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: BUS 201 and ME 116.
- Contract documents, insurance, bonding, specifications, drawings, labor and labor law, estimating, bidding and scheduling, business organizations, leadership, and ethics. Significant technical and business writing required.

CE 312 STRUCTURES I
F, S 3 cr. LEC 3
PREREQUISITE: EM 253.
- Study of loading on structures. Study of structural systems and systems modeling. Analysis of determinate and indeterminate structures. Introduction to matrix methods. Introduction to structural analysis software. Introduction to design approaches and philosophies.

CE 315 STRUCTURES II
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 312.
- Structural design of steel and reinforced concrete members used in buildings and bridges. Theory and application of design codes. Laboratory experience utilizing construction materials.

CE 320 GEOTECHNICAL ENGINEERING
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: EM 253.
- The treatment of soil as an engineering material. Fundamental soil mechanics principles and introductory solutions to geotechnical engineering problems. Basic soil mechanics laboratory tests and procedures.

CE 331 ENGINEERING HYDROLOGY
F 2 cr. LEC 2
PREREQUISITE: I & ME 350.
- Descriptive and quantitative hydrology with applications in water resources engineering.

CE 332 ENGINEERING HYDRAULICS
F, S 2 cr. LEC 1 LAB 1
PREREQUISITE: EM 353.
- Pipe flow, open channel flow, and hydraulic machines with applications in water resources engineering.

CE 340 PRINCIPLES OF ENVIRONMENTAL ENGINEERING
F, S 3 cr. LEC 3
PREREQUISITE: CHMY 143.
COREQUISITE: EM 355.
- Fundamentals of environmental engineering with emphasis on water and wastewater.

CE 350 TRANSPORTATION ENGINEERING
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 201.
- Introduction to vehicle operating characteristics, geometric and pavement design, traffic flow theory, signal design and analysis, capacity analysis and planning. Laboratory work will introduce various in-practice software packages.

CE 361 LEGAL PRINCIPLES IN SURVEYING
F alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: CE 201.
- Principles of the profession: case law, legal aspects of boundary location, monumentation, and property descriptions.

CE 362 PUBLIC LAND SURVEY SYSTEM
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 201.
- Federal and state laws and regulations governing land surveying, case studies and professional responsibilities.

CE 363 ADVANCED SURVEYING COMPUTATIONS
S alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 201.
- Modern instrumental and computational techniques in surveying.

CE 401 PROFESSIONAL PRACTICE AND ETHICS
F, S 1 cr. RCT 1
PREREQUISITE: Concurrent registration with CE 457 required.
- Professional ethics, social responsibility, public policy, and leadership.

CE 404 HEAVY CONSTRUCTION EQUIPMENT & METHODS
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: STAT 216, I & ME 325, and CET 302 or CE 320.
COREQUISITE: CE 307.
- Construction equipment operating characteristics, economics, and production rate estimation. Heavy construction methods associated with tunneling, aggregate production, and mass earthwork operations.

CE 405 CONSTRUCTION PROJECT PLANNING & SCHEDULING
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 307.
- Project planning and scheduling procedures involving both network (CPM) and non-network techniques. Introduction to computer scheduling software.

CE 413 REINFORCED CONCRETE DESIGN
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CE 315.
- Design of reinforced concrete members and systems.

CE 414 STEEL DESIGN
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 315.
- Design of structural steel members and systems.

CE 415 DESIGN OF MASONRY STRUCTURES
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CE 315.
- Design of reinforced concrete members and systems.

CE 416 DESIGN OF WOOD AND TIMBER STRUCTURES
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 315.
- Students will be exposed to the basic behavior of wood and timber structures. They will also be exposed to the current building codes and methodology for the design of wood and timber structures.
CE 420 EARTH AND FOUNDATION ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: CE 320.
- Application of soil mechanics principles to the engineering of shallow and deep foundations, analysis of lateral earth pressures and design of retaining walls, and the stability of natural and engineered slopes.

CE 425 GEOTECHNICAL STRUCTURES
F 3 cr. LEC 3
PREREQUISITE: CE 320.
- Analysis of lateral earth pressures and design of retaining structures and braced excavations. Stability analysis of natural and engineered slopes. Analysis and design of embankments and dams.

CE 431 OPEN CHANNEL HYDRAULICS
F 3 cr. LEC 3
PREREQUISITE: CE 332 or consent of the instructor.
- Principles of open channel flow; hydraulic design of open channel structures.

CE 435 CLOSED-CONDUIT HYDRAULICS
S 3 cr. LEC 3
PREREQUISITE: CE 332.
- Advanced topics in hydraulic engineering, with emphasis on analysis and design of pipe transmission lines, pumps, and pipe distribution networks.

CE 450 PUBLIC TRANSIT SYSTEM DESIGN
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 350, and I&ME 350 or STAT 332.
- Design, implementation and management of public transit systems including paratransit, bus and light rail; including an overview of funding sources, legislation, public relations and other issues with coverage or route optimization strategies and demand estimation techniques. CE 450 is co-convened with CE 550. Students enrolled in CE 450 will not be able to take CE 550 and have it count toward degree requirements.

CE 451 HIGHWAY PAVEMENTS
S alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 320, CE 350.
- Design of highway pavements including drainage and base/subbase/subgrade preparation. Laboratory in bituminous materials.

CE 452 TRAFFIC ENGINEERING AND ITS
F alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 350, I&ME 350.
- Application of driver, vehicle, and roadway characteristics to principles of traffic control, operations, and safety. Traditional and advanced technology solutions will be explored.

CE 454 TRANSPORTATION PLANNING
S alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 350, I&ME 350.
- Transportation planning process and travel demand forecasting including trip generation, trip distribution, mode split and traffic assignment. Laboratory work will introduce TransCADtm software.

CE 456 HIGHWAY GEOMETRIC DESIGN
F 3 cr. LEC 3
PREREQUISITE: CE 201, CE 350.
- Advanced geometric design of highway systems including two-lane and interstate roadways and intersection design and traffic control.

CE 457R SENIOR PROJECT I
F S 2 cr. RCT 1 LAB 1
PREREQUISITE: Student must be within two semesters of graduation.
COREQUISITE: I&ME 325, CE 308 and ENGR 310. Concurrent registration with CE 401 is required.
- Senior capstone course. Discussion of the design process from conceptual/preliminary design to final design, plans, and specifications. Development proposal for engineering services, including scope of work, data acquisition, and organization of design team.

CE 458R SENIOR PROJECT II
F S 2 cr. RCT 1 LAB 1
PREREQUISITE: CE 457.
- Senior capstone course. Design of an engineering project. Evaluation of design alternatives and design recommendations. Development of construction documents. Discussion of project management, cost estimates, and engineering services during construction.

CE 465 PHOTOGRAMMETRY
F alternate years, to be offered odd years 2 cr.
LEC 1 LAB 1
PREREQUISITE: M 165 or M 171.
- Measurement and computation techniques for mapping from photographic data, flight planning, ground control, cameras, control extension, stereoscopic instruments.

CE 466 PROJECT DESIGN IN SURVEYING
S alternate years, to be offered odd years 3 cr.
LEC 2 LAB 2
PREREQUISITE: CE 201.
- Surveying requirements of large project; land subdivision, utilities, topography, and earthwork. Term project research and report required.

CE 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 4 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head.
- Directed research and study on an individual basis.

CE 476 INTERNSHIP
On Demand 2 cr. IND
PREREQUISITE: Junior standing, consent of instructor and approval of Department Head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Students may not take this course the semester they graduate.

CE 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CE 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: CE 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CE 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-4 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

CE 500 SEMINAR
F S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics not offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CE 524 CONSTRUCTION PRODUCTIVITY
On Demand 3 cr. LEC 3
PREREQUISITE: One year of experience or one internship (CE 476 or CET 476).
COREQUISITE: CET 408 or equivalent.
- Productivity improvement, data collection, analysis, and solutions to include the construction work face and the office. Human factors and economics involved in productivity will be emphasized.

CE 535 QUALITY ASSURANCE/RISK MANAGEMENT IN CONSTRUCTION
On Demand 3 cr. LEC 3
PREREQUISITE: Either I&ME 350, I&ME 354 or STAT 352 and CE 508 or equivalent plus one year of industrial experience or one internship (CE 476 or CET 476).
- Analysis of quality assurance and control concepts to include utilization of statistical analysis. Application of risk analysis principles to the construction process to minimize liability and project costs.

CE 550 ADVANCED CONSTRUCTION MANAGEMENT
On Demand 3 cr. LEC 3
PREREQUISITE: One year of industrial experience or one internship (CE 476 or CET 476).
COREQUISITE: CET 408 or equivalent.
- Quality improvement techniques to include Total Quality Management and Partnering, Enlightened leadership and management concepts.

CE 551 BUILDING STRUCTURAL SYSTEMS
F alternate years, to be offered even years 2 cr. LEC 2
PREREQUISITE: CE 413 or CE 414 or CE 415 or CE 416.
COREQUISITE: CE 512.
- Analysis of multistory structural systems. Emphasis on lateral force resisting systems in buildings.

CE 552 STRUCTURAL DYNAMICS
F alternate years, to be offered even years 2 cr. LEC 2
PREREQUISITE: CE 312.
- Response of structures to dynamic loads, including seismic loads.

CE 553 BEHAVIOR OF CONCRETE STRUCTURES
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 413.
- Behavior of reinforced concrete members, frames, and shear wall systems. Significance of behavior in design of reinforced concrete structures.
CE 514 BEHAVIOR OF STEEL STRUCTURES
S alternate years, to be offered even years
5 cr. LEC 3
PREREQUISITE: CE 414 and EM 415.
- Behavior of steel members and frames.
  Significance of behavior in design of steel structures.

CE 519 BRIDGE & PRESTRESSED CONCRETE DESIGN
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 515.
- Design of concrete structures utilizing pre- and post-tensioned concrete elements. Introduction to bridge analysis and design.

CE 521 APPLIED GEOTECHNICAL ENGINEERING
F alternate years, to be offered even years 3 cr.
LEC 2 LAB 1
PREREQUISITE: CE 520.
- Principles of advanced geotechnical laboratory testing and field investigative techniques. Application of laboratory and field test results to the geotechnical design of soil-supported structures.

CE 524 ADVANCED SOIL MECHANICS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 520.
- Topics leading to an advanced understanding of the engineering behavior of soils with an emphasis on settlement and shear strength.

CE 529 GROUNDWATER CONTAMINATION
S 3 cr. LEC 3
PREREQUISITE: BREN 434.
- Subsurface mass transport and microbial processes and their affect on fate and transport of organic and inorganic contaminants. Bioremediation and other contemporary remediation technologies will be emphasized.

CE 530 ADVANCED HYDRAULIC INVESTIGATIONS
S alternate years, to be offered even years
3 cr. 3 LEC
PREREQUISITE: CE 431.
- Advanced topics in open channel flow.

CE 550 PUBLIC TRANSIT SYSTEM DESIGN
F alternate years, to be offered odd years 3 cr.
LEC 3
PREREQUISITE: Graduate Standing.
- This course covers the design, implementation and management of public transit systems including paratransit, bus and light rail. The course includes an overview of funding sources, legislation, public relations and other issues. The student will learn several route optimization strategies and demand estimation techniques.

CE 554 TRANSPORTATION SAFETY
S alternate years, to be offered even years
5 cr. LEC 3
PREREQUISITE: CE 350 or consent of instructor.
- This course addresses safety of the highway system as related to design, construction, and operations. The course provides an overview of the various elements of the highway system namely, road users, vehicles, roadways, and environment as related to safety. Apart from the introduction, the course is structured in three distinct components that represent the sequential stages in highway life; i.e. design, construction, and operations.

CE 556 TRAFFIC FLOW FUNDAMENTALS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 350 or consent of instructor.
- This course covers traffic stream parameters, their relationships, and important analytical techniques in traffic engineering such as capacity analysis, queueing analysis, shockwave analysis, and traffic simulation. Topics covered are essential in understanding the behavior of vehicular traffic as a complex system.

CE 570 INDEPENDENT STUDY
On Demand 1 - 9 cr. IND
PREREQUISITE: Consent of instructor, approval of Department Head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

CE 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 8 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

CE 576 INTERNSHIP
On Demand 2 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of Department Head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CE 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CE 589 GRADUATE CONSULTATION
F, S, Su 1-3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

CE 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

CE 680 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

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CET 202 CONSTRUCTION SURVEYING & EARTHWORK
S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 201.
- Advanced construction and route surveys, earthwork mass diagrams, quantity takeoff, computer analysis.

CET 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CET 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CET 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
S, F 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

CET 302 SOILS & FOUNDATIONS
F, S 4 cr. LEC 3 LAB 1
- Physical properties of construction materials with emphasis on soils, aggregates and asphalt. Earth pressures, flow nets, bearing capacity, retaining walls and slope stability.

CET 305 CONCRETE TECHNOLOGY & STRUCTURES
S 3 cr. LEC 2 LAB 1
PREREQUISITE: EM 215.
- Properties of concrete constituents, mechanical and service properties of concrete, mix design, field practices. Concrete reinforcing requirements and analysis of concrete members.

CET 408R CONSTRUCTION PROJECT MANAGEMENT
F, S 5 cr. LEC 2 LAB 1
PREREQUISITE: BUS 361, I & ME 325, and ENGR 510.
COREQUISITE: CE 404 and CE 405; student must be graduating the semester of enrollment in CET 408.
- A senior capstone course encompassing total project control through introduction of a professional construction management organization to ensure cost effectiveness and early completion of a project. Construction safety. A requirement of the course is to take the Constructor Qualification Examination Level 1 (CQE) administered by the American Institute of Constructors (AIC).
COURSE DESCRIPTIONS: CET 412 - CHBE 407

CHBE 100 INTRODUCTION TO CHEMICAL & BIOLOGICAL ENGINEERING
F 2 cr. LEC 1 LAB 1
COREQUISITE: M 151Q or above.
- An introduction to engineering measurements, computations, problem solving, and experimental design. Discussion of the breadth of opportunities in chemical and biological engineering.

CET 412 STRUCTURAL ELEMENTS
S 3 cr. LEC 3
PREREQUISITE: EM 215.
COREQUISITE: CET 305.

CET 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 4 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head.
- Directed research and study on an individual basis.

CET 476 INTERNSHIP
On Demand 1-2 cr. IND
PREREQUISITE: Sophomore standing, consent of instructor, and approval of Department Head.
- An individualized assignment arranged with an instructor, and approval of Department Head.

CHBE 120 CHEMICAL AND BIOLOGICAL ENGINEERING COMPUTATIONS
S 2 cr. LEC 2
COREQUISITE: M 171Q.
- Effective methods for applying the computer to common numerical problems encountered in chemical engineering. Chemical engineering examples will provide a basis for more comprehensive problems encountered in the other professional level courses.

CHBE 259C5 ENERGY & SUSTAINABILITY
F, S 3 cr. LEC 3
- Students from all academic backgrounds explore an array of renewable and non-renewable energy sources and energy conversion systems. Contemporary and contentious energy related issues are presented, and course participants will formulate strategies to address them.

CET 213 MATERIALS SCIENCE
F, S 5 cr. LEC 3
PREREQUISITE: CHMY 121 or CHMY 141.
COREQUISITE: M 165Q OR M 171Q.
- Chemistry and internal structure of solids and the relationship of structure to physical and mechanical properties of metals and nonmetallic solids.

CHBE 215 ELEMENTARY PRINCIPLES I
F 3 cr. LEC 3
PREREQUISITE: CHMY 141 and M 171Q.

CHBE 216 ELEMENTARY PRINCIPLES II
S 3 cr. LEC 3
PREREQUISITE: CHBE 215, M 172Q.
- Energy balances and combined energy-material balances. Discussion of contemporary issues in engineering and the impact of engineering solutions in a global, economic, environmental and societal context.

CHBE 226 PRINCIPLES OF BIOLOGICAL ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: CHBE 215, M 172.
- Fundamentals of energy balances in biological engineering applications.

CHBE 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of the Associate Dean.
- Directed research and study on an individual basis.

CET 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT May be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CHBE 307 CHEMICAL ENGINEERING THERMODYNAMICS I
F 3 cr. LEC 3
PREREQUISITE: CHBE 216, M 273Q.
- Application of the laws of thermodynamics to power, refrigeration and gas liquefaction cycles. An introduction to vapor-liquid phase equilibrium for solutions at low pressure.

CHBE 321 FLUID MECHANICS OPERATIONS
S 3 cr. LEC 5
PREREQUISITE: CHBE 215 and M 172Q.
COREQUISITE: M 273Q.
- Theory and equipment for fundamental chemical and biological engineering operations involving fluid mechanics. Equipment design and computations of operational rates.

CHBE 322 HEAT TRANSFER OPERATIONS
F 3 cr. LEC 3
PREREQUISITE: CHBE 120, CHBE 216, CHBE 321.
COREQUISITE: M 274.
- Theory and equipment for fundamental chemical engineering operations involving heat transfer. Equipment design and computations of operational rates.

CHBE 323 MASS TRANSFER OPERATIONS
S 3 cr. LEC 5
PREREQUISITE: CHBE 307, CHBE 322.
- Theory and equipment for fundamental chemical engineering operations involving mass transfer. Equipment design and computations of operational rates.

CHBE 324 BIOENGINEERING TRANSPORT
F 3 cr. LEC 3
PREREQUISITE: CHBE 226, CHBE 321.
- Fundamentals of the phenomena governing the transport of momentum, energy, and mass in biological systems.

CHBE 326 BIOMATERIALS ENGINEERING
On Demand 3 cr. LEC 3
PREREQUISITE: CHBE 213, CHBE 226, MB 301 or BCHM 540, CHMY 211 or CHMY 321.

CHBE 328 CHEMICAL REACTION ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: CHBE 216, M 274.
- Application of the chemical kinetics of homogeneous and heterogeneous reactions to the design of chemical processing equipment.

CHBE 407 CHEMICAL ENGINEERING THERMODYNAMICS II
F 2 cr. LEC 2 cr.
PREREQUISITE: CHBE 307 and CHBE 325 and CHBE 328.
- Application of laws of thermodynamics to vapor-liquid phase equilibrium, liquid-liquid phase equilibrium, and chemical reaction equilibrium.

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CHBE 517 INTRINSIC PROPERTIES OF MATERIALS
F 3 cr. LEC 3
PREREQUISITE: CHMY 141 and M 273Q.
- The study of the properties and behavior of materials at the atomic level. Focus on the relationships between structure and properties of materials.

CHBE 550R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT May be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CHBE 599R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.
COURSE DESCRIPTIONS: CHBE 411R - CHBE 530

CHBE 411R CHEMICAL & BIOLOGICAL ENGINEERING DESIGN I
F 3 cr. LEC 2 RCT 1
PREREQUISITE: ENGR 310, CHBE 438 and (CHBE 329, CHBE 328, or (CHBE 324, and CHBE 439).
- Senior capstone course. Design and simulation of chemical engineering equipment, processes and plants.

CHBE 412R CHEMICAL & BIOLOGICAL ENGINEERING DESIGN II
S 3 cr. LEC 2 RCT 1
PREREQUISITE: CHBE 411.
- Senior capstone course. Design and economic analysis of chemical engineering equipment, processes and plants.

CHBE 424 TRANSPORT ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: CHBE 323, M 273Q, M 274.
- Deterministic modeling techniques are applied to processes for the transport of momentum, energy and mass. Analytical and numerical solution techniques for the differential equations commonly encountered in the transport processes.

CHBE 438 BIOPROCESS ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: BCHM 340 or MB 501 and CHBE 216.
- Biotechnology process engineering - microbial process fundamentals, enzyme catalysis, bioreactor design and analysis, separation of biomaterials.

CHBE 439 DOWNSTREAM PROCESSING/
BIOENGINEERING SEPARATIONS
S 3 cr. LEC 3
PREREQUISITE: CHBE 324.
COREQUISITE: CHBE 438.
- Theory and quantitative description of separation processes commonly employed in biotechnology and bioengineering. Cell disruption, extraction, crystallization, precipitation, filtration, centrifugation, chromatography, electrophoresis.

CHBE 442 CHEMICAL & BIOLOGICAL
ENGINEERING LABORATORY I
F 2 cr. LEC 1 LAB 1
PREREQUISITE: CHBE 323, CHBE 438, University Seminar and WRIT 101W, I&ME 250.
- Experimental studies of unit operations and transport phenomena. Pilot plant studies. Design of Chemical processes and equipment from experimental studies.

CHBE 443 CHEMICAL & BIOLOGICAL
ENGINEERING LABORATORY II
S 2 cr. LEC 1 LAB 1
PREREQUISITE: CHBE 442.
- Experimental studies of unit operations and transport phenomena. Design of chemical processes and equipment from experimental studies.

CHBE 451 PROCESS DYNAMICS & CONTROL
S 3 cr. LEC 3
PREREQUISITE: CHBE 323, CHBE 328, M 274.
- Transient response analysis of controllers and instruments. Design of chemical process control systems.

CHBE 452 ADVANCED
ENGINEERING MATERIALS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 250 or CHBE 213, M 274.
- Micro and macro properties of electronic materials and material processing.

CHBE 461 BIOENGINEERING LABORATORY I
F 2 cr. LEC 1 LAB 1
PREREQUISITE: CHBE 324, CHBE 438, I&ME 350.
- Students will develop an experimental objective and experimental design to meet a particular objective. Independently investigate the relevant theory for a proposed experiment, analyze data for statistical significance, draw conclusions from the experimental data. They will then effectively communicate the technical information through written reports.

CHBE 462 BIOENGINEERING LABORATORY II
S 2 cr. LEC 1 LAB 1
PREREQUISITE: CHBE 461.
- Students will develop an experimental objective and experimental design to meet a particular objective. Independently investigate the relevant theory for a proposed experiment, analyze data for statistical significance, draw conclusions from the experimental data. They will then effectively communicate the technical information through written reports.

CHBE 465 COMPOSITE MATERIALS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHBE 213.
- Structure and properties of composite materials and design procedures for composite structures. Crosslisted with ME 463.

CHBE 467 INTRODUCTION TO POLYMER ENGINEERING
F 3 cr. LEC 3
PREREQUISITE: CHBE 213, CHBE 215.
- The nature and special characteristics of synthetic high polymers and the technology of their manufacture and processing.

CHBE 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

CHBE 476 INTERNSHIP
On Demand 1 - 12 cr. IND Maximum 12 cr.
PREREQUISITE: junior standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CHBE 480 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHBE 490R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CHBE 490R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY
F, S, Su 1-8 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Senior Standing.
- Directed undergraduate research/creative activity which may culminate in research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

CHBE 498 CO-OP EXPERIENCE
On Demand 1-12 cr. IND
PREREQUISITE: Co-op program participant, junior or senior.
- An individualized cooperative education assignment arranged to provide guided experience in the field.

CHBE 500 SEMINAR
F 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CHBE 503 THERMODYNAMICS
F 3 cr. LEC 3
- Chemical engineering application to phase equilibria and chemical reaction equilibrium. Liquid - liquid, vapor - liquid, and multiple reaction system.

CHBE 506 SEPARATIONS
On Demand 3 cr. LEC 3
PREREQUISITE: CHBE 323.
- Separation topics of interest, including distillation, membranes, specialized separation of low concentration materials.

CHBE 510 REACTION ENGINEERING & REACTION MODELING
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHBE 328.
- Theory and practice of industrial reactions, kinetics, synthesis, modeling of fixed and fluidized beds, process design problems.

CHBE 511 CATALYSIS AND
APPLIED SURFACE CHEMISTRY
On Demand 3 cr. LEC 3
PREREQUISITE: CHBE 328.
- The fundamental principles of catalysis, surface chemistry, and reactor design at a working research level.

CHBE 519 SURFACE ENGINEERING
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: Graduate standing.
- Consideration of chemistry and instrumentation needed in engineering design and research, including surface science, and materials.

CHBE 522 ADVANCED ENGINEERING ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: One of the following: ME 430, ME 326, EM 335.

CHBE 525 NUMERICAL SOLUTIONS
TO ENGINEERING PROBLEMS
S 3 cr. LEC 3
PREREQUISITE: ME 510.
- Numerical methods used to solve common chemical engineering research problems. Solutions to nonlinear equations. Optimization methods. Crosslisted with ME 541-01.

CHBE 530 TRANSPORT PHENOMENA
S 3 cr. LEC 3
PREREQUISITE: CHBE 424.
- Comprehensive treatment of mass, momentum, and energy transport. Cross listed with ME 553.
COURSE DESCRIPTIONS: CHBE 533 - CHMY 292

CHBE 533 VISCOS FLUID DYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: EM 355.
- Advanced fluid dynamics of viscous materials.
- Historical and theoretical development.
- Newtonian, non-Newtonian and turbulent flows.

CHBE 542 THEORY OF MAGNETIC RESONANCE IMAGING II
F S 3 cr. LEC 3
PREREQUISITE: Graduate standing. Consent of Instructor.
- Advanced topics in nuclear magnetic resonance phenomena focusing on molecular dynamics and pulse sequence development for measuring complex dynamics will be covered.

CHBE 550 FAILURE OF MATERIALS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: One of the following: CHBE 463, EM 415, ME 450.
- Concepts of brittle and ductile fracture, fatigue, creep-rupture and environmentally assisted fracture.
- Applications to metals, polymers, ceramics and composite materials. This course is cross-listed with ME 550.

CHBE 551 ADVANCED COMPOSITE MATERIALS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHBE 463.
- Advanced treatment of composite materials, including constituent properties, interfaces, micro-mechanics, microscopic behavior, modes and mechanisms of failure. This course is cross-listed with ME 551.

CHBE 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

CHMY 102CS APPLYING CHEMISTRY TO SOCIETY
S 3 cr. LEC 3
- An introduction to contemporary chemistry in the contextual framework of current issues including the effect of human impact on the air, water, and earth. This course will examine the scientific basis for current scientific and societal issues such as depletion of the ozone layer, water pollution, acid rain, genetic engineering and nuclear fusion among other issues. Topics will be addressed from a scientific viewpoint to develop knowledge and understanding of the chemical concepts that underlie these contemporary issues. The goal is to inform non-science majors of chemical and scientific issues in order to help them to become well-informed, inquiring citizens.

CHMY 121IN INTRO TO GENERAL CHEMISTRY
F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: High school algebra.
- Introductory general chemistry. Measurement systems, atomic structure, chemical periodicity, bonding, chemical reactions, acid-base chemistry, electrochemistry, nuclear chemistry.

CHMY 123 INTR TO ORGANIC & BIOCHEMISTRY PRINCIPLES
F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: CHMY 121, CHMY 141, or equivalent.
- An introduction into functional group organic chemistry and important biochemical structures, concepts, and processes. The laboratory is closely integrated with lecture coverage.

CHMY 141 COLLEGE CHEMISTRY I
F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: One year of high school chemistry. Two years of high school math including algebra, or math test score to be eligible for college calculus.
- The first of a two-semester course sequence about the general principles of modern chemistry with emphasis on atomic structure, chemical bonding, the periodic table, equilibrium, chemical reactivity, and kinetics.

CHMY 145 COLLEGE CHEMISTRY II
F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: CHMY 141 or CHMY 151.
- The second semester of the two-semester general chemistry sequence.

CHMY 151 HONORS COLLEGE CHEMISTRY I
F 4 cr. LEC 3 LAB 1
PREREQUISITE: High school chemistry and physics, high school algebra, and some additional mathematics.
- Topic coverage parallels CHMY 141, with emphasis on critical and analytical thought and with a greater reliance on math skills. For departmental honors program.

CHMY 153 HONORS COLLEGE CHEMISTRY II
S 4 cr. LEC 3 LAB 1
PREREQUISITE: A grade better than a "C" in CHMY 141 or CHMY 151.
- Topic coverage parallels CHMY 143, with emphasis on critical and analytical thought and with a greater reliance on math skills. For departmental honors program.

CHMY 194 SEMINAR, WORKSHOP
F 1 cr. SEM 1
- For the new student. Integration into the department and its research and educational program. Scientific communication and chemical literature searching skills.

CHMY 211 ELEMENTS OF ORGANIC CHEMISTRY
F S 5 cr. LEC 4 LAB 1
PREREQUISITE: One of the following: CHMY 121, CHMY 143, or CHMY 153.
- A one-semester introduction to organic chemistry. The unique character of carbon: bonding, structure, nomenclature, and common reactions of hydrocarbons and functional organic compounds.

CHMY 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F S 1-6 cr.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

CHMY 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required, but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHMY 292 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.
CHMY 294 SEMINAR/WORKSHOP
S cr. SEM 1
PREREQUISITE: CHMY 194 or BCHM 100.
- Introduction to faculty research through faculty mini seminars. Departmental research facilities, research groups. Research planning decisions (MSU laboratory, summer internship, student exchange, REU, USP, etc).

CHMY 311 FUNDAMENTAL ANALYTICAL CHEMISTRY
S cr. LEC 3 LAB 1
PREREQUISITE: CHMY 143 or CHMY 153.
- Introduction to wet analytical chemistry with an emphasis on the systematic treatment of equilibria, acid-base chemistry, redox equilibria and titrations, complexometric equilibria and titrations, Beer's law, fundamental lab skills and chromatography.

CHMY 321 ORGANIC CHEMISTRY I
F, Su cr. LEC 3 LAB 1
PREREQUISITE: CHMY 145 or CHMY 153.
- The first of a two-semester professional sequence in organic chemistry. In-depth coverage of stereochemistry, synthetic organic chemistry, physical organic chemistry, spectroscopy, and nomenclature. Students should register for both semesters.

CHMY 323 ORGANIC CHEMISTRY II
S, Su cr. LEC 3 LAB 1
PREREQUISITE: CHMY 321.
- The second semester of the two-semester professional sequence in organic chemistry.

CHMY 331 HONORS ORGANIC CHEMISTRY I
F cr. LEC 3 LAB 1
PREREQUISITE: CHMY 151 and CHMY 153 or consent of instructor.
- CHMY 331 is the first of a two-semester honors sequence in organic chemistry. Topic coverage parallels CHMY 321, but at an accelerated pace with in-depth coverage of physical organic chemistry, stereochemistry, synthetic organic chemistry, spectroscopy, and nomenclature.

CHMY 333 HONORS ORGANIC CHEMISTRY II
S cr. LEC 3 LAB 1
PREREQUISITE: A grade of better than a “C” in CHMY 331.
- CHMY 333 is the second semester of the two-semester honors sequence in organic chemistry. Topic coverage parallels CHMY 323, with more in-depth coverage of mechanisms and more emphasis on retrosynthetic analysis and on solving multi step synthesis problems.

CHMY 361 ELEMENTS OF PHYSICAL CHEMISTRY
F cr. LEC 4
PREREQUISITE: M 170, PHYS 206, and CHMY 211 or CHMY 212.
- A physical chemistry course directed toward the life sciences, health professions, and agricultural sciences.

CHMY 362 ELEMENTS OF PHYSICAL CHEMISTRY LABORATORY
F cr. LAB 1
PREREQUISITE: or COREQUISITE: CHMY 361.
- The laboratory to accompany CHMY 361.

CHMY 371 PHYSICAL CHEMISTRY QUANTUM CHEMISTRY AND SPECTROSCOPY I
F cr. LEC 3
PREREQUISITE: CHMY 143 or CHMY 153, PHYS 206, M 172.
- COREQUISITE: M 275.
- The first semester of a two-course sequence for science and engineering majors on quantum chemistry, statistical thermodynamics, spectroscopy, classical thermodynamics and kinetics.

CHMY 372 PHYSICAL CHEMISTRY LABORATORY I
F cr. LAB 1
PREREQUISITE: or COREQUISITE: CHMY 371 or CHMY 373.
- Laboratory to accompany CHMY 371 or 373. Fundamental experiments in thermodynamics and kinetics.

CHMY 373 PHYSICAL CHEMISTRY KINETICS AND THERMODYNAMICS
S cr. LEC 3
PREREQUISITE: CHMY 371.
- The second semester of a two-course physical chemistry sequence for science/engineering majors. Students should take both semesters of the sequence.

CHMY 374 PHYSICAL CHEMISTRY KINETICS
F cr. LAB 1
PREREQUISITE: CHMY 372.
- COREQUISITE: CHMY 323.
- The advanced laboratory to accompany CHMY 373. In-depth experiments and data analysis. Required of all chemistry majors who take CHMY 373.

CHMY 394 SEMINAR/WORKSHOP II
S, Su cr. LEC 3
PREREQUISITE: CHMY 394.
- Seminar and workshop II.
- Seminar report and presentation skills.
- Career planning and resume preparation.

CHMY 417 SYNTHETIC CHEMISTRY
F, S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHMY 323.
- Organic and inorganic reaction chemistry for advanced students. Modern reagents and transformations are treated in detail, along with relevant theoretical and mechanistic considerations.

CHMY 421 ADVANCED INSTRUMENT ANALYSIS
F cr. LEC 3
PREREQUISITE: CHMY 321.
- COREQUISITE: CHMY 361 or CHMY 373.
- An advanced analytical chemistry course which covers modern instrumental methods based on spectrochemical and electrochemical principles.

CHMY 422 ADVANCED INSTRUMENT ANALYSIS LABORATORY
F cr. LAB 2
COREQUISITE: CHMY 421.
- The laboratory to accompany CHMY 421.

CHMY 490 UNDERGRADUATE RESEARCH
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

CHMY 491 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHMY 492 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

CHMY 494 SEMINAR/WORKSHOP
S cr. SEM 1
PREREQUISITE: or COREQUISITE: CHMY 394 or BCHM 300.
- Senior capstone course. Taught in collaboration with departmental Honors Thesis, CHMY 499. The chemistry/biochemistry research undergraduate experience constitutes a synthesis of our (bio)chemistry class room and laboratory education. The projects are orally presented in seminar form, discussed on the basis of acquired knowledge, and analyzed using stringent scientific methods and criteria. A complete personal resume is prepared. May be repeated once.

CHMY 499 SENIOR THESIS/CAPSTONE
S cr. LEC 1
PREREQUISITE: CHMY 490 or BCHM 490 (minimum of 3 cr.
- Thesis format and style will be illustrated, discussed, and monitored. Draft portions of manuscripts are to be completed on a regular schedule. Required of all candidates for departmental honors.

CHMY 500 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CHMY 505 CRITICAL CONCEPTS IN CHEMISTRY
Su cr. LEC 2 LAB 1
PREREQUISITE: CHMY 121 or equivalent.
- Course explores new learning strategies that encourage discovery-based learning. Class will explore ways to use computer technology to engage students in discovery-based learning.
CHMY 506 INTEGRATING COMPUTERS INTO LABORATORY INSTRUCTION
Su 3 cr. LEC 2 LAB 1
PREREQUISITE: Secondary teacher certification and 2 years teaching experience. One year introductory chemistry course (CHMY 142 and 143) and coursework or experience equivalent to one semester physical chemistry (CHMY 361). A baccalaureate degree and experience teaching science at the secondary level are required.

- The course will examine and discuss fundamental and critical concepts in chemistry. A practical laboratory component will enable students to develop laboratory and/or demonstration projects for each concept. Individual students-generated presentations are a key course component.

CHMY 507 MODERN ORGANIC AND BIOCHEMISTRY
S 3 cr. RCT 3
PREREQUISITE: Secondary teaching certification and 2 years teaching experience. One year introductory chemistry course (CHMY 141,144) and coursework or experience equivalent to one semester physical chemistry (CHMY 361). A baccalaureate degree and experience teaching science at the secondary level are required.

- The course will examine/discuss fundamental information and concepts in organic chemistry and biochemistry. A module based on drug development will exemplify major topics. Information acquired via the internet will be a significant course component. (A distance learning course)

CHMY 515 STRUCTURE AND BONDING IN INORGANIC CHEMISTRY
F 3 cr. LEC 3
PREREQUISITE: CHMY 401.
- Spectroscopy, structure, and bonding of coordination and organometallic compounds.

CHMY 516 MECHANISMS AND DYNAMICS IN INORGANIC CHEMISTRY
S 3 cr. LEC 3
PREREQUISITE: CHMY 401.
- Mechanisms and dynamics of the reactions of coordination and organometallic compounds.

CHMY 523 ORGANIC REACTION MECHANISMS
F 3 cr. LEC 3
PREREQUISITE: CHMY 325.
- Corequisite: CHMY 533.
- A problem solving course concentrating on analyzing organic reactions and transformations via electron-pushing mechanisms. Problems chosen will be from the current chemical literature. Designed for incoming graduate students and upper-class undergraduates who want to learn or brush up on their electron-pushing skills.

CHMY 524 MASS SPECTROMETRY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHMY 571 or CHMY 361.

CHMY 525 CHEMICAL REACTIONS AND TRANSFER IN ANALYTICAL METHODS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHMY 575.
- Treatment of complex chemical equilibria, kinetics, and mass transport in the solution and gas phases with respect to their effects on methods of chemical analysis.

CHMY 526 ADVANCED PROTEIN NMR SPECTROSCOPY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHMY 571.
- This lecture-based course is designed to teach the fundamental principles of nuclear magnetic resonance (NMR) spectroscopy as it applies to the structural elucidations of proteins in solution. Prerequisites include familiarity with linear algebra and basic trigonometric functions and CHMY 325. Cross-referenced with BCHM 526.

CHMY 527 OPTICAL SPECTROSCOPY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHMY 571.
- Use of optical spectroscopic methods for chemical analysis.

CHMY 533 PHYSICAL ORGANIC CHEMISTRY
F 3 cr. LEC 3
PREREQUISITE: CHMY 417.
- A semi-quantitative description of the mechanisms of organic reactions. Topics include M.O. theory, orbital symmetry, addition and elimination reactions, the kinetics and thermodynamics of organic reactions, solvents effects, etc.

CHMY 535 REAGENT CHEMISTRY
S 3 cr. LEC 3
PREREQUISITE: CHMY 417.
- A thorough study of synthetic processes, methodologies and reagents.

CHMY 540 ORGANIC SYNTHESIS
F 3 cr. LEC 3
PREREQUISITE: CHMY 533 and CHMY 555.
- A thorough study of strategies for the synthesis of complex natural products.

CHMY 551 ORGANIC STRUCTURE ELUCIDATION
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHMY 417.
- Spectroscopic structure elucidation of small organic molecules. Techniques to be discussed include 1-D and 2-D NMR spectroscopy, UV, IR, MS, and Raman spectroscopies. Emphasis will be on interpreting spectra to deduce the structure of the compound in question.

CHMY 554 ORGANOMETALLIC CHEMISTRY
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHMY 521, CHMY 325 and CHMY 555.
- Application of organometallic chemistry to organoic transformations.

CHMY 557 QUANTUM MECHANICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHMY 575 or equivalent.
- Applications of quantum mechanics to molecules and spin systems.

CHMY 558 CLASSICAL & STATISTICAL THERMODYNAMICS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHMY 575 or equivalent.
- Classical & statistical thermodynamics applied to chemical systems.

CHMY 559 KINETICS AND DYNAMICS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHMY 373 or equivalent.
- Chemical kinetics, theories of reaction rates, molecular reaction dynamics, with applications to Chemical reactions in the gas phase, on surfaces, and in solution.

CHMY 560 SYMMETRY, ORBITALS AND SPECTROSCOPY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHMY 575.
- Group theory with applications, semi-empirical and ab initio calculations, vibrational and electronic spectroscopy, and their interrelationship will be covered.

CHMY 564 ADVANCED QUANTUM CHEMISTRY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHMY 557 or equivalent.
- Time independent and time dependent quantum mechanics with application to chemical bonding and molecular spectroscopy.

CHMY 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

CHMY 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHMY 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; Maximum 3 cr.
PREREQUISITE: Graduate standing; teaching experience and/or current employment in a school or organization; and consent of instructor and Dean of Graduate Studies.
- Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

CHMY 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

CHMY 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

CHMY 689 GRADUATE RESEARCH/Creative Activity Instruction
F, S, Su 1 - 3 cr. RCT
PREREQUISITE: Graduate standing.
COREQUISITE: CHMY 590 or CHMY 690.
- Classroom instruction associated with directed graduate research/creative activity projects.

CHMY 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.
CHIN

Modern Languages, Chinese
Department of
Modern Languages & Literatures
(406) 994-4448

CHIN 101 ELEMENTARY CHINESE I
F 4 cr. RCT 4
– Elementary course designed to help students acquire basic language skills in Mandarin: reading, writing, listening, speaking. Introduction to Chinese writing systems. Emphasis on establishing correct pronunciation and grasp of grammar. Cultural perspectives such as greetings, simple dialogues re introduced.

CHIN 102D ELEMENTARY CHINESE II
S 4 cr. RCT 4
PREREQUISITE: CHIN 101 or equivalent, or placement interview with instructor.
– Continuation of CHIN 101. Builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues.

CHIN 120 HISTORY, CULTURE AND SOCIETY IN CHINESE FILMS
F 3 cr. LEC 3
– This course is intended to present students with a clear picture of contemporary Chinese society in transition, as reflected in the cinematic works of the fifth-generation and sixth-generation Chinese directors.

CHIN 130D HISTORICAL AND LITERARY JOURNEY INTO MODERN CHINA
F 3 cr. LEC 3
– The focus of this course will be on twentieth-century Chinese short stories and novellas in English translation. We will look at modern Chinese literature in its historical setting as well as from the point of view of literary critical theory.

CLS

College of Letters and Science
College of Letters and Science
(406) 994-4288

CLS 101US KNOWLEDGE AND COMMUNITY
F S 3 cr. SEM 5
PREREQUISITE: First-year students (less than 30 credits) only.
– Small seminar-style classes. Introduction to university study and the excitement of intellectual inquiry. Participation in a community of learners. Readings in the humanities, social sciences, and natural sciences. Emphasis on critical thinking, effective communication, and active learning.

CLS 201US KNOWLEDGE AND COMMUNITY
F S 3 cr. SEM 5
– CLS 201 is similar to CLS 101 but is designed for students beyond their freshman year. CLS 201 is open to students who have completed at least 30 credits; students will not receive credit if they have passed CLS 101 with a grade of C- or better. Small seminar-style classes.

CLS 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S 1-3 cr. RCT may be repeated
– Classroom instruction associated with directed undergraduate research/creative activity projects.

COM

Communications
University Studies
(406) 994-3532

COM 110US INTRODUCTION TO PUBLIC COMMUNICATION
F S 5 cr. LEC 1 RCT 2
– Overview of the theories, concepts, and principles of public speaking, to include audience analysis, evidence, intercultural communication, small group communication and media communication. Application of those concepts and principles through preparation and delivery of ceremonial, informative, persuasive, and group presentations.

CS

Computer Science
Department of Computer Science
(406) 994-4780

CAPP 120 INTRODUCTION TO COMPUTERS (Formerly CS 150)
F S 3 cr. LEC 2 LAB 1
– Computer hardware and software concepts as they apply to all computers. Exposure to software packages such as Windows, word processors, spreadsheets, and Internet applications. Laboratory projects reflect practical usage in resolving real world problems/situations.

CS 140CS SPINNING WEBS
S 3 cr. LEC 5
– The World Wide Web. What it is. How it works. Where it’s headed. Societal implications. Examination of currently popular Web ventures, such as Google, Facebook, YouTube, Twitter, and Drupal. Construction of individual Web portfolios and a hosted website. Prepares students from all majors to participate in Web ventures and to become Web-informed citizens. No previous Web or programming experience required.

CS 145RA WEB DESIGN
F S 3 cr. LEC 2 LAB 1
– Basic design principles and how these principles apply to web site construction. HTML, HTML editors and Cascading Style Sheets. Laboratory projects reflect practical usage of course concepts. Cross-listed with ART 145.

CS 150RA WEB DESIGN
F S 4 cr. LEC 3 LAB 1
/corequisite: M 151.
– Introduction to programming: program design, analysis, and implementation in Java, including I/O, assignment, decision, iteration, scalar types, arrays, control structures, methods, classes, and common data types; and Linux fundamentals. No previous programming experience required.

CS 201 PROGRAM DESIGN WITH C
S 3 cr. LEC 2 LAB 1
PREREQUISITE: CS 160 or EE 371.
– C Programming Knowledge. Introduces imperative programming and the C standard library. Course covers pointers, memory management and structures.
CS 204 MULTIMEDIA
DEVELOPMENT METHODS
S odd years 3 cr. LEC 2 LAB 1
– The design and development of multimedia presentations using computerized studio techniques. Methods for combining video, audio, photography, studio techniques, and computer-generated art forms. Computer-assisted studio control and editing. Project-oriented course organization with interdisciplinary project teams.

CS 215CS SOCIAL & ETHICAL ISSUES IN COMPUTING
F 3 cr. LEC 2 RCT 1
PREREQUISITE: W core and US core.
– Social and ethical issues as they relate to computing, including privacy, risks, computer abuse, commerce, professionalism, free speech, intellectual property, social justice, and current issues. History of computing.

CS 221 ADVANCED PROGRAMMING
F, S 3 cr. LEC 3 LAB 1
PREREQUISITE: CS 160 and M 151.
– An examination of advanced Java and basic data structures and their application in problem solving. Data structures include stacks, queues and lists. An introduction to algorithms employing the data structures to solve various problems including searching and sorting, and recursion. Understanding and using Java class libraries. The laboratory uses Java. Introduces Big-O Notation.

CS 222 DISCRETE MATHEMATICS
F 3 cr. LEC 3
PREREQUISITE: CS 160.
COREQUISITE: M 171.
– This course covers logic, discrete probability, recurrence relations, Boolean algebra, sets, relations, counting, functions, maps, Big-O notation, proof techniques including induction, and proof by contradiction.

CS 223 DATA STRUCTURES AND ALGORITHMS
S 4 cr. LEC 3 LAB 1
PREREQUISITE: CS 221.
– Advanced data structures and programming techniques and their application. Topics include: trees, balanced trees, graphs, dictionaries, hash tables, heaps. Examines the efficiency and correctness of algorithms. The laboratory uses Java.

CS 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. END
PREREQUISITE: Consent of instructor and approval of department head.
– Directed research and study on an individual basis.

CS 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: To be determined based on actual topic offered.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CS 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
– Classroom instruction associated with directed undergraduate research/creative activity projects.

CS 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. END may be repeated
– Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

CS 309 SYSTEMS ADMINISTRATION
S 3 cr. LEC 3
PREREQUISITE: CS 201 and CS 223.
– The administration and management of Linux computer systems. Includes installation, user process management, configuration of services and device handling. A thorough knowledge of Linux/Unix command structure is required.

CS 324 DESIGN AND ANALYSIS OF ALGORITHMS
F 3 cr. LEC 3
PREREQUISITE: CS 222 and CS 223.
– A rigorous examination of advanced algorithms and data structures. Topics include: average case analysis, probabilistic algorithms, advanced graph problems and theory, distributed and parallel programming.

CS 330 COMPUTER ORGANIZATION AND ARCHITECTURE
F 4 cr. LEC 3 LAB 1
PREREQUISITE: CS 221.
– The structure and function of computer systems: CPU, memory, I/O. Includes digital logic, instruction set design, pipelining, RISC, parallel processing, and assembly language programming.

CS 350 THEORY OF COMPUTATION
S 3 cr. LEC 3
PREREQUISITE: CS 222.
COREQUISITE: M 172.
– Formal languages, theory, automata, Turing Machines, computability, the Church-Turing thesis, computational complexity, and NP-completeness.

CS 351 SOFTWARE ENGINEERING I
F 3 cr. LEC 3
PREREQUISITE: CS 223 and WRIT 221.
– Software lifecycles, Unified Modeling Language, design patterns, software engineering standards, requirements analysis, development issues, efficiency tools, verification and validation, configuration management, testing and maintenance.

CS 355 CONCEPTS OF PROGRAMMING LANGUAGES
S 3 cr. LEC 3
PREREQUISITE: CS 221 and CS 222.
– An examination of several programming paradigms, and languages, as well as their application and underlying execution model. Paradigms examined include imperative, object-oriented, functional, logic and string based. Students will gain exposure to a variety of languages such as C, C++, Scheme, Prolog and Perl.

CS 392 NUMERICAL COMPUTATION FOR SCIENTISTS AND ENGINEERS
S 3 cr. LEC 3
PREREQUISITE: M 172. Basic computer literacy is assumed.
– Numerical methods to solve problems in science and engineering using MATLAB. Number systems and error analysis, finding roots, solving linear systems, curve fitting, integration and differentiation, solving ordinary differential equations.

CS 400 SEMINAR
On Demand 1 cr SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined by each offering.
– Topics offered at the upper divisional level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

CS 418 OPERATING SYSTEMS
F 3 cr. LEC 3
PREREQUISITE: CS 223 and CS 330 or EE 371.
– Operating systems design including necessary hardware support. Processes, threads, concurrent programming, and scheduling. Memory, file, and I/O management. Security issues.

CS 422 INTRODUCTION TO SIMULATION
F 3 cr. LEC 5
PREREQUISITE: CS 201 and a probability or statistics course.
– Discrete and continuous simulation modeling methodology using a computer simulation language; random number generation, output analysis, validation, and verification; application to varied system design and analysis problems. Cross-listed with I&ME 422.

CS 425 COMPUTER GRAPHICS
S odd years 3 cr. LEC 5
PREREQUISITE: M 221 and CS 223.

CS 430 IMAGE PROCESSING
F even years 3 cr. LEC 3
PREREQUISITE: CS 223.
– Image processing techniques are used to quantify and manipulate visual information in diverse applications such as satellite imagery, robotic vision, and animation. Topics include enhancement, representation, restoration, segmentation, and digitization techniques.

CS 432 COMPUTATIONAL BIOLOGY
F odd years 3 cr. LEC 3
PREREQUISITE: CS 222.
– This course surveys classic and recent problems from computational biology. Topics covered include algorithms for genomic sequencing and searching, protein structure prediction, and regulatory network discovery.

CS 435 DATABASE SYSTEMS
F 3 cr. LEC 5
PREREQUISITE: CS 223.
– DBMS architecture; major database models; relational algebra fundamentals; SQL, query language; index file structures, data modeling and management, entity relationship diagrams.

CS 436 ARTIFICIAL INTELLIGENCE
F 3 cr. LEC 5
PREREQUISITE: CS 223.
– The fundamental bases of artificial intelligence: knowledge representation, search, and learning. Applications include game playing, neural networks, and expert systems.
CS 440 COMPUTER NETWORKS
F 4 cr. LEC 3 LAB 1
PREREQUISITE: CS 223 and CS 390 or EE 371.
- How computer systems are organized into networks and how communication over networks is organized. Communication protocols and their design with an emphasis on current technology and implementation of software.

CS 445 EMBEDDED SYSTEMS
S even years 3 cr LEC 3.
PREREQUISITE: CS 225 and CS 330 or EE 371.
- The basic tools and techniques of embedded systems using robotics as a platform. Student teams will build an autonomous mobile robot, and learn to program it to perform increasingly sophisticated behaviors. Besides providing an introduction to autonomous mobile robot technologies, the students also learn key concepts of mechanics, electronics, programming techniques, and systems design and integration.

CS 450 COMPILERS
S 4 cr. LEC 3 LAB 1
COREQUISITE: CS 350 and CS 355.
- Senior capstone course. Compiler design and construction. Scanning, parsing, symbol tables, semantic analysis, intermediate representations, run-time memory management, target code generation, and optimization. Implementation of a small compiler.

CS 451 SOFTWARE ENGINEERING II
S 3 cr. LEC 3
PREREQUISITE: CS 351.
- Functional specification, formal methods, cost models, project management, software management, risk analysis, fault tolerance, metrics, reverse engineering, safety critical software engineering, real-time systems.

CS 455 COMPUTER SECURITY
S 3 cr. LEC 3
PREREQUISITE: CS 225.
- Introductory to computer security. Covers security issues in software design and development from technical, social and legal viewpoints. Topics include cryptography, security models, software security, authentication, authorization, and system security.

CS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

CS 474 UNDERGRADUATE CONSULTATION
F, S 1 cr. IND
PREREQUISITE: Junior standing and CS 223.
- Directed assistance to, and involvement in labs, with lower division CS students. Can only complete once.

CS 476 INTERNSHIP
On Demand 1 - 6 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: To be determined based on actual topic offered.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
On Demand 1 cr. RCT May be repeated. Max 4 cr.
PREREQUISITE: Senior standing. Consent of instructor.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
On Demand 14 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Consent of instructor.
COREQUISITE: CS 489.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

CS 499 COMPUTER SCIENCE PROGRAM ASSESSMENT
F, S 0 cr. IND 0
PREREQUISITE: Graduating Senior.
- Student participation in Computer Science program assessment activities such as taking the Computer Science Major Field Test.

CS 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CS 510 COMPUTABILITY
F 3 cr. LEC 3
PREREQUISITE: CS 350.
- Turing machine computability and decidability; abstract time and space complexity; intractability.

CS 513 COMPUTATIONAL RESEARCH TOPICS
S odd years 3 cr. LEC 3 Maximum 9 cr.
PREREQUISITE: To be determined based on actual topic offered.
- Focus on a current research topic such as structured probabilistic models and explore the topic using a project-oriented format.

CS 515 ALGORITHMS
S 3 cr. LEC 3
PREREQUISITE: CS 223.
- Concrete time and space complexity; combinatorial algorithms; greedy algorithms; dynamic programming; probabilistic and randomized algorithms; branch-and-bound algorithms.

CS 518 ADVANCED OPERATING SYSTEMS & SYSTEMS PROGRAMMING RESEARCH
F even years 3 cr. LEC 3
PREREQUISITE: CS 418.
- Contemporary topics in systems programming and operating system design and research.

CS 525 GRAPHICS & SCIENTIFIC VISUALIZATION
S odd years 3 cr. LEC 3
PREREQUISITE: CS 425.

CS 530 DATA MINING
F even years 3 cr. LEC 3
PREREQUISITE: A probability or statistics course.
- Clustering, classification and pattern recognition; performing automated discovery of knowledge from a data set.

CS 535 ADVANCED DATABASE SYSTEMS
F odd years 3 cr. LEC 3
PREREQUISITE: CS 435 or consent of instructor.
- Advanced database models including spatial, temporal, and object-oriented; advanced data indexing techniques, data warehousing and query optimization.

CS 536 ADVANCED ARTIFICIAL INTELLIGENCE
S even years 3 cr. LEC 3
PREREQUISITE: CS 456.
- An exposure to advanced topics from the field of artificial intelligence. Example topics include machine learning, evolutionary computation, natural language processing, and cognitive science.

CS 540 DISTRIBUTED COMPUTING
S even years 3 cr. LEC 3
PREREQUISITE: CS 324 and CS 440.
- The design and implementation of software systems that utilize multiple host computer networks as a foundation. Concurrency control, homogenous and heterogeneous systems, interprocess communication, protocols and application design.

CS 541 ADVANCED NETWORKING
S odd years 3 cr. LEC 3
PREREQUISITE: CS 440.
- This graduate-level course covers advanced topics in networking, with emphasis on IP and wireless networks. After taking this course, the students are expected to know the state-of-the-art in networking algorithms, protocols and architectures, and to understand how networking research is done.

CS 550 DESIGN & TRANSLATION OF PROGRAMMING LANGUAGES
F odd years 3 cr. LEC 3
PREREQUISITE: CS 450.
- Contemporary topics in programming language design, advanced compiler design and research.

CS 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

CS 575 MASTER'S PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

CS 576 INTERNSHIP
On Demand 1 - 6 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CS 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

COURSE DESCRIPTIONS: CS 440 - CS 580
CS 589 GRADUATE CONSULTATION
On Demand 1-3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
– This course may be used only by students who have completed all of their course work, and thesis, if on a thesis plan but who need additional faculty or staff time or help.

CS 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

CS 690 DOCTORAL THESIS
F, S 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

DGED
Department Of Graduate Education
Department Of Graduate Education
(406) 994-1145

DGED 501 GTA DEVELOPMENT
F, S 1 cr. SEM 1
PREREQUISITE: Current Graduate Teaching Assistant Program.
– The purpose of this course is to provide MSU’s graduate teaching assistants (GTA) with an opportunity for ongoing, interdepartmental training throughout the semester as they teach their assigned course(s). The class will meet three times a semester in a seminar style fashion. Most of the requirements will be met through independent reflective writings by the GTA.

DGED 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Max 12 cr
PREREQUISITE: Upper division courses and others as determined for each offering.
– Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

DGED 610 GEOBIOLOGICAL SYSTEMS: TEXTS AND CRITICS: KNOWLEDGE
F 3 cr. LEC 2 RCT 1
PREREQUISITE: Acceptance into a Ph.D. program.
– This course represents the first of a two-course sequence for Ph.D. students participating in the Geobiological Systems Science IGERT program. The course will provide an introduction to systems biology and explore the components necessary for understanding, formulating and developing models that represent key processes in complex microbial communities.

DGED 611 IGERT: GEOBIOLOGICAL SYSTEMS SCIENCE II
S 3 cr. LEC 1 RCT 2
PREREQUISITE: Acceptance into a Ph.D. program, DGED 610.
– This course represents the second of a two-course sequence for Ph.D. students participating in the Geobiological Systems Science IGERT program. The goal of the course is to develop a working understanding of system biology models and how these approaches can be applied to complex microbial communities.

DGED 613 IGERT: SCIENTIFIC PROPOSAL WRITING
F 3 cr. LEC 3
PREREQUISITE: Acceptance in IGERT Program; DGED 610 and DGED 611.
– The goal of this course is to provide the doctoral student with strategies, practical skills and experience in seeking funding sources and writing and evaluating scientific proposals. The student should leave this course with a proposal that is ready to submit for funding.

DGED 614 IGERT: ADVANCED METHODS IN GEOBIOLOGY
F, S, Su 3 cr. LEC 1 IND 1 LAB 1
PREREQUISITE: Acceptance in IGERT Program.
– This course is part of the required curriculum for IGERT students. The purpose is to provide students with the opportunity to experience different laboratory environments and different experimental approaches, which will assist them in choosing a laboratory for thesis work.

DGED 621 IGERT: GEOBIOLOGICAL SYSTEMS SCIENCE: LABORATORY ROTATIONS
F, S,Su 1 cr. LAB 1
PREREQUISITE: Acceptance in IGERT Program.
– This course is part of the required curriculum for IGERT students, and provides an opportunity for IGERT students to participate in a domestic or international internship at an academic, private, or national laboratory.

DGED 622 IGERT: GEOBIOLOGICAL SYSTEMS SCIENCE: INTERNSHIP
F, S,Su 3 cr. IND 3
PREREQUISITE: Acceptance in IGERT Program, DGED 610 and DGED 611.
– This course is part of the required curriculum for IGERT students, and provides an opportunity for IGERT students to participate in a domestic or international internship at an academic, private, or national laboratory.

ECNS (Formerly ECON)
Economics
Department of Agricultural Economics & Economics
(406) 994-3701

ECNS 101S ECONOMIC WAY OF THINKING
F, S 3 cr. LEC 3
PREREQUISITE: ECNS 101.
– A study of microeconomic theory and selected applications with emphasis on theory of consumer behavior and theory of the firm. A major objective of the course is to prepare students for additional upper-division courses in economics.

ECNS 108S ECONOMIC WAY OF THINKING
F, S 3 cr. LEC 3
PREREQUISITE: ECNS 204 or ECNS 251, M 161 or M 171.
– A study of microeconomic theory and selected applications with emphasis on theory of consumer behavior and theory of the firm. A major objective of the course is to prepare students for additional upper-division courses in economics.

ECNS 109 MANAGERIAL ECONOMICS
S 3 cr. LEC 3
PREREQUISITE: ECNS 204 or ECNS 251, M 161 or M 171.
– An integration of various principles and concepts from different areas of economics. These are combined with several tools of analysis and related to problems of economic decision making and policy formulation at the firm level.

ECNS 202 PRINCIPLES OF MACROECONOMICS
F, S, Su 3 cr. LEC 3
PREREQUISITE: ECNS 101.
– Topics include inflation, unemployment, interest rates, money, and the impact of government surplus or deficits. Government policies of growth, employment, income distribution, and international trade are examined.

ECNS 204S MICROECONOMICS
F, S, Su 3 cr. LEC 3
PREREQUISITE: ECNS 101.
– Consumer theory and the theory of the firm are utilized to show how independent decisions by consumers and firms interact in markets to determine the price and output of goods and services.

ECNS 251S HONORS ECONOMICS
S 4 cr. SEM 4
– Economic principles are introduced and applied to a wide range of contemporary and historical problems including legal, environmental, resource, health, taxation, poverty, economic development, and macroeconomic policy issues.

ECNS 200R UNDERGRADUATE RESEARCH
F, S, Su 1 - 8 cr. IND
PREREQUISITE: ECNS 101 and approval of instructor.
– Intended for lower division undergraduate research/undergraduate scholar program. The student will work closely with the supervising faculty. Course will address responsible conduct of research.

ECNS 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Dependent on the offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting regular course number.

ECNS 292 INDEPENDENT STUDY
F, S, Su 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
– Directed research and study on an individual basis.

ECNS 301 INTERMEDIATE MICRO WITH CALCULUS
F, S 3 cr. LEC 3
PREREQUISITE: ECNS 204 or ECNS 251, M 161 or M 171.
– A study of microeconomic theory and selected applications with emphasis on theory of consumer behavior and theory of the firm. A major objective of the course is to prepare students for additional upper-division courses in economics.

ECNS 303 INTERMEDIATE MACRO WITH CALCULUS
F, S 3 cr. LEC 3
PREREQUISITE: ECNS 202 and ECNS 204 or ECNS 251; M 161 or M 171.
– The economic theory of economywide aggregates such as national income, levels of employment, income distribution; the determinants of the performance of entire economies: nations, groups of nations, and the world.

ECNS 309 MANAGERIAL ECONOMICS
S 3 cr. LEC 3
PREREQUISITE: ECNS 204 or ECNS 251, M 161 or M 171.
– An integration of various principles and concepts from different areas of economics. These are combined with several tools of analysis and related to problems of economic decision making and policy formulation at the firm level.
ECNS 311 INT. MICRO WITH ECON EDUC APPS
F, to be offered alternate years, 2008 3 cr. LEC 3
PREREQUISITE: ECNS 294 or ECNS 251 or consent of instructor.
- A study of microeconomic theory with selected applications in the area of the economics of education and emphasis on the theory of the behavior of consumers, firms, non profit organizations and government agencies, and welfare economics.
Applications will address issues such as the labor market for primary and secondary school teachers, the effects of voucher programs on the quality of public and private education, and the returns to primary and secondary education.

ECNS 312 LABOR ECONOMICS
S, to be offered alternate years, 2012 3 cr. LEC 3
PREREQUISITE: ECNS 294 or ECNS 251.
- Economics of labor markets, wage determination, and human capital. The theoretical framework of labor market analysis is presented, along with empirical research results and descriptive aspects of current labor issues.

ECNS 313 MONEY & BANKING
F, S 3 cr. LEC 3
PREREQUISITE: ECNS 292 or ECNS 251.
- Principles and problems of money, banking, and credit. Monetary and banking history; monetary theory and policy; structure and operation of our financial system.

ECNS 314 INTERNATIONAL ECONOMICS
F 3 cr. LEC 3
PREREQUISITE: ECNS 294 or ECNS 251.
- A survey of international economic theory and policy. Major concepts explored are comparative advantage, impacts of tariffs, exchange rates, and international payments.

ECNS 317 ECONOMIC DEVELOPMENT
S, to be offered alternate years, 2011 3 cr. LEC 3
PREREQUISITE: ECNS 204 or ECNS 251.
- The plight of the world’s low income countries, and the many national and international programs devoted to its alleviation. Primary emphasis directed to economic factors, but attention given to political and social characteristics vital to economic development.

ECNS 320 PUBLIC FINANCE
F 3 cr. LEC 3
PREREQUISITE: ECNS 294 or ECNS 251.
- Analysis of public expenditure programs, government behavior, and public decision making. Topics such as health care and welfare programs, and principles of taxation will be covered.

ECNS 332 ECON OF NATURAL RESOURCES
F 3 cr. LEC 3
PREREQUISITE: ECNS 294 or ECNS 251.
- Economic principles regarding the allocation and use of natural resources and the impact of institutional factors within which these decisions are implemented. Emphasis on property rights, economic rent, and impact of regulations on resources such as forests, fisheries, land, and water.

ECNS 372 ECONOMIC HISTORY OF THE US
On Demand 3 cr. LEC 3
PREREQUISITE: ECNS 101 or ECNS 251.
- Interpretation of American economic growth in the context of economic theory. Examines specific issues in U.S. history while focusing on the question of how the U.S. has been able to sustain increases in per-capita income.

ECNS 394 SEMINAR
F S 1 cr. SEM 1
PREREQUISITE: ECNS 294 or ECNS 251 or consent of instructor.
- Current economic problems and current writings of people in the profession. Topics vary each semester; students should check with the department before registering.

ECNS 401 MICROECONOMIC THEORY
F 3 cr. LEC 3
PREREQUISITE: ECNS 301. Need to have senior or graduate standing.
- Advanced price theory. Objectives of this course include further development of students’ intuitive understanding of price theory and learning how to use calculus in economics. Topics covered include comparative statics, consumer and producer theory, and pricing in competitive and non-competitive product and factor markets.

ECNS 403 INTRODUCTION TO ECONOMETRICS
S 3 cr. LEC 3
PREREQUISITE: ECNS 294 and STAT 216 and M 161.
- Statistical analysis and interpretation of quantitative data in economics. Focus on estimating economic relationships and conducting hypothesis testing in economics. Utilizes cutting-edge statistical software packages and real data to apply economic methods to problems in business, economics, and public policy.

ECNS 406 INDUSTRIAL ORGANIZATION
F 3 cr. LEC 3
PREREQUISITE: ECNS 301.
- Offers students the opportunity to use training in price theory by focusing on issues concerned with public policy toward business. The subject matter should appeal to students in pre-law and business as well as economics majors.

ECNS 432R BENEFIT-COST ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: ECNS 301.
- Senior capstone course. Applied welfare economics and methods and criteria for evaluating benefits and costs of public policies and investment. Applications include environmental and natural resource issues.

ECNS 490R UNDERGRADUATE RESEARCH/Creative Activity
F, S, Su 1-8 cr. IND
PREREQUISITE: ECNS 294, junior standing, and approval of instructor.
- Intended for upper division undergraduate research/undergraduate scholars program. The student will work closely with the supervising faculty. Course will address responsible conduct of research.

ECNS 491 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Determined by each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECNS 492 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

ECNS 494 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ECNS 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined on the offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ECNS 501 MICROECONOMIC THEORY
S 3 cr. LEC 3
PREREQUISITE: ECNS 401.
- Economic models of optimization as they apply to consumer and firm decision making. Topics covered include comparative statics, theory of the firm and consumer, and consumer and producer surplus.

ECNS 592 MACROECONOMIC THEORY
S 3 cr. LEC 3
PREREQUISITE: ECNS 303.
- Systematic review of accepted macroeconomic theory and critical study of the functional relationships contained therein.

ECNS 561 ECONOMETRICS I
F 3 cr. LEC 3
PREREQUISITE: ECNS 301, STAT 216, M 221.
- The use of regression analysis in the estimation of economic relationships, with emphasis on development of the least squares technique, the properties of estimators, and hypothesis testing in the context of the regression model.

ECNS 562 ECONOMETRICS II
S 3 cr. LEC 3
PREREQUISITE: ECNS 561.
- Course consists of theoretical and applied econometrics of static and dynamic structural models, primarily using time-series data. Single equations and system of equations are evaluated. Estimation properties specific to statistical problems, dynamic adjustments to economic behavior, and model forecasting are emphasized.

ECNS 569 RESEARCH METHODOLOGY
F 1 cr. LEC 1
PREREQUISITE: Graduate standing, ECNS 301, ECNS 303.
- The research process as a means of acquiring knowledge which is reliable and relevant to problems.

ECNS 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, and approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ECNS 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.
ECNS 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECNS 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ECNS 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND MAY BE REPEATED.
PREREQUISITE: Master’s standing.

EDCI Education, Curriculum & Instruction
Department of Education
(406) 994-3120

EDCI 102 IN-SCHOOL EXPERIENCE
F, S 1 cr. LAB 1
- Students will explore the profession of teaching by attending an orientation, conducting in-school observations and interviews, recording personal reflections in a portfolio, and participating in two seminar sessions to debrief/discuss their experiences.

EDCI 105 TEACHING THE GRAMMAR AND STRUCTURE OF THE ENGLISH LANGUAGE
F, S 3 cr. LEC 3
- This course explores the structure and function of the English language. In particular, study of grammar including the eight parts of speech, types of phrases and clauses, sentence structure and fluency, word usage, and other language conventions will be addressed.

EDCI 208 EDUCATIONAL PSYCHOLOGY & HUMAN DEVELOPMENT OF SCHOOL AGE CHILDREN
F, S 3 cr. LEC 3
PREREQUISITE: EDCI 102, HDCF 150, or COREQUISITE: EDCI 102.
- Human growth and psychological development of school age students, to include physical, cognitive, and psychosocial development within an educational, familial, and societal context.

EDCI 209 EDUCATIONAL PSYCHOLOGY AND ADOLESCENT DEVELOPMENT
F, S 3 cr. LEC 3
PREREQUISITE: HDCF 150 and one of the following:
COREQUISITE: EDCI 102, HDPF 102.
- An examination of theory and research related to the development, learning and motivations of middle and high school students. Implications for effective classroom teaching will be identified throughout the course.

EDCI 240D MULTICULTURAL EDUCATION
F, S 3 cr. LEC 3
PREREQUISITE: Sophomore Standing.
- Examination of the school-society relationship in the United States and of the many issues and variables embedded in this relationship, including equal opportunity, human diversity, ideology, politics and social change. Foundational perspectives (historical, political, social, and policy) will be explored.

EDCI 280 SPECIAL TOPICS
On Demand 1 - 10 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDCI 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EDCI 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

EDCI 320 FOUNDATIONS OF EDUCATIONAL TECHNOLOGY
F, S, Su 2 cr. LEC 1 LAB 1
PRE OR CO-REQUISITE: EDCI 289 or EDCI 299.
- Exploration of technological use in society and effects on teaching and learning. Includes strategies for developing technology-rich curriculum and techniques for enhancing learning through integration of technology and 21st century skills.

EDCI 360 FOUNDATIONS OF ASSESSMENT
F, S, Su 2 cr. RCT 2
PREREQUISITE: EDCI 289 or EDCI 299.
- Fundamental concepts of differentiated educational assessment for classroom teachers including the alignment of assessment to curriculum standards and essential understandings, quality of assessment, principles of item construction, evaluation of student responses, interpretation of results, and improvement of techniques.

EDCI 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDCI 401 INTRODUCTION TO INSTRUCTIONAL LEADERSHIP FOR LITERACY EDUCATORS
S 3 cr. LEC 3
PREREQUISITE: EDCI 320, EDCI 304, and EDEL 305 or EDEL 405 or consent of instructor.
- This course will introduce students to the role and responsibilities of reading specialists in the professional school setting. Topics include collaborating with colleagues, parents, and the community, current practice in literacy professional development, and reading policy.

EDCI 406 YOUNG ADULT LITERATURE
F alternate years, to be offered even years 3 cr. RCT 3
PREREQUISITE: EDEL 304.
- Survey of materials for young adult readers. Includes literary analysis, pedagogy, electronic resources, and motivational strategies.

EDCI 425 TECHNOLOGY IN THE CLASSROOM
F 3 cr. LEC 2 LAB 1
- Hands on experiences in the production of advanced instructional media materials. Emphasis on exploration of techniques using current and cutting edge technologies. Appropriate for media specialists, teachers, trainers and communicators interested in using the new technology tools.

EDCI 427 MEDIA DESIGN:
DYNAMIC CLASSROOM ENVIRONMENTS
S 3 cr. LEC 2 LAB 1
- To construct effective documents and classroom displays utilizing a variety of materials. Focuses on design techniques and production for those in education, library media, marketing, engineering, graphic design, and others requiring professional visual presentations.

EDCI 434 LITERACY ASSESSMENT AND INSTRUCTION
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: EDEL 305 or EDEL 405.
- Current theory and techniques in literacy assessment and individualization. Emphasis will be on specific instructional strategies that focus on independence in reading and writing. A practicum is included.

EDCI 450 EDUCATIONAL COMPUTING MANAGEMENT AND APPLICATION
F, S 1 - 3 cr. IND
PREREQUISITE: EDCI 320.
- A flexible format that allows the student to select hands-on learning modules based on student need and interest in educational technology and 21st century skills.

EDCI 460 APPLICATIONS OF EDUCATIONAL TECHNOLOGY
S 3 cr. LEC 1 RCT 1 LAB 1
PREREQUISITE: EDCI 320.
- Exploring the benefits of technology to maximize student learning and strategies for development of standards-based technology integration to promote 21st century skills. Includes an Action Research component and classroom practice.

EDCI 462 METHODS OF TEACHING MODERN LANGUAGES
S 4 cr. LEC 4
PREREQUISITE: EDCI 360, 20 or more credits in subject area, and good standing in Teacher Education Program.
COREQUISITE: EDSD 301 (for teaching majors in this subject).
- Provides prospective foreign language instructors with a practical and theoretical foundation for planning (including lesson/unit), implementing teaching, and evaluating programs and learning for levels K-12. Content reading skills are also addressed. Includes classroom paraprofessional experience for majors only.

EDCI 470 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.
EDCI 476 INTERNSHIP
On Demand 2.5 cr. IND
PREREQUISITE: EDCI 360, consent of instructor, and approval of department head.
- An individualized assignment with a professional agency to provide a guided field experience.

EDCI 480 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDCI 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 6 cr. IND May be repeated. Max 4 cr.
COREQUISITE: EDCI 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EDCI 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

EDCI 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing and as determined for each offering.
- Topics offered at the graduate level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDCI 501 EDUCATIONAL STATISTICS I
F, Su 3 cr. LEC 3
PREREQUISITE: STAT 216, graduate standing or consent of instructor.
- The application of statistical processes to the analysis of educational data. Educational problems that require hypothesis testing, regression, estimation, and the T-distribution, analysis of frequencies, and ANOVA in their solution will be included.

EDCI 502 EDUCATIONAL STATISTICS II
S 3 cr. or On Demand. LEC 3
- The application of statistical processes to the analysis of educational data. Educational problems that apply multifactor ANOVA, multiple comparison techniques, ANCOVA, multiple regression, and factor analysis in their solution are included.

EDCI 504 ASSESSMENT AND EVALUATION IN EDUCATION
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Evaluation as an ongoing process in education. This course will engage students in a discussion regarding the construction, selection and use of criterion-referenced, norm-referenced, and alternative assessment methods. In addition, students will be involved in special projects which allow them to explore evaluation at the classroom and program level.

EDCI 505 FOUNDATION OF ACTION RESEARCH IN TEACHING AND LEARNING
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course presents an overview of classroom-based research for practicing teachers. Students will explore the role of action research in teacher professional development, and review multiple models and methods for action research. Participants will gain experience in data collection and, analysis, and will prepare an action research proposal.

EDCI 506 APPLIED EDUCATIONAL RESEARCH
F, S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Students are introduced to systematic scientific inquiry, its purpose in an educational environment, the different approaches to conducting educational research, and the major components of an educational research study. Providing a foundation for further study of research methodologies, students will identify and evaluate existing literature on a topic and conduct an educational research study. Course will address responsible conduct of research.

EDCI 507 QUALITATIVE EDUCATIONAL RESEARCH
S or On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing and EDCI 506.
- This course explores the implications and application of the qualitative research paradigm to systematic inquiry within the field of education. Methods used in qualitative research including techniques of data collection, analysis, and reporting will be reviewed. Students will plan and complete a qualitative research project. Course will address responsible conduct of research.

EDCI 508 ADVANCED EDUCATIONAL PSYCHOLOGY
S 3 cr. LEC 3
PREREQUISITE: Graduate standing or permission of the instructor.
- An examination of theory and research related to the diverse learning and motivation needs of K-12 students. Practical implications for effective teaching will be identified throughout the course.

EDCI 509 IMPLEMENTING ACTION RESEARCH IN TEACHING AND LEARNING
On Demand 3 cr. LEC 3
PREREQUISITE: EDCI 505 or another foundational course in action research.
- In this course, students will implement the research design created in EDCI 505 or in a similar course. This will include developing and refining techniques for gathering classroom data, using multiple strategies for data analysis, and communicating the research results in a professional report and in presentation to more than one audience (e.g., other educators, community members.)

EDCI 510 ISSUES & TRENDS IN SOCIAL STUDIES INSTRUCTION
On Demand 3 cr. LEC 3
PREREQUISITE: EDEL 313, EDSD 458.
- Treats current issues & trends in social studies teaching and learning, with special focus on the social and political forces driving change in social studies education and the responses from the research and practice communities.

EDCI 511 IMPROVEMENT OF INSTRUCTION IN HEALTH ENHANCEMENT
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: EDEL 410.
- Health enhancement curriculum content, integration concepts amongst instructional topics such as: skill acquisition, physical fitness, nutrition, mental health, sexuality and drug and alcohol education. Identification and development of appropriate value orientation and curriculum framework for health enhancement instructional design activities.

EDCI 512 WRITING AND ITS IMPROVEMENT
Su alternate years, 3 cr. LEC 3
PREREQUISITE: EDEL 410.
- Advanced study in language arts pedagogy. Special attention is given to the writing process.

EDCI 514 MENTORING NEW TEACHERS
F 3 cr. LEC 3
PREREQUISITE: Graduate Standing.
- This course examines research relevant to the process of mentoring new teachers and supporting their professional development. Course content explores skills necessary for successful mentoring, the professional development needs of new teachers, and development of tools for monitoring and evaluation.

EDCI 518 MASTER TEACHING STRATEGIES FOR SCIENCE EDUCATORS
On Demand 3 cr. LEC 3
PREREQUISITE: EDCI 325 or 333 or 466 or 461 or the equivalent.
- A professional development class for practicing science educators to learn master teaching strategies to engage grade 6 - 12 students learning science. Intended as a “gateway” online class for teachers interested in exploring an online course in consideration of the MSSE degree. Course elective for the MSSE degree.

EDCI 520 VISUAL ARTS AND LEARNING (Replaces EDEL 532)
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Explores the importance of art in the lives of children and adolescents while finding ways to include art experiences in an integrated curriculum. Emphasizes philosophical and cultural groundings for teaching art, studio experiences and research potentials.

EDCI 522 INFORMATION RESOURCES AND SERVICES
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- A course in the use of information resources in research, reference, integration, and online learning. Topics include the use and evaluation of traditional and electronic information resources, design and selection of information resources for classrooms and libraries. Restricted to BATE Library Media program students.

EDCI 525 IMPROVEMENT OF INSTRUCTION IN SCIENCE
S 3 cr. LEC 3
PREREQUISITE: EDEL 410 OR EDSD 466.
- This course focuses on theoretical and practical concerns in science education. Research, conceptual frameworks and policy issues will be introduced, as well as teaching and learning activities for elementary and secondary science classrooms.
EDCI 531 CONTEMPORARY ISSUES IN EDUCATION
Su 3 cr. LEC 3
– This course is designed to establish the necessary social, technical, and research foundations for cohort groups in the Masters degree program. This course will examine critical issues in education including advanced pedagogy, Indian Education for All, and school law.

EDCI 532 GENERAL SCHOOL CURRICULUM
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
– A survey of developments in curriculum theory and the role of curriculum reform in school improvement initiatives. Also treated is the relationship between curriculum reform and implementation.

EDCI 533 MIDDLE YEARS SCHOOL
Su alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EDEL 410 or EDSD 410, graduate standing.
– History, philosophy and organization of Junior High and Middle schools, emphasizing curriculum and instruction based on the characteristics and needs of 10 to 13 year olds.

EDCI 534 LITERACY ASSESSMENT AND INSTRUCTION
Su 3 cr. LEC 3
PREREQUISITE: EDEL 305, EDEL 405, teaching experience.
– Current theory and techniques in assessment of reading. Emphasis on instructional strategies and assessment tools developing the literacy of all students. A practicum is included.

EDCI 535 NEEDS ASSESSMENT IN EDUCATION
On Demand 2 cr. LEC 2
PREREQUISITE: EDCI 532 or ELDL 540 or ELDL 501 or ELDL 505, graduate standing.
– Understanding the strategies and techniques for determining educational needs in a variety of settings, and disseminating and utilizing the data and information for program planning and development.

EDCI 536 CONSTRUCTION OF CURRICULUM
On Demand 3 cr. LEC 3
PREREQUISITE: EDCI 532 or EDEL 510, graduate standing.
– The development and evaluation of curriculum based on psychological and social foundations of curriculum, curriculum theory, developmental models, design issues, purposes, implementation plans and techniques for assessing the impact of curriculum change.

EDCI 537 CONTEMPORARY ISSUES IN SCIENCE EDUCATION
On Demand 2 cr. LEC 2
PREREQUISITE: Must be enrolled in graduate program in Education or related field.
– This seminar style course focuses on current problems and controversial issues in science education. Emphasis is placed on those issues which relate directly to science teaching, learning and curriculum. Students investigate a variety of issues especially as they relate to their own teaching practices and student learning in their classroom.

EDCI 540 AMERICAN INDIAN STUDIES FOR EDUCATORS
Su,F 3 cr. LEC 3
PREREQUISITE: Graduate standing or the consent of the instructor.
– To equip teachers with the skills, knowledge, and dispositions to meet Indian Education for All requirements. Instruction pertains to the history, traditions, customs, values, beliefs, and contemporary affairs of American Indians, particularly tribal groups in the Northern Plains Region.

EDCI 541 HISTORY & PHILOSOPHY OF EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
– In its classical obligation, philosophy meant “a love of learning.” This course traces the growth of cultural and intellectual awareness in human civilizations and examines how we humans learned to create tools for the mind. Teachers learn to see the nature of formal cultural systems in the way they developed, and to recognize the central concepts that are the key to learning any subject.

EDCI 542 CREATIVE PROCESSES IN EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: EDEL 410 or EDSD 410, teaching experience.
– Reviews historical and current issues in art education, aesthetic education and related areas which inform how we know our world and construct meaningful ways to pursue creative endeavors. Emphasizes documentation and research while acknowledging growth as teachers and artists.

EDCI 544 PHILOSOPHICAL ISSUES IN EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
– An examination of contemporary educational issues using the perspectives of traditional and contemporary philosophical documents.

EDCI 545 ORGANIZATION OF INFORMATION IN SCHOOL LIBRARY MEDIA CENTERS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
– Strategies to harness the power of technology to enhance teaching and learning while promoting 21st century skills, productivity, assessment and communication.

EDCI 546 THE SCHOOL LIBRARY MEDIA SPECIALIST
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
– In this course students learn application of descriptive and subjective cataloging content and procedures including: Dewey Decimal Classification, Library of Congress headings, AACR II rules, and examine technology issues for automation and management of library holdings. Restricted to BATE Library Media program students.

EDCI 547 INFORMATION INQUIRY AND EDUCATIONAL CHANGE
F alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
– This course presents prospective school library media specialists with content and strategies for working with teachers to incorporate information literacy and media literacy into a changing curriculum and explore information inquiry models. Also included are topics affecting change in libraries and education such as: filtering, censorship, digital ethics, new technologies and other topics as relevant to inquiry and integration. Restricted to BATE Library Media program students.

EDCI 548 MANAGEMENT OF INFORMATION AND RESOURCES
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
– Students learn the management, development, use, and evaluation of materials for building library collections in K-12 library media centers. Restricted to BATE Library Media program students.

EDCI 549 APPLICATIONS OF LITERATURE FOR CHILDREN AND YOUNG ADULTS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
– This course presents an overview of materials for educational, informational, and literary use by children and young adults (YA) with an emphasis on critical selection and analysis, knowledge of age-level developmental stages, and motivational techniques in libraries. Restricted to BATE Library Media program students.

EDCI 551 EDUCATIONAL TECHNOLOGY: CREATIVE INTEGRATION
F 3 cr. LEC 5
PREREQUISITE: Graduate standing.
– Strategies to harness the power of technology to enhance teaching and learning while promoting 21st century skills, productivity, assessment and communication.

EDCI 552 SOCIOCULTURAL PERSPECTIVES IN LITERACY
On Demand 3 cr. LEC 3
PREREQUISITE: EDCI 551.
– This course introduces graduate students in education to contemporary theories and research in literacy studies, with a specific focus on critical literacy.
EDCI 564 THE COMPREHENSIVE PORTFOLIO
Su 3 cr. LEC 3
PREREQUISITE: For NPTT candidates: EDCI 552, EDCI 553, EDCI 554, EDCI 555, EDCI 556, EDCI 558, EDCI 559.
- This course provides advanced training on the preparation of a professional teaching portfolio for candidates in the NPTT program or final project portfolio in the practitioner stand of the master’s degree in Curriculum & Instruction. Based upon the standards and practices established by the National Board of Professional Teaching Standards (NBPTS), the Interstate New Teacher Assistance and Support Consortium (INTASC), and the National Council for Accreditation of Teacher Education (NCATE) these portfolios are designed to provide comprehensive evidence of effectiveness in practice, the habit of reflection, and a command of the knowledge, skills, and dispositions expected of professional educators as developed in the student’s graduate program. Portfolios developed in this course may in turn serve as the basis for the student’s comprehensive exam.

EDCI 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

EDCI 571 IN-SERVICE EDUCATION
On Demand 1 - 4 cr. RCT/DIS/LAB
PREREQUISITE: Graduate standing and employment by sponsoring school organization.
- An approved supervised group study of an educational problem within a local school supervised by an MSU faculty member which culminates in a specific report to be filed with the local district and the Department of Education.

EDCI 575 PROFESSIONAL PAPER/PROJECT
F, S 1 - 4 cr. END Maximum 6 cr.
PREREQUISITE: Graduate standing and employment by sponsoring school organization.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

EDCI 576 INTERNSHIP
F, S, Su 1 - 12 cr. END 2-12
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with a school, agency, business or other organization to provide guided experience in the field.

EDCI 577 INTERNSHIP OPI TEACHER CERTIFICATION
F, S, Su 1 END 1
PREREQUISITE: Consent of instructor and approval of department head.
- An internship course restricted to OPI teacher certification students.

EDCI 580 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDCI 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 3 cr.
- Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled.

EDCI 589 GRADUATE CONSULTATION
F, S Su 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the department head.
- This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

EDCI 590 MASTER’S THESIS
F, S Su 1 - 10 cr. IND May be repeated.
PREREQUISITE: Master’s standing. Restricted Entry: Requires contract with major advisor.

EDCI 607 QUANTITATIVE EDUCATIONAL RESEARCH
F or On Demand 3 cr. LEC 3
PREREQUISITE: EDCI 502, EDCI 506, graduate standing.
- This course explores the implications of and application of the quantitative research paradigm to systematic inquiry within the field of education. The course includes quantitative designs, design-related data collection and management methodologies, appropriate data analysis and writing strategies, and the role of quantitative research in decision-support. Students will plan and complete a quantitative research project. Course will address responsible conduct of research.

EDCI 609 DOCTORAL THESIS
F, S Su 1 - 10 cr. IND May be repeated.
PREREQUISITE: Doctoral standing. Restricted Entry: Requires contract with major advisor. Course will address responsible conduct of research.

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Department of Education
(406) 994-3120

EDEL 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EDEL 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

EDEL 301 TEACHING PRACTICUM
F, S, Su 1-3 cr. LAB 1-3
PREREQUISITE: EDCI 360, good standing in Teacher Education Program.
- Students will be assigned to school classrooms to observe children, teachers, and teaching strategies. Students will teach lessons in subject areas corresponding to the methods classes in which they are currently enrolled.

EDEL 303 TEACHING ELEMENTARY HEALTH ENHANCEMENT
F, S 3 cr. LEC 2 LAB 1
- The class is designed to provide the elementary education student with a conceptual understanding of school-age health enhancement (health and physical education), to include relationships between movement concepts and skill analysis, the ten comprehensive school health areas, and health-related behaviors.

EDEL 304 CHILDREN’S LITERATURE
F, S 3 cr. LEC 3
PREREQUISITE: EDCI 208 or EDCI 209 and junior standing.
- A survey of children’s books with an emphasis on their use in K-8 classrooms. Introduces the history and current genres of children’s literature, selection criteria, award-winning books, and strategies for sharing books with students.

EDEL 305 PRINCIPLES AND PRACTICES OF EMERGENT LITERACY K-3
F, S Su alternate years, to be offered even years 4 cr. LEC 4
PREREQUISITE: EDEL 304, EDCI 360, and good standing in Teacher Education Program.
- Current theory concerning emergent literacy and developmentally appropriate classroom practices. Emphasis is on a balanced approach which includes phonics and other cue systems, use of authentic children’s literature, and use of programmed reading materials.

EDEL 307 TEACHING THE MULTICULTURAL CHILD
On Demand 3 cr. RCT 3
PREREQUISITE: EDCI 208 and EDCI 240.
- To recognize the factors impacting minority language and ethnic group students in the elementary classroom with an emphasis on Native Americans, and to apply pedagogical principles to the teaching of reading and language arts in multicultural classrooms.

EDEL 308 TEACHING SOCIAL STUDIES, GRADES K-8
F, S, Su alternate years, to be offered odd years 3 cr. LEC 5
PREREQUISITE: Completion of social science core including PSCI 210, one additional restricted social science elective course, and good standing in the Teacher Education Program.
- Identification of goals, objectives, and instructionstrategies for elementary social studies.

EDEL 325 TEACHING ELEMENTARY SCIENCE
F, S, Su alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
PREREQUISITE: EDCI 360 and good standing in Teacher Education Program.
- This course focuses upon methods of teaching science inquiry skills, content, and attitudes in the elementary classroom.

EDEL 332 TEACHING ART AND THE ELEMENTARY CURRICULUM
F, S, Su alternate years, to be offered even years 5 cr. LEC 2 LAB 1
PREREQUISITE: EDCI 360, and good standing in Teacher Education Program.
- Experiences which enhance student understanding of how children make art, appreciate historical aspects of art, and construct their place in a social world. Students explore these concerns through studio experiences, readings, written reports, and locating and gathering resources for teaching art.
EDEL 333 TEACHING MATHEMATICS
F, S. Su alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: EDCI 360, M 131, and good standing in Teacher Education Program.
- M methods and materials for the prospective elementary teacher. Classroom organization, opera-
tion, management, applied technology, evaluation, and current theory.

EDEL 355 TEACHING HEALTH ENHANCEMENT
F 3 cr. LEC 3
PREREQUISITE: EDCI 360, good standing in Teacher Education Program.
- The theoretical and practical aspects of teaching health enhancement in the elementary schools.

EDEL 356 TEACHING MUSIC
F, S. Su alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: EDCI 360, good standing in Teacher Education Program.
- Improving musical skills to incorporate methods of integrating music into the elementary classroom
through signing, listening, instrument playing, creating, and movement in order to further the goals
and standards of the elementary music program as well as the general elementary curriculum.

EDEL 357 ELEMENTARY MUSIC METHODS
S 3 cr. LEC 3
PREREQUISITE: MUS 204, MUS 206, MUS 250, EDCI 350, and good standing in Teacher Education
Program.
COREQUISITE: EDEL 301
- Elementary music methods for the music education majors; in-depth study and application of
elements of music methods using singing, listening, instrument playing, creating, and movement;
materials, management, sequencing, planning, and assessment for K-6 music classes.

EDEL 401 EDUCATIONAL PLANNING AND MANAGEMENT
F, S. Su 1 cr. RCT 1
PREREQUISITE: EDCI 360, good standing in Teacher Education Program.
- An introduction to instructional planning (lesson and unit planning) classroom management and
organization, and working with parents. General teaching issues and problems associated with the
Teaching Practicum will also be explored and discussed.

EDEL 402 EDUCATIONAL MANAGEMENT AND DISCIPLINE
F, S. Su 1 cr. RCT 1
PREREQUISITE: EDEL 401, good standing in Teacher Education Program.
- An introduction to the models of various management and discipline techniques. General control
issues and problems associated with the teaching practicum will also be explored and discussed.

EDEL 405 TEACHING LITERACY TO ESTABLISHED READERS (4-8)
F, S. Su alternate years, to be offered odd years 4 cr. LEC 4
PREREQUISITE: EDCI 360, EDEL 304, and good standing in Teacher Education Program.
- Current theory and practice addressing literacy instruction in grades 4-8, with special emphasis on
middle school. Topics include reading strategies, the writing process, and workshop approaches to
literacy.

EDEL 406 TEACHING THE PRIMARY GRADES
F 3 cr. LEC 3
PREREQUISITE: EDCI 208, and either HDCF 150 or PSYX 100.
- Preparing teachers to teach kindergarten and the primary grades one through three. Understanding
of the characteristics of the age-level child; establishing curriculum methods, materials, learning envi-
ronments, and activities for teaching and investigation of the relevant subject areas.

EDEL 410 STUDENT TEACHING
F, S. Su 5 - 12 cr. IND
PREREQUISITE: Senior standing, completion of all required EDEL methods courses, and good standing
in Teacher Education Program.
COREQUISITE: EDEL 414.
- Observation and teaching in a classroom setting; preparation and delivery of lesson plans. The student
Teaching experience will occur under the supervision of experienced teachers and MSU staff
supervisors.

EDEL 411 PROFESSIONAL ISSUES
F, S 2 cr. LEC 2
PREREQUISITE: Senior standing, completion of all required EDEL methods courses, and good standing
in Teacher Education Program.
COREQUISITE: EDEL 410.
- Senior capstone course. Review the role of teachers and elementary school; school law; teacher contracts;
certification; professional organizations; ethics; job seeking; job success; cooperative learning; and other
critical issues for elementary education majors.

EDEL 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: EDEL 410 or ESDS 410.
- Directed research and study on an individual basis.

EDEL 480 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as deter-
mined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a
trial basis to determine acceptability and demand before requesting a regular course number.

EDEL 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: EDEL 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EDEL 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal
article, or undergraduate thesis. Course will address responsible conduct of research.

EDEL 500 SEMINAR
On Demand 1 cr.SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing and as deter-
mined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in
preparing and presenting discussion material.

EDEL 503 CONTEMPORARY ISSUES IN CHILDREN'S LITERATURE
On Demand 3 cr. LEC 3
PREREQUISITE: EDEL 304 and EDEL 305 and EDEL 410.
- Examination and interpretation of the themes of current, award-winning children’s literature and
their relevance to today’s children. Inquiry projects will focus on topics of critical literacy. Emphasis will
be on classroom application.

EDEL 505 ISSUES AND TRENDS IN LITERACY
On Demand 3 cr. LEC 3
PREREQUISITE: EDEL 410.
- Contemporary issues in reading, addressed through advanced study of recent research, with a
focus on standards-based classroom application. Topics include the reading/writing relationship and
the complexities if the reading process.

EDEL 510 ELEMENTARY SCHOOL CURRICULUM
On Demand 3 cr. LEC 3
PREREQUISITE: EDEL 410.
- Explores the importance of art in the lives of children and adolescents while finding ways to
include art experiences in an integrated curriculum. Emphasizes philosophical and cultural grounds
for teaching art, studio experiences and research potentials.

EDEL 533 IMPROVEMENT OF MATHEMATICS INSTRUCTION
F 3 cr. LEC 3
PREREQUISITE: EDEL 333, EDEL 410.
- Stresses use of appropriate knowledge from math-
ematics education, learning theory, developmental psychology, readiness, evaluation, curriculum
development and individual differences in selecting, designing, organizing and presenting mathematical
content for elementary school children.

EDEL 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of
instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

EDEL 575 PROFESSIONAL PAPER/PROJECT
F, S. Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: EDCI 506, graduate standing.
- A research or professional paper or project deal-
ing with a topic in the field. The topic must have
been mutually agreed upon by the student and his
or her major advisor and graduate committee.

EDEL 576 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum credits
limited
PREREQUISITE: Graduate standing, consent of
instructor and approval of department head.
- An individualized assignment arranged with an
agency, business or other organization to provide
guided experience in the field.
EDLD 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDLD 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, and consent of instructor.
- Courses offered on a one-time basis to fulfill professional development needs of inservice educators. A specific focus is given to each course which is appropriately subtitled.

EDLD 589 GRADUATE CONSULTATION
F, S, Su 5 cr. IND Maximum credits unlimited
PREREQUISITE: Master’s standing and approval of the department head.
- This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

EDLD 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited
PREREQUISITE: Master’s standing. Restricted Entry: Requires contract with major advisor.

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EDLD 498R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: EDLD 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EDLD 498R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

EDLD 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 3 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Consent of instructor.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDLD 501 FOUNDATIONS OF ADULT EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- A survey of the field and profession of adult education as part of lifelong learning. Professionalism in adult education is approached through the study of related adult education; historical and philosophical foundations; providers and programs; issues and trends.

EDLD 503 COMMUNITY EDUCATION
On Demand 2 cr. LEC 2
PREREQUISITE: EDLD 501.
- Emphasis on the historical and philosophical development, understanding the concept, goals and objectives, emerging models and institutions and agencies of community education.

EDLD 504 TEACHING AND LEARNING IN ADULT EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This is a study of the adult learner, adult learning theories, and teaching strategies appropriate for adult education strategies. Practice teaching will be evaluated.

EDLD 505 HISTORY AND PHILOSOPHY OF AMERICAN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course is an in-depth past-to-present study of the historical and philosophical development of American higher education set against the backgrounds of political, social, economic, cultural, and intellectual landscapes.

EDLD 507 FOUNDATIONS OF EDUCATIONAL LEADERSHIP
Su & On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA/BS in Education.
- This is the entry course for the K-12 Educational Leadership program. Topics included are leadership theory and practice; instructional leadership; basic organization theory; working with students, staff, parents, and community; creating a vision and a strategic plan for realizing the vision; and the identification and initial development of leadership skills, including a personal and professional code of ethics.

EDLD 508 SUPERVISION OF INSTRUCTION
Su & On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA/BS in Education.
- This course emphasizes the improvement of teaching and learning. There is emphasis on supervision of instruction, professional development, creating a learning community, and leading schools to meet high academic standards. School and staff accountability is also included.

EDLD 509 ISSUES AND TRENDS IN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- An in-depth and contemporary exploration of critical issues, trends, and forces facing and influencing higher education with an emphasis on current issues. The theme is addressing the ways in which institutions respond to these issues.

EDLD 510 ORGANIZATION AND ADMINISTRATION OF HIGHER EDUCATION
On Demand 3 cr. LEC 3
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- In this course students will examine the different organizational structures that characterize and govern American higher education. In this introduction to the field of higher education governance, organization and change structures and influences will be examined.

EDLD 511 PLANNING PROGRAM ASSESSMENT
On Demand 3 cr. LEC 3
PREREQUISITE: EDLD 506 and graduate standing or consent of instructor.
- This course, students learn about the literature, models, standards, strategies, and skills to plan and implement an assessment or program evaluation of educational programs, services and administration. Students evaluate literature and conduct an original assessment project.

EDLD 512 FINANCE AND ADMINISTRATION IN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- The study of financial governance across higher education: from macro-systems (national and state governing boards) to micro-systems (university, college, and department). In the course, students assess the impact of various decisions and levels of funding on students and an institution’s financial status.

EDLD 513 RESOURCE AND PROGRAM MANAGEMENT
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- The study of program department management in higher and adult education for both academic and administrative support units. Includes issues that deal with leadership, the management of faculty, support personnel, programs, and budgeting.

EDLD 515 PLANNED CHANGE
Su & On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- A study of the change process as applied to schools. Includes the theory and process of change, research about change, roles and practice, change models and systems, and leadership in school improvement planning and implementation, and evaluation of changed systems.

EDLD 520 SCHOOLS AND DIVERSE COMMUNITIES
Su & On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- A study of the process of leadership in improving elementary school student achievement with focus on how principals impact their schools by shaping school goals; providing direction, structure, and organizational and social networks; by guiding school policies, procedures, curriculum and learning.

EDLD 525 INSTRUCTIONAL LEADERSHIP IN THE ELEMENTARY SCHOOL
Su & On Demand 3 cr. LEC 3
- A study of principal leadership responsibilities in improving elementary school student achievement with focus on how principals impact their schools by shaping school goals; providing direction, structure, and organizational and social networks; by guiding school policies, procedures, curriculum and learning.
EDLD 526 ORGANIZATION & SUPERVISION OF SCHOOL PROGRAMS
Su & On Demand 3 cr. LEC 3
PREREQUISITE: Graduate Standing & EDLD 534.
- The role of the administrator in improving instruction; different approaches and formative assessment-instruction; What data indicates and what conditions promote effective instruction.

EDLD 528 COLLEGE STUDENTS
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing;
- This foundations course reviews theory and research on undergraduate college students' learning, development, culture, demographics, and sub-populations which inform current educational practice.

EDLD 529 POST SECONDARY DISTANCE DELIVERED EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing;
- Higher, Continuing, and Adult Education professionals will study the literature, strategies, and practices involved in delivering post secondary education at a distance.

EDLD 530 COLLEGE TEACHING
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing;
- This course explores the learning-teacher nexus with special attention to effective teaching practices and models, learning and assessment theories, and effective course design. Topics are approached in the spirit of the scholarship of teaching and learning and with attention to traditional and diverse learners.

EDLD 531 THEORETICAL FOUNDATIONS OF COLLEGE STUDENTS
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing;
- This course will introduce the theories which have been advanced regarding college students and the professional practice of student affairs. The course will examine the similarities and differences among college students and the impact which different environments and policies may have on student psycho-social development, learning attitudes, values, behaviors, and satisfaction with college.

EDLD 532 MONTANA SCHOOL LAW
F & On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA/BS in Education;
- A general examination of law and court decisions relative to the administration of K-12 schools. Specific attention is given to Montana school law.

EDLD 533 LAW AND POLICY IN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing;
- Analysis and interpretation of landmark legislation affecting American higher education since 1960 and the resulting policies that govern the management of universities and colleges. Topics include: separation of church and state, access, collective bargaining, intercollegiate athletics, affirmative action, and relations with state and federal governments.

EDLD 534 DATA DRIVEN DECISIONS
Su & On Demand 5 cr. LEC 3
PREREQUISITE: Graduate standing;
- The course focuses on acquiring, synthesizing, assessing, and using a variety of data to facilitate sound decision making as regards to student achievement and program improvement. Special attention will be paid to systems for collecting, analyzing and using data to continuously improve schools.

EDLD 535 STUDENT SERVICES
Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate Standing;
- Students will examine philosophical, organizational and programmatic aspects of post secondary student services and the ethical and legal dimensions of student affairs professional practice.

EDLD 537 INSTITUTIONAL RESEARCH AND ASSESSMENT
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing;
- Students will explore the roles of institutional research and assessment in higher education identifying appropriate measures for academic and administrative assessment, internal and external data sources, analytic techniques, and the communication of information to academic and administrative decision makers.

EDLD 538 COLLEGE CURRICULUM
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing;
- This course considers the definition, philosophical and historical roots, disciplinary organization, current issues, designs, administration, and evaluation of the college curriculum.

EDLD 543 SOCIAL JUSTICE IN EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing;
- Consideration of social equity issues in education to include disabilities, gender, ethnic, social, and economic issues.

EDLD 555 MONTANA SCHOOL FINANCE
Su & On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA in Education;
- This course prepares school leaders to identify and analyze sources of fiscal and non-fiscal revenue and resources for schools and school districts, to manage financial and material assets, to develop an efficient budget planning process, and to perform a variety of budget management functions. Course emphasis is on Montana school finance.

EDLD 564 THE COMPREHENSIVE PORTFOLIO
Su & On Demand, Variable Credit 2-5 cr.
PREREQUISITE: Consent of Instructor;
- Students create a professional portfolio to evidence their vision of learning, the culture of teaching and learning, community/school relationships, and the social, cultural, ethical, legal, political, and economic context of schooling.

EDLD 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of the Dean of Graduate Studies;
- Directed research and study on an individual basis.

EDLD 571 IN-SERVICE EDUCATION
On Demand 1 - 4 cr. RCT/DIS/LAB
PREREQUISITE: Graduate standing and employment by sponsoring school organization;
- A carefully supervised group study of an educational problem. The study will culminate in a special report, syllabus, blueprint, course of study or guide book or report to be filed with the local administrator and with the Department of Education.

EDLD 574 FIELD EXPERIENCE IN EDUCATIONAL LEADERSHIP
F, S, Su 1-6 cr. LAB 1-6
PREREQUISITE: 15 Credits of EDLD Course Work;
- This is a course that offers students the opportunity for guided field experience as a principal or superintendent in K-12 schools.

EDLD 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing;
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

EDLD 576 INTERNSHIP
On Demand 3 - 18 cr. IND Maximum credits may be restricted by program.
PREREQUISITE: EDLD 507, EDLD 598, EDLD 592; Graduate standing, consent of instructor and approval of advisor;
- The internship course is designed for those required to include practical experience as part of their degree. Course content is informed by bridging theory with practice and the on-the-job expectations and responsibilities.

EDLD 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering;
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDLD 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies;
- Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

EDLD 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies;
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

EDLD 590 MASTER’S THESIS
F, S, Su 1 - 16 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.
- This course will address responsible conduct of research.
EDLD 610 LEADERSHIP AND ORGANIZATIONAL THEORY
F & On Demand 3 cr. LEC 3
PREREQUISITE: MA in Educational Leadership, or Principal's Certification, EDLD 507.
- This course will provide existing school leaders with theories, concepts, and behaviors of effective leadership that addresses the challenges of schools today. The course encourages a deeper understanding of personal beliefs, style, values, and ethics required of school leaders. The development of a shared vision and strategic plan will be emphasized.

EDLD 620 THE SCHOOL SUPERINTENDENT
S alternate years, to be offered even years; Su, 3 cr. LEC 3
PREREQUISITE: Principal's Certification, or concurrent enrollment in EDLD 529.
- This course focuses on the leadership skills necessary for the school superintendent. There is emphasis on superintendent relations with the school board and the school community, and on working with stakeholders to identify school priorities. The development of effective and appropriate communication strategies and interpersonal skills that promote public confidence for schools is stressed.

EDLD 630 SUPERVISION AND INSTRUCTIONAL LEADERSHIP
Su alternate years, or On Demand 3 cr. LEC 3
PREREQUISITE: MA in Educational Leadership or Principal's Certification, and EDLD 508.
- The course focuses on increasing the knowledge and skills of supervising and leading instruction on a district or school systems basis. Emphasis is given to dimensions of leadership at the district level including supervision of the leadership team, aligning the vision, mission, and strategic plan with student needs, professional growth, and maximizing resources to support teaching and learning.

EDLD 645 PERSONNEL MANAGEMENT IN EDUCATION
F & On Demand 3 cr. LEC 3
PREREQUISITE: Principal's Certification or concurrent enrollment in EDLD 508.
- This course is designed to prepare educational leaders to apply effective job analysis procedures, to understand performance appraisal for instructional and non-instructional staff, formulate professional growth plans, negotiate union agreements, and apply appropriate policies, criteria, processes for recruitment, selection, induction, and compensation of personnel with an emphasis on equity and diversity.

EDLD 650 RESOURCE MANAGEMENT: FINANCE AND FACILITIES
F alternate years & On Demand; Su 3 cr. LEC 3
PREREQUISITE: Principal's Certification, or concurrent enrollment in EDLD 555.
- This course is designed to facilitate a more in-depth understanding of the efficient and effective use of finances, facilities, and other tangible and intangible resources at the school district level. An emphasis will be placed on equitable distribution of resources and the alignment of resources to strategic plans and district vision.

EDLD 655 LEGAL AND POLICY STUDIES
S & On Demand 5 cr. LEC 3
PREREQUISITE: Principal's Certification, or concurrent enrollment in EDLD 532.
- This course is designed to facilitate a more in-depth understanding of legal issues relative to educating and their policy implications. Students will increase their understanding of how legal decisions impact their school. They will explore policy analysis and implementation, and develop an understanding of how laws, policies, and systemic organizational life are intertwined.

EDLD 690 DOCTORAL THESIS
F, S Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing. Restricted Entry.
- This course will address responsible conduct of research.

EDSD Education, Secondary Department of Education
(406) 994-3120

EDSD 301 TEACHING PRACTICUM
F 1-3 cr. LAB 1-3
PREREQUISITE: EDSD 300 and good standing in Teacher Education program.
COREQUISITE: EDSD 413.
- Observation and teaching in a classroom setting; preparation and delivery of lesson plans. The student teaching experience will occur under the supervision of experienced teachers and MSU staff supervisors. Observational participation at grades five and/or six also takes place.

EDSD 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: EDSD 400 Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDSD 410 STUDENT TEACHING
F, S, Su 5 - 12 cr. IND
PREREQUISITE: Senior standing, completion of all required EDSD special methods courses, and good standing in Teacher Education Program.
COREQUISITE: EDSD 413.
- Observation and teaching in a classroom setting; preparation and delivery of lesson plans. The student teaching experience will occur under the supervision of experienced teachers and MSU staff supervisors. Observational participation at grades five and/or six also takes place.

EDSD 413 PROFESSIONAL ISSUES
F, S 2 cr. LEC 2
PREREQUISITE: Senior standing, completion of all EDSD special methods courses, and good standing in Teacher Education Program.
COREQUISITE: EDSD 410.
- Senior capstone course. Role of the teacher in the contemporary secondary school. Overview of salient issues to include applied evaluation, classroom management and discipline, cooperative learning, law, contracts, certification, professional organizations, ethics, resume, job seeking, and professionalism.

EDSD 450 CONTENT AREA READING
S 2 cr. LEC 2
PREREQUISITE: EDSD 355 or EDSD 405.
- Techniques, materials, organization, and theory in teaching effective reading skills in all content fields, grades 5-12.

EDSD 452 METHODS OF TEACHING VOCATIONAL AGRICULTURE & TECHNOLOGY EDUCATION
F 3 cr. LEC 3
PREREQUISITE: EDSD 360, 20 or more credits in subject area and good standing in Teacher Education program.
COREQUISITE: EDSD 301 (for teaching majors in this subject).
- Problem solving approach to planning (including lesson/unit), teaching and evaluating vocational and technology education at the middle and secondary school levels. Content area reading will be investigated. Includes classroom paraprofessional experience.

EDSD 453 METHODS OF TEACHING ART
S 3 cr. LEC 2 LAB 1
PREREQUISITE: EDSD 360, 20 or more credits in subject area and good standing in Teacher Education program.
COREQUISITE: EDSD 301 (for teaching majors in this subject).
- Emphasizes the teacher-artist as the essential resource for art experiences in the schools. Readings and written assignments, exploring curriculum content and program implementation, media, resources, content reading, lesson/unit planning and evaluation issues in art education. Includes classroom paraprofessional experience.

EDSD 457 METHODS OF TEACHING ENGLISH
S 3 cr. LEC 3
PREREQUISITE: EDSD 360, 20 or more credits in subject area and good standing in Teacher Education Program.
COREQUISITE: EDSD 301 (for teaching majors in this subject).
- Teaching strategies, methods and materials for planning (including lesson/unit), implementing, teaching, and evaluating language arts instruction. Includes components on course design, writing, reading, literature, speaking and media instruction, and professional development. Includes classroom paraprofessional experience.

EDSD 458 METHODS OF TEACHING SOCIAL STUDIES
F, S 5 cr. LEC 3
PREREQUISITE: EDSD 360, 20 or more credits in subject area, and good standing in Teacher Education Program.
COREQUISITE: EDSD 301 (for teaching majors in this subject).
- Curriculum, materials, procedures and content reading for planning (including lesson/unit), implementing, teaching, and evaluating social studies programs in secondary schools. Includes classroom paraprofessional experience.
COURSE DESCRIPTIONS: EDSD 459 - EE 290R

EDSD 459 METHODS OF TEACHING FAMILY AND CONSUMER SCIENCES
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EDSD 301, 20 or more credits in subject area, and good standing in Teacher Education Program.
COREQUISITE: EDSD 301 (for teaching majors in this subject).
- Teaching strategies, methods, materials, and content reading for planning (including lesson/unit); implementing and evaluating family and consumer science programs. Includes classroom paraprofessional experience.

EDSD 461 METHODS OF TEACHING SENIOR HIGH MATHEMATICS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EDSD 301, 20 or more credits in subject area, and good standing in Teacher Education Program.
COREQUISITE: EDSD 301 (for teaching majors in this subject).
- Effective techniques in presenting materials, and planning class activities (including lesson/unit). Methods of teaching and evaluating algebra, geometry, trigonometry, probability/statistics; application of current mathematics education research and reading in the content area of mathematics. Includes classroom paraprofessional experience.

EDSD 465 METHODS OF TEACHING SECONDARY HEALTH IMPROVEMENT
S 3 cr. LEC 3
PREREQUISITE: EDSD 301, 20 or more credits in subject area, and good standing in Teacher Education Program.
- Developing pedagogical content knowledge by focusing on research based instructional strategies, methods, materials, and content reading for planning, implementing, and evaluating health improvement lessons, units, and programs in secondary schools. Includes classroom paraprofessional experience.

EDSD 466 METHODS OF TEACHING SECONDARY SCIENCE
F S 3 cr. LEC 3
PREREQUISITE: EDSD 301, 20 or more credits in subject area, and admission to the Teacher Education Program.
COREQUISITE: EDSD 301 (for teaching majors in this subject).
COREQUISITE: For science majors: EDSD 400.
- Focuses on methods of planning (including lesson/unit), teaching, and evaluating science inquiry skills, content, attitudes, and safety in the secondary classroom.

EDSD 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. Maximum 6 cr.
PREREQUISITE: Junor standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

EDSD 471R METHODS OF TEACHING MIDDLE SCHOOL MATHEMATICS
S 3 cr. LEC 3
PREREQUISITE: EDSD 301, 20 or more credits in subject area, and good standing in Teacher Education Program.
- Effective techniques in presenting materials, planning class activities, and creating good learning experiences. Methods of teaching and evaluating arithmetic, remedial mathematics, basic geometry, introductory algebra, and reading/writing mathematics.

EDSD 480 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDSD 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: EDSD 490
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EDSD 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F S 14 cr. END May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

EDSD 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. Maximum 6 cr.
PREREQUISITE: Good standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

EDSD 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EE Electrical Engineering
Department of Electrical & Computer Engineering

EE 101 INTRODUCTION TO ELECTRICAL FUNDAMENTALS
F S 2 cr. LEC 1 LAB 1
PREREQUISITE: M 151 or equivalent.
- Lecture/laboratory introduction to electrical fundamentals including Kirchhoff’s and Ohm’s Laws, using meters and oscilloscopes, time-varying signals in electric circuits, inductors and capacitors, series and parallel circuits, introduction to digital circuits, troubleshooting and troubleshooting computer applications, technical communications, team work.

EE 206 CIRCUITS I
F S 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 101, M 172.
COREQUISITE: PHYSICS 212.
- Introduction to circuit analysis including Ohm’s and Kirchhoff’s Laws, nodal and mesh methods, network theorems; resistors, capacitors, inductors, independent and dependent sources, diodes; ideal OP/AMP and transistor circuits; R-L, R-C, and R-L-C responses; complex frequency and phasors; steady-state AC circuits.

EE 207 CIRCUITS II
F S 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 206, M 274.
- Complete response of R-L-C circuits to step and harmonic excitations, coupled inductors and ideal transformers, two port networks, network functions and Bode plots, frequency response of circuits with non-ideal OP/AMP and transistor based amplifiers, Laplace Transform and Fourier series.

EE 217 THE SCIENCE OF SOUND
S 2 cr. LEC 2
PREREQUISITE: M 121, M 135, or M 145, or the equivalent.
- Introduction to the principles of musical acoustics, sound systems, and audio technology for non-engineering students. This course is particularly geared toward students in the College of Arts and Architecture and in the Music Technology program.

EE 250 CIRCUITS, DEVICES, AND MOTORS
F S 4 cr. LEC 3 LAB 1
PREREQUISITE: M 166 or M 172.
COREQUISITE: PHYS 212 or PHYS 206.
- Introduction for non-majors to electrical circuit principles, voltage and current laws, frequency response; introduction to electronic circuits including transistors, operational amplifiers, and power electronics; digital logic; introduction to electromechanical energy conversion devices, DC and AC machines, special purpose machines.

EE 261 INTRODUCTION TO LOGIC CIRCUITS
F S 3 cr. LEC 3
COREQUISITE: M 171.
- An introductory course in the fundamental concepts of classical digital design. Covers design and implementation of combinational logic circuits, synchronous sequential circuits and information storage circuits. Basic concepts of programmable logic devices and computer-aided design tools are presented.

EE 262 LOGIC CIRCUITS LABORATORY
F S 1 cr. LEC 1
PREREQUISITE: EE 261.
- Application of digital circuit theory and logic circuit design, utilizing both discrete and programmable logic. Design of IC timing circuits for digital clock applications.

EE 270 INDEPENDENT STUDY
On Demand 1 - 2 cr. Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

EE 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EE 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S 1-5 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EE 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F S 16 cr. END may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.
EE 301 MULTIDISCIPLINARY SEMINARS
F 3 cr. SEM 1
PREREQUISITE: Junior standing.
- Students attend seminars presented by a variety of departments and disciplines to gain an appreciation of multidisciplinary environments leading to a greater understanding of the impact of engineering solutions in a global and societal context.

EE 308 SIGNAL AND SYSTEM ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: EE 207, M 273.
- Discrete and continuous time signals and systems.
- Properties, application, synthesis and analysis for the CT and DT Fourier Series, the Fourier transform, the DFT, z and Laplace transform. Applications in differential and difference equations, sampling, feedback, and communications. Introduction to the DFT.

EE 317 ELECTRONICS
F 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 207.
- This is an introductory course in electronics. It introduces diodes, bipolar junction transistors, field effect transistors and bipolar and MOS analog and digital circuits.

EE 321 INTRODUCTION TO CONTROLS
S 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 308 or consent of instructor.
- Classical continuous-time, transfer function approach to control systems engineering.
- Approximations, linearization, and time response.
- Design and analysis via root-locus, Nyquist, and Bode methods.
- Proportional, dominant pole, lead, lag, PID, and minor loop compensation. Describing functions. Lab exercises incorporate a variety of hand-on control systems.

EE 334 ELECTROMAGNETIC THEORY I
F 3 cr. LEC 3
PREREQUISITE: PHYS 212, M 273.
- Basic electric and magnetic fields including transmission lines. The materials covered will include both static and dynamic fields, traveling waves, and transmission line concepts such as impedance, reflection coefficient, and transient response.

EE 335 ELECTROMAGNETIC THEORY II
S 3 cr. LEC 3
PREREQUISITE: EE 334.
- This course provides students the opportunity to gain more depth in EM fields topics such as Maxwell’s equations, plane wave propagation, reflection and antennas, and the use of the Smith Chart.

EE 354 ELECTRIC POWER APPLICATIONS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: M 166 or M 171 and PHYS 206 or PHYS 212.
- An applied study of electricity and electrical power circuits, with laboratory experience, for that person not expected to deal with electronics or advanced circuit techniques. Topics covered include electrical circuit laws; power and energy; alternating current circuits; residential, commercial and industrial wiring; wire sizing; three-phase circuits; and application of transformers and electric motors.

EE 355 ENERGY CONVERSION DEVICES
S 4 cr. LEC 5 LAB 1
PREREQUISITE: EE 207.
- Introduction to electrical energy conversion devices such as DC and AC generators and motors, transformers, single phase and special purpose motors, and power electronic converters; three-phase circuits; introduction to power systems. Laboratory experience includes construction and demonstration of energy conversion circuits.

EE 367 LOGIC DESIGN
S 4 cr. LEC 5 LAB 1
PREREQUISITE: EE 262 and EE 371.
- Advanced combinational and sequential logic design. Hardware descriptive language (HDL) programming knowledge. Laboratory experience implementing advanced logic designs using FPGAs.

EE 371 MICROPROCESSOR
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 207 and knowledge of a programming language or consent of instructor.
- Introduction to the structure of microprocessors, arithmetic and logic units, processor control, interrupts, memories, and input/output. Laboratory experience in assembly level programming of microprocessor applications.

EE 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 1 cr.
PREREQUISITE: Junior standing.
- Engineers from industry and others present weekly seminars about new developments in EE, research at MSU, law and the EE, starting companies, etc. The course is designed to expose students to different career options and present background in related areas.

EE 407 INTRODUCTION TO MICROFABRICATION
S 3 cr. LEC 2 LAB 1
PREREQUISITE: Junior standing and PHYS 212 or PHYS 206.
- Provide an introduction to clean room safety, basic electronic devices. Human psychoacoustics.
- Introduction to the fundamentals of CMOS VLSI circuit design. This course covers CMOS device characteristics and timing, CMOS fabrication, CAD tools, design rules, simulation and layout, CMOS combinational and sequential logic, SRAM and DRAM memory, and dynamic logic design.

EE 417 ACOUSTICS AND AUDIO ENGINEERING
F alternate years, to be offered even years 5 cr. LEC 3.
PREREQUISITE: PHYS 212.

EE 422 INTRODUCTION TO MODERN CONTROL
F 3 cr. LEC 3.
PREREQUISITE: EE 321.

EE 433 PLANAR MICROWAVE CIRCUIT DESIGN
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 334.
- An introductory course on microwave circuits emphasizing the design, fabrication and measurement of planar circuits (matching networks, filters, couplers, mixers, etc.) for frequencies above 1 GHz. Students will learn to use state-of-the-art CAD tools and a vector network analyzer.

EE 445 TELECOMMUNICATIONS SYSTEMS
S 4 cr. LEC 5 LAB 1
PREREQUISITE: EE 308, EE 317.
- Introduction to analog and digital communication systems with lab. Topics include signals in communications; noise characteristics; bandwidth considerations; probability of error; analog and digital modulation; frequency domain analysis; matched filter applications. Experiments involve modulation, demodulation, A/Ds, sampling theory, and aliasing.

EE 447 MOBILE WIRELESS COMMUNICATIONS
F 3 cr. LEC 3.
PREREQUISITE: EE 445.
- Characteristics of the radio environment, propagation, cellular concepts, channel allocation, modulation techniques, multiple access techniques, Shannon’s Capacity Theorem, error-correcting codes, data compression, spread spectrum modulation, current wireless communication systems.

EE 451 POWER ELECTRONICS
S alternate years, to be offered even years 3 cr.
PREREQUISITE: EE 262 LAB 1.
- Introduction to solid-state power devices; topologies, operating principles, and control methods of solid-state power converters; applications of solid-state power converters in different electric systems.

EE 454 ELECTRIC POWER SYSTEMS
F 3 cr. LEC 3.
PREREQUISITE: EE 355.
- Power system components, transmission system design, power flow studies, automatic generation control, symmetrical components, faulted power systems, protection, introduction to transient stability.
### COURSE DESCRIPTIONS: EE 455 - EE 528

#### EE 455 ALTERNATIVE ENERGY POWER GENERATION
S, alternate years, to be offered even years 3 cr. LEC 3.
- PREREQUISITE: EE 355 or equivalent.
- Exploration and analysis of alternative power generation sources and systems such as wind, solar, microturbine, and fuel cells, combined sources and their design, power electronic interfacing, and energy storage systems.

#### EE 461 DIGITAL SYSTEM DESIGN
S, alternate years, to be offered even years 3 cr. LEC 3.
- PREREQUISITE: EE 308 and EE 334 and EE 371.
- Analysis and design of high speed digital systems including chip-to-chip signal propagation, transmission lines, PC package interconnect, printed circuit board design, state-of-the-art simulation tools, and measurement techniques using Time Domain Reflectometry (TDR).

#### EE 465 REAL TIME MICROCONTROLLER APPLICATIONS
S 4 cr. LEC 2 LAB 2
- PREREQUISITE: EE 371.
- Lecture/laboratory exposure to microcontroller hardware and software applications, serial and parallel I/O, timing, interrupts LCDs, keyboards, A to D conversion, and a project realizing a real time control problem.

#### EE 466 COMPUTER ARCHITECTURE AND SYSTEM ORGANIZATION
S 4 cr. LEC 3 LAB 1
- PREREQUISITE: EE 367 and CS 201.
- Design of computer system instruction sets, data path, storage, memory systems, and interfaces. Cost and speed relations, tradeoffs between hardware and software architectures including CISCs and RISCs, multiprocessors, and distributed processors. Control and implementation tradeoffs. Laboratory experience implementing soft processors and custom logic in FPGAs.

#### EE 470 INDEPENDENT STUDY
On Demand 1 - 2 cr. IND Maximum 4 cr.
- PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

#### EE 475 HARDWARE AND SOFTWARE ENGINEERING FOR EMBEDDED SYSTEMS
F 3 cr. LEC 2 LAB 1
- PREREQUISITE: EE 367 and CS 201.
- Topics in embedded system design, real-time operating systems, high level language programming of embedded systems, software and hardware tradeoffs, and laboratory experience with embedded systems.

#### EE 476 INTERNSHIP
F, S, Su 1-2 cr. IND Maximum 5 cr.
- PREREQUISITE: Sophomore standing and consent of instructor.
- On-site, one semester practicum under guidance of employer designated mentor.

#### EE 477 DIGITAL SIGNAL PROCESSING
S 4 cr. LEC 3 LAB 1
- PREREQUISITE: EE 308.
- Analysis and design of discrete-time systems, including frequency response. Sampling and reconstruction of continuous signals. Analysis, design, and applications of FIR and IIR digital filters. Properties and applications of the discrete Fourier transform. Laboratory experience implementing offline and real time digital signal processing algorithms.

#### EE 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
- PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

#### EE 482 ELECTRO-OPTICAL SYSTEMS
F 3 cr. LEC 2 LAB 1
- PREREQUISITE: EE 334 or PHYS 317 or equivalent.
- Provides an overview of electro-optic systems and components. Lectures cover ray optics, scalar wave optics, laser and Gaussian beam optics, optical polarization and polarization devices, light sources, detectors, and electro-optic and acoustic-phonic devices. Laboratory experiments introduce basic photonic instrumentation and measurement techniques.

#### EE 483 FIBER AND OPTICAL COMMUNICATIONS
S alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
- PREREQUISITE: PHYS 213 AND EE 334 or PHYS 318.
- This introduction to fiber and integrated optics components for telecommunications systems includes: ray tracing, graded index lenses, single mode and multimode optical fiber, fiber Bragg gratings, wave guides, WDM components, light sources and detectors, optical link design, link budgets and optical system architectures.

#### EE 484 LASER ENGINEERING
S alternate years, to be offered even years 3 cr. LEC 3.
- PREREQUISITE: PHYS 212.
- The laser engineering course provides a basic understanding of the design and operational principles of lasers. Discussions of design and operation of several types of lasers will be covered including solid state lasers, gas lasers, and semiconductor lasers.

#### EE 489R UNDERGRADUATE RESEARCH / CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
- PREREQUISITE: EE 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

#### EE 490R UNDERGRADUATE RESEARCH / CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 6 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

#### EE 492R ELECTRICAL ENGINEERING DESIGN II
F, S 3 cr. SEM 1 LAB 2
- PREREQUISITE: ENGR 310.
- Senior capstone course. A design project culminates with the actual construction and demonstration of the results. Design teams report progress to the design supervisor periodically. Students are required to write a technical paper, participate in a Design Fair, and generate complete technical documentation for the project.

#### EE 495 PROFESSIONALISM, ETHICS AND ENGINEERING PRACTICES
S 1 cr. LEC 1
- PREREQUISITE: Junior standing.
- Engineers from industry and others give presentations on professionalism, ethics, and engineering practices. Included are specific well-known, historical engineering ethics cases and professional practices of engineering, intellectual property issues, and new developments.

#### EE 498 CO-OP EXPERIENCE
F, S, Su 3 cr. IND
- PREREQUISITE: Junior standing, GPA of 3.00 or better.
- On-site cooperative work experience for electrical engineering co-op students.

#### EE 503 ADVANCED ANALOG CIRCUIT DESIGN
F alternate years, to be offered odd years 3 cr. LEC 3.
- PREREQUISITE: EE 317.
- Solid-state device models, pnp and pmos and other computer simulations, single and multiple state amplifier design, current sources, operation amplification design, frequency response, feedback and feed forward amplifier analysis, noise and distortion in electronics.

#### EE 505 MEMS SENSORS AND ACTUATORS
S alternate years, to be offered odd years 3 cr. LEC 3.
- PREREQUISITE: EE 409.
- Micro fabrication of electrical and mechanical devices. Theory of various mechanical transducers and physical sensors including optical MEMS, RF MEMS, and Bio/Chemical MEMS.

#### EE 522 ADAPTIVE CONTROL
S alternate years, to be offered even years 3 cr. LEC 3.
- PREREQUISITE: EE 422.
- On-line parameter estimation, self-tuning regulators, model reference adaptive controls. Robust control.

#### EE 525 SYSTEM IDENTIFICATION
F alternate years, to be offered odd years 3 cr. LEC 3.
- PREREQUISITE: EE 422.

#### EE 526 SEQUENTIAL STATE ESTIMATION
F alternate years, to be offered even years 3 cr. LEC 3.
- PREREQUISITE: EE 422.
- Sequential state estimation, with emphasis on Kalman filtering and smoothing. Continuous and discrete time.

#### EE 528 ADVANCED TOPICS - CONTROLS & SIGNALS
On Demand 3 cr. LEC 3 Max 6 cr.
- PREREQUISITE: EE 492 or equivalent.
- Reading, discussion and exploration of original source material on advanced control systems and signal processing. Topics selected to complement current interest and existing courses; for example, computational statistical methods, estimation, modeling, compression, advanced analytical techniques, multi-dimensional systems, spectral analysis, and implementation.
EE 533 ANTENNA ENGINEERING
F alternate years, to be offered even years
5 cr. LEC 3
PREREQUISITE: EE 534 or equivalent.
- Introduction to the electromagnetic theory and practice of antenna design and analysis.
Common antenna structures are studied, including dipoles, arrays, horns, and reflectors. Applications will be explored in wireless communication, remote sensing, and related fields. Numerical electromagnetic simulation techniques are used for antenna modeling.

EE 538 ADVANCED TOPICS IN ELECTROMAGNETICS AND OPTICS
On Demand 3 cr. LEC 3 MAX 6 cr.
PREREQUISITE: None.
- Advanced topics in applied electromagnetics and optics, chosen to represent current research in this field.

EE 541 ADVANCED COMMUNICATION THEORY
F alternate years, to be offered even years
5 cr. LEC 3
PREREQUISITE: EE 445.
- Introduction to the electromagnetic theory and practice of antenna design and analysis.
- Exploration and analysis of alternative power generation sources and systems such as wind, solar, microturbine, and fuel cells, combined sources and their design, power electronic interfacing, and energy storage systems.

EE 556 ADVANCED POWER ELECTRONICS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EE 451.
- Mathematical modeling of switching power converters, advanced power converter topologies, design constraints and control methods, design-oriented analysis techniques for applications in electromechanical systems, power systems, transportation systems, etc.

EE 558 ADVANCED TOPICS - ELECTRICAL POWER
On Demand 3 cr. LEC 3 MAX 6 cr.
PREREQUISITE: EE 445 or equivalent.
- Reading, discussion and exploration of advanced electrical power topics including power system operation and control, power dynamics, power markets, protection, electric drives, or power electronics.

EE 561 DIGITAL SYSTEM DESIGN
S alternate years, to be offered even years
3 cr. SEM 3
PREREQUISITE: EE 588 and EE 534 and EE 371.
- Reading and discussion of advanced digital system design topics including chip-based signal propagation, transmission lines, IC package interconnect, printed circuit boards, state-of-the-art simulation tools, and measurement techniques using Time Domain Reflectometry (TDR) and Vector Network Analyzers. Research of modern topics.

EE 565 PARALLEL PROCESSING
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EE 466.
- Architecture and applications of parallel processing systems, major trends and techniques, fault-tolerant computing, performance measures of parallel systems, and issues in concurrent programming.

EE 570 INDEPENDENT STUDY
On Demand 1 - 6 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor. Supervisor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

EE 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 5 - 6 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. This course is required for students in the Electrical Engineering non-thesis (plan B) master’s degree program.

EE 577 ADVANCED DIGITAL SIGNAL PROCESSING
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EE 477.
- Advanced topics in digital signal processing. Review of LTI discrete-time systems; signal and coefficient quantization; sample rate conversion and multirate filter structures; time-varying and adaptive systems; fast algorithms; system implementation alternatives; DSP applications in current research.

EE 578 SPEECH SIGNAL PROCESSING
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EE 477.
- Digital signal processing techniques that are used to analyze, code, and manipulate speech signals will be covered. Topics include modification, coding, enhancement, and recognition of speech signals.

EE 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EE 581 FOURIER OPTICS AND IMAGING THEORY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EE 534 or consent of instructor.
- Optical propagation and diffraction using scalar wave approach and Fourier Theory of imaging. Introduces concepts of pupil function, point and line spread function and optical transfer function. Develops image formation with coherent and incoherent light, holography and diffractive optical elements.

EE 582 OPTICAL DESIGN
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EE 482 or PHYS 425.
- Optical design using geometric optics and computer ray-tracing software. Introduces ray and wave front aberrations, control of aberrations in optical systems, designing for system requirements, and analytic tools including the modulation transfer function for describing the imaging and beam-conditioning properties of typical optical systems, including lenses, mirrors, cameras, and telescopes.

EE 583 REMOTE SENSING SYSTEMS
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EE 534 or PHYS 317 or equivalent.
- Design, analysis, and calibration of electromagnetic remote sensing systems. Combines an introduction to atmospheric radiative transfer and wave propagation principles with detailed coverage of radiometry and optical detectors to analyze remote sensing systems. The course considers the full electromagnetic spectrum, but emphasizes optical systems at ultraviolet, visible, and infrared wavelengths, including cameras, spectrometers, radiometers, polarimeters, multispectral and hyperspectral imagers, laser radars, etc.

EE 589 GRADUATE CONSULTATION
F, S, Su 1 - 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

EE 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

EE 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.
EM
Engineering Mechanics
Department of Civil Engineering
(406) 994-2111

EM 205 MECHANICS
F, S 3 cr. LEC 3
PREREQUISITE: PHYS 205.
COREQUISITE: M 166.
- Force systems in equilibrium and applications to structural trusses and frames; section properties; distributed force systems; shear and moment distributions in beams; basic particle dynamics.

EM 215 STRENGTH OF MATERIALS
F, S 3 cr. LEC 3
PREREQUISITE: EM 205.
- Equilibrium and deformation of structural elements; concepts of stress and strain and inter-relationship; representation and transformation of combined stress states; axial, torsional and flexural stresses and deformation; column buckling.

EM 251 STATICS
F, S Su 3 cr. LEC 3
PREREQUISITE: PHYS 211.
COREQUISITE: M 275.
- Equilibrium of particles and rigid bodies; static analysis of structures including trusses, beams, frames and machines; coulomb friction; area and mass centroids, moments and products of inertia.

EM 252 DYNAMICS
F, S Su On Demand 3 cr. LEC 3
PREREQUISITE: EM 251.
- Kinematics, kinetics, work-energy, and impulse-momentum for particles and rigid bodies.

EM 253 MECHANICS OF MATERIALS
F, S Su On Demand 3 cr. LEC 3
PREREQUISITE: EM 251.
- Stress and strain, Hooke’s Law, thermal strain, torsion, bending of beams, combined stress, limit analysis, energy methods, virtual work, column theory.

EM 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or on a trial basis to determine acceptability and demand before requesting a regular course number.

EM 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EM 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

EM 331 APPLIED FLUID MECHANICS
F, S 3 cr. LEC 3
PREREQUISITE: EM 215 or EM 253.
- Basic principles of fluid mechanics: pressure measurement, forces on submerged areas, fluid flow through conduits, parallel pipe systems, open channel flow, forces caused by fluids in motion, pumps, flow of air in ducts.

EM 335 MECHANICS OF FLUIDS
F, S 3 cr. LEC 3
PREREQUISITE: EM 252, EM 253.
- Introduction to modern fluid mechanics.

EM 415 ADVANCED MECHANICS OF SOLIDS
F 3 cr. LEC 3
PREREQUISITE: EM 253.
- Advanced topics in deformational mechanics of materials; application to contemporary engineering problems. Computer applications.

EM 455 FLUID DYNAMICS
S 3 cr. LEC 3
PREREQUISITE: EM 335.
- Equations governing steady and unsteady fluid flow; applications to contemporary engineering problems. Computer applications.

EM 470 INDIVIDUAL PROBLEMS
On Demand 1 - 3 cr. IND Maximum 4 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head.
- Directed research and study on an individual basis.

EM 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or on a trial basis to determine acceptability and demand before requesting a regular course number.

EM 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: EM 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EM 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S Su 1 - 4 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

EM 506 ADVANCED DYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: EM 335.
- Kinematics of particles, rigid bodies, and mechanisms. Lagrange’s equations, constraints, applications, and numerical solutions.

EM 510 ELASTIC AND INELASTIC ANALYSIS I
S 3 cr. LEC 3
PREREQUISITE: EM 525 or EM 415.
- Fundamentals of linear elasticity, linear visco-elasticity and plasticity. A previous knowledge of Cartesian tensors in conjunction with small deformation stress and strain theory are expected. Correspondence principles for elastic and visco-elastic materials and analogy between elastic and inelastic materials will be presented. Constitutive theories of linear elasticity, linear viscoelasticity, and plasticity. Application to static structural theories for beams, torsion, plane stress, and plane strain will be covered for elastic and inelastic behavior.

EM 512 ELASTIC AND INELASTIC ANALYSIS II
On Demand 3 cr. LEC 3
PREREQUISITE: EM 510.
- Topics in two and three dimensional linear and nonlinear elasticity, viscoelasticity, and plasticity, including large deformation theory, computer applications.

EM 518 THEORY OF PLATES & SHELLS
S alternate years, to be offered even years
2 cr. LEC 2
PREREQUISITE: EM 415.
- Theory of small plate deformations, membrane shell theory, shell bending.

EM 525 CONTINUUM MECHANICS
F 3 cr. LEC 3
PREREQUISITE: EM 415 or ME 426.
- Solid and fluid mechanics, laws of vector and tensor transformations, vector and tensor calculus using cartesian tensors, theory of deformation, principles of thermodynamics, constitutive equations for elastic solids and viscous fluids.

EM 526 ADVANCED CONTINUUM MECHANICS
On Demand 3 cr. LEC 3
PREREQUISITE: EM 525.
- Laws of vector and tensor transformations using non-orthogonal tensors. Large deformation theory, constitutive equations for nonlinear solids and fluids.

EM 560 FINITE ELEMENT ANALYSIS IN ENGINEERING
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EM 415 or EM 435.
- General finite element analysis. Application to the classical equations of fluid, solid, and thermal mechanics.

EM 570 INDIVIDUAL PROBLEMS
On Demand 1 - 3 cr. IND Maximum 4 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

EM 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or on a trial basis to determine acceptability and demand before requesting a regular course number.

ENGL, LIT, WRIT

English
Department of English
(406) 994-3768

WRIT 080 BUILDING BASIC WRITING SKILLS (COT-GF)
F 4 cr. LEC 4
- Building Basic Writing Skills introduces students to critical reading practices by focusing on textual analysis of non-fiction works and to writing for academic purposes by focusing on the development of the paragraph. The course also provides, in the context of writing, a review and reinforcement of principles of English grammar and punctuation associated with successful college-level writing. The goal of this course is to develop confidence and the ability to write clear and effective paragraphs and to read college-level texts. Offered in partnership with the COT in Bozeman.
WRIT 095 DEVELOPMENTAL WRITING (COT-GF)
F S 4 cr. LEC 4
- Developmental Writing introduces students to critical reading practices within thematic non-fiction, fosters students' critical thinking based on textual analysis, and encourages questioning and exploration. Composing paragraphs and short essays provides a review and reinforcement of principles of English grammar and punctuation associated with successful college-level writing. Confidence and ability to write clear and effective sentences are assumed. Offered in partnership with the COT in Bozeman.

WRIT 101W COLLEGE WRITING I
F S Su 3 cr. RCT 3
- Studies in the discovery and written expression of ideas, stressing organization, support, audience awareness, clarity, and persuasive presentation. Taught around a particular topic or theme varying with each offering.

LIT 110H INTRODUCTION TO LITERATURE
F S 3 cr. RCT 3
- Introduction to basic concepts including but not limited to: plot, character, theme, symbol, and the primary literary modes of poetry, fiction, and drama. Students will be introduced to terms through a standard handbook which should accommodate all future English courses.

LIT 201 INTRODUCTION TO LITERARY STUDIES
F S 3 cr. SEM 3
- This writing-intensive introduction to the English major will prepare students for advanced study in literature by providing them with the foundational skills of literary analysis, literary theory, disciplinary methodologies, and close readings of literary texts.

WRIT 201 COLLEGE WRITING II
F S 3 cr. RCT 3
PREREQUISITE: WRIT 101W.
- Study and practice of strategies and devices of expository and argumentative prose. Builds upon writing skills learned in WRIT 101.

LIT 214D REGIONAL LIT
F S 3 cr. RCT 3
- Examination of American literary regions in the context of critical multiculturalism. Analyzes topics such as the development of local color writing, borderlands/transnational studies, and the concept of the frontier as contact zone. May focus on a specific regional literature or adopt a comparative approach.

WRIT 221 INTERMEDIATE TECH WRITING
F S 3 cr. RCT 3
PREREQUISITE: WRIT 101W.
- Focuses on kinds of writing done in technical or business environments: business letters, proposals, formal reports, technical presentations, user manuals, etc. Prepares students for technical writing in a range of disciplines and with attention to the social implications of technology.

LIT 233 CLASSICAL FNDTNS OF LIT
S 5 cr. LEC 3
- Study of the literature of Classical Greece and Rome and how this tradition has influenced subsequent literature.

ENGL 256H THEORY AND METHODS IN LINGUISTICS
F S 5 cr. LEC 3
- Examines the nature and function of linguistic systems, the psychology of language, the relationship between language and culture, usage patterns, linguistic variety and change, and levels of linguistic analysis.

ENGL 258H THE STRUCTURE AND FUNCTION OF LANGUAGE
F S 3 cr. LEC 3
- Focused study of how meaning is made in the English language, primarily through grammar. From parts of speech to sentence construction, this course will assist students in evaluating literary writing styles as well as in improving their own.

LIT 240 BIBLE AS LIT
F 3 cr. LEC 3
- Study of the Bible and related texts and how this tradition has influenced subsequent literature.

LIT 240H MYTHOLOGIES
F S 3 cr. RCT 3
- The study of specific cultural mythologies to explore the nature, function, and theory of myth.

ENGL 248H UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ENGL 249H UNDERGRADUATE RESEARCH
F S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ENGL 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by the department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENGL 292 INDEPENDENT STUDY
On Demand 1 - 3 cr. ENDT Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

LIT 300 LITERARY CRITICISM
F S 3 cr. RCT 3
PREREQUISITE: LIT 201.
- Historical survey of principles, problems, and strategies of literary criticism.

LIT 308 MULTICULTURAL LIT
S 3 cr. RCT 3
PREREQUISITE: LIT 201.
- Designed specifically for English Education students. Focuses on literature by American minorities, women, and ethnic subcultures. Includes young adult literature, popular literature, and the work of one or more Montana Native American writers.

LIT 310 EARLY AMERICAN LIT
S alternate years, to be offered every even years 5 cr. RCT 3
PREREQUISITE: LIT 201.
- Intensive studies in early American literature, with attention to development of a distinct national literature and culture.

LIT 311 19TH CENTURY AMER LIT
F alternate years, to be offered odd years 3 cr. RCT 3
PREREQUISITE: LIT 201.
- Intensive studies in selected literary works by 19th-century American writers, with attention to historical context, particularly America’s evolving national culture.

LIT 323 BRIT/OLD/MID ENGLISH LIT
F alternate years, to be offered every years 3 cr. RCT 3
PREREQUISITE: LIT 201.
- Intensive studies in selected literary works of the 16th and 17th centuries, with attention to historical and cultural context.

LIT 324 16TH/17TH CTRY BRIT LIT
F alternate years, to be offered every years 3 cr. RCT 3
PREREQUISITE: LIT 201.
- Intensive studies in selected literary works by writers of the Restoration period and 18th-century England, with attention to historical and cultural context.

LIT 326 19TH CENTURY BRITISH LIT
F alternate years, to be offered even years 3 cr. RCT 3
PREREQUISITE: LIT 201.
- Intensive studies in selected literary works by 19th-century British writers, with attention to historical and cultural context.

WRIT 326 ADVANCED COMPOSITION
F S 3 cr. RCT 3
PREREQUISITE: WRIT 201 or WRIT 221.
- Advanced composition with attention to research writing, academic standards of evidence, logic, and development of style.

LIT 335 WOMEN & LIT
F alternate years, to be offered odd years 3 cr. RCT 3
PREREQUISITE: LIT 201.
- A study of the relationship between women and literature, with some attention to feminist approaches to critical interpretation.

LIT 337 ORAL TRADITIONS
S 3 cr. LEC 3
PREREQUISITE: LIT 201.
- An examination of oral poetic/story traditions with emphasis on theory and primary materials. Students will be expected to make oral presentations based on class research.

ENGL 338 LANGUAGE FOR TEACHERS
S 3 cr. RCT 3
PREREQUISITE: WRIT 101.
- Designed to provide English Teaching option students with an overview of linguistic systems, such as phonetics, phonemics, and semantics, and an intensive study of the structure of American English.
ENGL 339 TEACHING
COMPOSITION, RHETORIC & SPEECH
F 3 cr. RCT 3
PREREQUISITE: WRIT 101.
- This course explores practical and theoretical issues around writing instruction (introducing several approaches to composition pedagogy and working with student texts), rhetoric (attending to, for example, theories of argument and audience), and speech (focusing on preparing students for oral presentation).

LIT 371 20TH CTRY BRIT/AMER LIT
F alternate years, to be offered every even 5 cr. RCT 3
PREREQUISITE: LIT 201.
- Intensive study of selected English literary works by British and American authors, and in various genres written between the end of the 19th century and World War II, with attention to historical and cultural contexts and current literary trends and issues.

LIT 382 LIT FOR CHILDREN/ADOLESCENTS
F alternate years, to be offered every even cr. RCT 3
PREREQUISITE: LIT 201.
- Studies in selected literary works for children and young adults. The course may focus on genres, authors, themes, and/or critical approaches.

ENGL 385 HISTORY
OF THE ENGLISH LANGUAGE
S alternate years, to be offered every even 5 cr. LEC 3
PREREQUISITE: ENGL 235, or ENGL 236, or ENGL 334.
- Development of the English language from Old English to contemporary English, with focus on structure, phonology, dialects, and external influences. Readings in Old and Middle English.

ENGL 428 CREATIVE WRITING
F, S 3 cr. RCT 3 Maximum 6 cr.
PREREQUISITE: WRIT 101, junior standing and consent of instructor based on review of writing sample provided by student.
- Exploration of professional writing techniques in a particular genre, such as fiction, poetry, playwriting, autobiographical writing, creative nonfiction.

WRIT 429 PROFESSIONAL WRITING
S alternate years, to be offered every even 3 cr. RCT 3
PREREQUISITE: WRIT 201 or WRIT 221.
- Intended for students who already have considerable skill and experience in expository writing. Focuses on professional writing designed to be read by the general public or a specialized audience.

LIT 431RH STUDIES IN MAJOR AUTHOR/S
F 3 cr. LEC 3 Maximum 6 cr.
PREREQUISITE: LIT 201 and at least one other literature course.
- Intensive study in the works, biography, and criticism of a particular author.

LIT 437 STUDIES IN GENRES
F alternate years, to be offered every even 3 cr. RCT 3
PREREQUISITE: LIT 201 and at least one other literature course.
- Intensive study of a single genre, such as the epic, novel, poem, dream vision, hypertext, or the idea of “genre” itself. Selection and approach will vary with each offering.

LIT 438 STUDIES IN LITERARY TOPICS
F 3 cr. LEC 3 Maximum 12 cr.
PREREQUISITE: LIT 201 and at least one other literature course.
- Provides an in-depth, rigorous analysis of current trends in literary scholarship. Organized around a specific theme, this course will expose students to new groups of literary works that cut across traditional historical, national, or generic boundaries.

LIT 440 STUDIES IN WORLD LIT
S 3 cr. LEC 3
PREREQUISITE: LIT 201 and at least one other literature course.
- Selected literary works in translation from non-English cultures and/or from English speaking cultures outside the United States and Britain.

ENGL 450 HISTORY AND
THEORY OF RHETORIC/COMPOSITION
F alternate years, to be offered every even 5 cr. RCT 3
PREREQUISITE: WRIT 201 or WRIT 221.
- Intensive study in composition/rhetorical theory, with attention to writing pedagogy.

ENGL 461R INTEGRATIVE
TEACHING METHODS
F 3 cr. RCT 3
PREREQUISITE: EDSD 457, senior standing.
- Senior capstone course for senior English teaching majors and minors. Integration of methodologies and English content for secondary school instruction through unit plans and videotaped mini-lessons. Class will include close analysis of issues and tasks central to the preparation of secondary teachers.

ENGL 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: junior standing, consent of instructor and approval of department chair.
- Directed research and study on an individual basis. May not be used in lieu of another required course in the English curriculum.

LIT 473RH STUDIES IN SHAKESPEARE
S 3 cr. RCT 3
PREREQUISITE: LIT 201 and at least one other literature course.
- Studies in selected Shakespearean works, drawn from tragedies, comedies, histories, romances, and poetry. Development of Shakespeare’s philosophy, poetics, and dramaturgy in the context of the Renaissance.

ENGL 476 INTERNSHIP
On Demand 1 - 12 cr. IND
PREREQUISITE: junior standing, consent of instructor and approval of department chair.
- An individual assignment arranged with an agency, business or other organization to provide guided experience in the field.

ENGL 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Topics not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENGL 490R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: ENGL 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ENGL 490R UNDERGRADUATE RESEARCH
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

ENGL 510 STUDIES IN
CRITICAL THEORY AND PRACTICE
S 3 cr. RCT 3
PREREQUISITE: Graduate standing and upper division literary theory courses.
- Topics in critical theory and practice. Explores how historical and contemporary theories of literature have shaped the ways readers, teachers, and critics have thought about such fundamental questions as canon formation, pedagogical practice, and the goals and purposes of literary studies as a field.

ENGL 530 STUDIES IN
WRITING THEORY AND PRACTICE
F 3 cr. RCT 3
PREREQUISITE: Graduate standing and upper division writing courses.
- Topics in rhetoric and composition. Examines a variety of models that have historically governed composition theory and writing practice.

ENGL 540 STUDIES IN THEORY AND
PRACTICE OF LITERARY HISTORY
F alternate years, to be offered every even 3 cr. RCT 3
PREREQUISITE: Graduate standing and upper division literary history courses.
- Topics in the theory and practice of literary history. Examines debates in the discipline on topics such as the production and reception of literary texts, the practice of periodization, and the relationship between literary studies and historiography.

ENGL 550 FOCUSED RESEARCH SEMINAR
S, F alternate years F odd years 3 cr. SEM
Maximum 6 cr.
PREREQUISITE: Graduate standing. Course prerequisites as determined for each offering.
- Topics offered at the graduate level not covered in the required courses. Involves directed research resulting in paper, as well as participation in preparing and presenting discussion material. Topics will vary.
ENGL 570 INDEPENDENT STUDY
On Demand 1 - 4 cr. END Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department chair and Dean of Graduate Studies.
– Directed research and study on an individual basis.

ENGL 575 PROFESSIONAL PAPER
F, S 1 - 4 cr. END Maximum 6 cr.
PREREQUISITE: Graduate standing.
– A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ENGL 576 INTERNSHIP
On Demand 1 - 12 IND
PREREQUISITE: Graduate standing, consent of instructor, approval of the department chair, and completion of 15 credits of graduate work in English.
– An individualized assignment arranged with an agency, business, school, or other organization to provide guided experience in the field.

ENGL 580 SPECIAL TOPICS
On Demand 1 - 4 cr. SEM Maximum 9 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
– Advanced study of topics in the discipline, in courses not required in any curriculum, including experimental offerings of visiting professors, trial offerings of new courses, or one-time offerings of current topics.

ENGL 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 5 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
– Courses offered on a one-time basis to fulfill professional development needs of service educators. A specific focus is given to each course, which is appropriately subtitled.

ENGL 590 MASTER'S THESIS
F, S 1 - 10 cr. END
PREREQUISITE: Graduate standing.
– A thesis dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ENGR 100 INTRODUCTION TO ENGINEERING
F 5 cr. LEC 1
– Provides students an opportunity to explore the fields of engineering, engineering technology, and computer science. Other topics include engineering design, career opportunities, professionalism, and ethics.

ENGR 125CS TECHNOLOGY, INNOVATION, AND SOCIETY
F, Su 5 cr. LEC 3
– This course explores the innovative engineering processes that connect the creative elements of science and engineering with solving problems of everyday life. Topics include understanding the role of creativity, public safety and ethics in creating technological solutions. Case studies are investigated, including applying critical thinking to exploring how innovation can help society.

ENGR 200 DESIGNING OUR COMMUNITY
F, S 1 cr. SEM
– This course is designed to explore issues in engineering and college academics for American Indian students in the Designing Our Community Program. The course will provide a learning community among students to ensure success in achieving their professional goals. Spring semester focuses on service learning projects.

ENGR 310R INTRODUCTION TO ENGINEERING DESIGN
F, S 3 cr. LEC 2 RCT 1
PREREQUISITE: Junior standing in an Engineering curriculum or consent of instructor.
– Introduces engineering students to topics such as design process, creative design, project management, teamwork, and technical leadership while highlighting the skills needed to work in a multidisciplinary environment.

ENGR 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENGR 499 ENGINEERING PROGRAM ASSESSMENT
F, S 0 cr. IND 0
PREREQUISITE: Must be in final two semesters of program.
– Student participation in engineering program assessment. Requirement to complete the Fundamentals of Engineering (FE) examination or the Major Field Test in Computer Science (CS majors only). Applications for the exams must be obtained from the students’ departments. Application deadlines: fall semester - May 15th; spring semester - December 15th.

ENGR 600 SEMINAR
S 1-2 cr. SEM Required, 2 cr. total
PREREQUISITE: Doctoral standing or consent of instructor.
– Seminar experience. For students enrolled before 8/07, initial enrollment immediately follows completion of ENGR 610. First time students will present and defend their thesis topics (1 credit). The second enrollment will be taken the semester prior to the student’s comprehensive exam where they will prepare and defend a formal research proposal (1 credit). For students enrolling after 8/07, ENGR 600 will be taken once as a two credit class the semester prior to scheduling the comprehensive exam; the course is designed to help the student prepare their proposal.

ENGR 610 RESEARCH AND METHODS IN ENGINEERING
F 3 cr. LEC 3
PREREQUISITE: Doctoral standing.
– Exploration of experimental design, statistical methods, models, and teaching issues. Methods of modern information access will also be covered.

ENTO Entomology
Department of Animal and Range Sciences
Department of Land Resources and Environmental Sciences
Department of Plant Sciences and Plant Pathology.

ENTO 500 SEMINAR
F 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
– Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ENTO 510 INSECT ECOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BIOL 100 and one of the following: STAT 410, STAT 412.

ENTO 514 BEHAVIORAL ECOLOGY
F alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: One of the following: ENTO 432, BIOL 405, BIOL 415, BIOL 418, BIOL 419, BIOL 435, BIOL 436.
– Functional and evolutionary aspects of the behavior of insects and vertebrates, concentrating on the structure and tests of present-day theory; optimal foraging theory, habitat selection, mating systems, parental investment, game theory and social behavior.

ENTO 516 BIOSYSTEMATICS
F alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
PREREQUISITE: One of the following: ENTO 432, BIOL 239, BIOL 415, BIOL 418, BIOL 419, BIOL 435, BIOL 436, BIOL 436.

ENTO 520 INSECT PHYSIOLOGY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: ENTO 204 and one of the following: BIOL 312, BIOL 402, BIOL 411, BIOL 413, BIOL 430, ENTO 501, ENTO 432, ENTO 514, or ENTO 525.
– Principles of insect physiology and insect physiological ecology; digestive, respiratory, and circulatory processes, neurophysiology, endocrinology, reproductive systems, muscular systems and locomotion, defensive mechanisms, thermoregulation and water balance.
ENTO 525 INSECT MORPHOLOGY
S alternate years, to be offered every even years 2 cr.
LEC 1 LAB 1
PREREQUISITE: ENTO 294 and one of the following: BIOL 310, BIOL 403, ENTO 401, ENTO 432, ENTO 510, ENTO 514, ENTO 516, or ENTO 520.
- The principles of insect morphology and the evolutionary principles behind the diversity of form and function of the major insect and arthropod groups.

ENTO 590 MASTER'S THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

ENVIRONMENTAL ENGINEERING
Department of Civil Engineering
(406) 994-2111

ENVE 445 AIR POLLUTION CONTROL
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EM 335, CHMY 141 and ME 324 or equivalent.
- Fundamentals of air quality management with emphasis on the design of processes and equipment for controlling gaseous and particulate emissions.

ENVE 444 HAZARDOUS WASTE MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: CHMY 211 or EM 335
- Introduction to the technologies, regulations, political and social issues, and environmental impacts of hazardous wastes. Management approaches are developed through fundamental studies and review of case histories.

ENVE 445 HAZARDOUS WASTE TREATMENT
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 340 or equivalent.
- Principles, theory, and practice of treating hazardous materials.

ENVE 534 ENVIRONMENTAL ENGINEERING INVESTIGATIONS
F 3 cr. LEC 3
PREREQUISITE: CE 340 and one of the following: CE 431, BREN 434, CE 435.
- Laboratory and field investigations for design and analysis of environmental engineering systems.

ENVE 535 HAZARDOUS WASTE MANAGEMENT
On Demand 3 cr. LEC 3
PREREQUISITE: ENVE 580 (Bioremediation) or previous graduate level courses in environmental engineering.
- Examination of the technologies, regulations, political and environmental impacts of hazardous wastes. Management approaches are developed through fundamental studies of case histories.

ENVE 560 ENVIRONMENTAL ENGINEERING PROCESSES
F 2 cr. LEC 2
PREREQUISITE: CE 340.
- Physical, chemical, and biological processes in water quality management.

ENVE 561 ENVIRONMENTAL ENGINEERING REACTOR THEORY
F 2 cr. LEC 2
PREREQUISITE: CE 340.
- Theory and mathematics of reactors commonly used in water and wastewater operations.

ENVE 562 WATER TREATMENT PROCESSES & DESIGN
S 3 cr. LEC 3
PREREQUISITE: ENVE 560, ENVE 561.
- Principles, theory, and practice of water treatment plant design.

ENVE 563 WASTEWATER TREATMENT PROCESSES & DESIGN
S 3 cr. LEC 3
PREREQUISITE: ENVE 560, ENVE 561.
- Principles, theory, and practice of wastewater treatment plant design.

ENVE 564 ENVIRONMENTAL ENGINEERING APPLICATIONS LABORATORY
On Demand 3 cr. LEC 3
COREQUISITE: Graduate standing or equivalent.
- The laboratories will be modular units based on environmental engineering application areas such as bioremediation, water and wastewater treatment, and biofilm systems. Students will learn analytical methods for determining chemical and biological components and will become familiar with laboratory and pilot scale reactors. Where appropriate, students will cooperate with field investigations.

ENVE 565 CHEMICAL SENSORS AND INSTRUMENTATION FOR ENVIRONMENTAL BIOTECHNOLOGY
S alternate years, to be offered every even years 2 cr. LEC 2
PREREQUISITE: CE 340 or consent of instructor.
- The course provides the knowledge necessary to design, manufacture, and use chemical sensors in the area of environmental biotechnology. Principles of manufacture and examples of application of chemical sensors along with the principles of measurement, signal conditioning, and data acquisition are presented to an extent that is necessary for the operation of sensors. The measurement techniques are preceded with an adequate theoretical introduction. Demonstrations of the sensors are organized in the Microsensors Laboratory located at the Center for Biofilm Engineering.

ENVE 566 FUNDAMENTALS OF BIOFILM ENGINEERING
F 3 cr. LEC 3
PREREQUISITE: M 274.
- Development of quantitative descriptions of processes of microbial growth, diffusive and convective solute transport, and cell attachment and detachment. Integration of these processes in mathematical models of biofilm accumulation and activity. Application of these approaches to the analysis of biofilms in diverse industrial and natural environments.

ENVE 570 INDEPENDENT STUDY
On Demand 1 - 6 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ENVE 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ENVE 576 INTERNSHIP
On Demand 2 cr.
PREREQUISITE: Graduate standing, consent of instructor and approval of Department Head.
- An individual assignment arranged with an agency, business or other organizations to provide guided experience in the field.

ENVE 580 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENVE 589 GRADUATE CONSULTATION
On Demand 3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ENVE 590 MASTER’S THESIS
On Demand 1 - 10 cr. IND May be repeated.
PREREQUISITE: Master’s standing.

ERTH
Earth Science
Department of Earth Sciences
(406) 994-3331

ERTH 212RN YELLOWSTONE SCIENTIFIC LAB
F 4 cr. LEC 3 RCT 1
- The Yellowstone region is an unparalleled laboratory for earth scientists. The volcanic, glacial, climatic, and ecological processes that shaped the region will be introduced through lecture, discussions, and projects. Recitation sections and field trips provide additional hands-on experiences.

ERTH 290R UNDERGRADUATE RESEARCH
F, S 16 cr. IND May be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ERTH 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITES: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
COURSE DESCRIPTIONS: ERTH 303 - ERTH 583

ERTH 303 WEATHER AND CLIMATE
F 3 cr. LEC 3
PREREQUISITE: GPHY 111.
- The climates of the continents, and their classification, characteristics and interrelationships with other factors of the physical and human environment.

ERTH 307 PRINCIPLES OF GEOMORPHOLOGY
F 4 cr. LEC 3 LAB 1
PREREQUISITE: GEO 101 and GPHY 111; familiarity with spreadsheets and word-processing is assumed. Junior standing
- Framework, process, system, and time as factors which control the generation of land forms. Laboratories involve field trips and map interpretation, and computer modeling.

ERTH 432R SURFACE WATER RESOURCES
F alternate years, to be offered odd years
5 cr. LEC 2 LAB 1
PREREQUISITE: Junior Standing, GRHY 111 and STAT 216 or GRHY 333 and PHYS 205 or PHYS 211.
- Physical analysis of the surface portion of the hydrologic cycle: climate, evapotranspiration, precipitation, runoff, flooding, stream channels, sediment production, sediment transport and drainage basins. The surface water resource in terms of regional supply and human use and intervention. Laboratory fee required.

ERTH 450R SNOW DYNAMICS & ACCUMULATION
S 3 cr. LEC 1 LAB 2
PREREQUISITE: Junior or Senior standing; STAT 216; ability to ski at intermediate level in alpine terrain; PHYS 205 or 211 and GPHY 111 or consent of instructor.
- Senior capstone for the Snow Science Option. The accumulation, redistribution, and metamorphism of snow as related to humans. Avalanche, recreation, agriculture, silviculture, runoff, and the alpine environment. Field studies are conducted on a regular basis under rigorous field conditions.

ERTH 455 PHYSIOGRAPHY OF THE UNITED STATES
On Demand
5 cr. LEC 2 LAB 1
PREREQUISITE: Junior Standing, ERTH 307.
- The physiographic provinces of the United States, their physical characteristics, evolution, and identification.

ERTH 460R UNDERGRADUATE RESEARCH
F, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

ERTH 494 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

ERTH 498 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ERTH 499 SENIOR THESIS / CAPSTONE
On Demand 3 cr. RCT 3
PREREQUISITE: Senior standing; minimum 3.0 GPA; faculty recommendation.
- Senior thesis provides an opportunity to conduct research under the supervision of a faculty member leading to the production of a research paper ("mini-thesis") and an oral presentation to the department or at a professional meeting. Excellent preparation for graduate school and professional work.

ERTH 500 SEMINAR
F 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ERTH 502 FLUVIAL GEOMORPHOLOGY
On Demand 3 cr. LEC 2
PREREQUISITE: ERTH 307 or other introduction to fluvial systems or instructor permission.
- This course provides a foundation for understanding fluvial processes, interpreting fluvial forms, and teaching basic tools for use in watershed and river assessment. Course will cover drainage networks, channel form, and apply these concepts to a river assessment problem.

ERTH 505 GEOMICROBIOLOGY
S alternate years, to be offered even years 3 cr. SEM
- The course will examine geochemical and microbial interactions that control earth surface processes and ultimately major biogeochemical cycles. The course will study integrated approaches to research problems using geochemistry, stable isotope geochemistry, culture-based and molecular microbial techniques.

ERTH 512 MOUNTAINS AND PLAINS RIPARIAN PROCESSES
Su On Demand 2 cr. SEM 2
PREREQUISITE: Introductory geology (GEO 101), secondary teaching certification plus two years teaching experience; recommended ERTH 516 and access to the world wide web.
- Riparian hydrologic and geomorphic processes with examples drawn from the mountains and plains. Groundwater recharge and discharge; Horton overland flow; partial variable runoff areas; riparian best management practices; sapping, types of springs, sediment from slopes. K-12 riparian science education.

ERTH 516 NORTHERN ROCKY MOUNTAIN GEOLOGY
Su 2 cr. SEM 1 LAB 1
PREREQUISITE: Introductory physical geology (GEO 101), intro to physical geography (GPHY 111), early history and evolution (GEO 211); graduate standing; secondary teaching certification plus two years teaching experience; a computer with modem.
- Geologic history of Northern Rocky Mountains, and landscapes from Archean to present. Structural, tectonic, and surficial elements. Field examination of geologic evidence for history of the Gallatin Range, Bridger Range, and Yellowstone National Park. Exploration and development of teaching methods and resources for the K-12 classroom.

ERTH 517 ELECTRONIC HYDROLOGY
Su On Demand 2 cr. SEM 2
PREREQUISITE: GEO 101, GPHY 111; secondary teaching certification plus two years teaching experience; access to the world wide web linked with text. Recommended ERTH 519.
- Electronic acquisition, analysis, and interpretation of hydrologic data for K-12 teachers. Data acquired through the world wide web and telnet. Students will learn to download, analyze and interpret data including rainfall, snowfall, precipitation probability, temperature, stream flow, flood frequency, evapotranspiration, and reservoir capacity.

ERTH 519 HYDROLOGY OF STREAMS AND LAKEs
Su On Demand 3 cr. SEM 3
PREREQUISITE: Introductory geology/physical geography; two years K-12 teaching experience; recommended ESCI 516, and a basic course in physics.
- Streams in the mountains and plains; drainage basin analysis, stream hydraulics, slope, channel plan, channel cross section, channel types, geologic origin, evaporation, ground water recharge/discharge. Applications in the K-12 science classroom (habits of a scientific mind).

ERTH 551 SNOW SCIENCE SEMINAR
On Demand 1 cr. IND
PREREQUISITE: Graduate Standing; PHYS 211, STAT 332 or STAT 401; Interest in snow science.
- Seminar-style discussion of recent developments in snow science based upon current literature, important journal articles, and newly published or about to be published literature regarding snow science. Topics will depend upon the interests of the instructor and students in the course.

ERTH 576 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ERTH 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ERTH 582 QUATERINARY PALEOECOLOGY & VEGETATION HISTORY
F alternate years, to be offered odd years
3 cr. SEM 3
PREREQUISITE: Upper division background in ecology, biogeography, stratigraphy or paleontology.
- Course examines the history and development of modern biomes and the causes and consequences of long-term ecological change.

ERTH 583 TOPICS IN PALEOECOLOGY
F alternate years, to be offered odd years
PREREQUISITE: Upper division background in ecology, biogeography, stratigraphy or paleontology.
- Course examines important themes in paleoecology. Topics change on a yearly basis depending on needs and interests of current students. It is intended for students with an interest in ecology, paleontology and environmental history.
ERTH 584 QUATERNARY ENVIRONMENTS OF THE WESTERN UNITED STATES
F to be offered even years 3 cr. SEM 3
PREREQUISITE: GEO 445, GEO 581, ERTH 507, GPHY 511 or equivalent course work, or consent of the instructor.
- This graduate course examines current research and recent developments in Quaternary paleoecology in the western U.S. The seminar will be centered around weekly discussions of the primary literature, hands-on experience with international data bases, and class paper and presentation.

ERTH 585 ADVANCES IN GEOBIOLOGY
F, to be offered even years 1 cr. SEM 1
- Discussion of recent developments in paleontology, paleoecology, biogeochemistry, and biogeography based on current literature and presentation of faculty and student works in progress.

ERTH 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

ERTH 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

ERTH 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

ERTH 600 DOCTORAL SEMINAR
F, S, Su 1 - 3 cr. SEM Maximum 6 cr.
PREREQUISITE: Doctoral candidate standing.

ERTH 605 HISTORY OF GEOLOGICAL CONCEPTS
On Demand 3 cr. LEC 3 cr.
PREREQUISITE: Course limited to graduate students or senior undergraduates with permission.
- Weekly seminars examine the evolution of geological thinking through an exploration of its history and contributions to science. The course enables students to research the origin and importance of concepts in their area of scientific specialization.

ERTH 689 GRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 3 cr. RCT Maximum 3 cr.
PREREQUISITE: Doctoral candidate standing.
- Directed doctoral research/creative activity projects; may include reading research publications in the field in preparation for beginning dissertation research.

ERTH 690 DISSERTATION RESEARCH
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral candidate standing.

FIN

FIN 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

FIN 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative projects. Course will address responsible conduct of research.

FIN 352 INTERMEDIATE FINANCE
S 3 cr. RCT 3
PREREQUISITE: Junior standing and BUS 351. For business majors: Formal admission to the College of Business.
- In-depth extension of financial management topics introduced in BUS 351. Topics include: risk, valuation, cost of capital, capital budgeting, capital structure, dividend policy, ethical and professional standards for finance professionals, and quantitative methods essential for effective financial analysis.

FIN 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering. For business majors: Formal admission to the College of Business.
- Topics offered at the upper-division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

FIN 409 INTRODUCTION TO APPLIED INVESTING
F, S 3 cr. REC 1
PREREQUISITE: Junior standing. For business majors: Formal admission to the College of Business.
- Introduces students to the risks associated with financial management and market and investment analysis. Much of the course material is also applicable to personal financial planning.

FIN 450 REAL ESTATE AND INVESTMENT ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: BUS 351 or permission of instructor.
- For business majors: Formal admission to the College of Business.
- To prepare students for careers in real estate, construction lending, real estate valuation, acquisition and asset management, and market and investment analysis. Much of the course material is also applicable to personal financial planning.

FIN 451 ENTREPRENEURIAL FINANCE
F, S 3 cr. LEC 3
PREREQUISITE: BUS 351. For business majors: Formal admission to the College of Business.
- Study of corporate finance issues confronting entrepreneurial firms. Focus is on financial forecasting and assessing financial needs. Students utilize fundamental financial principles to make small business decisions. Topics include: strategic financing, financing alternatives, financial contracting, venture valuation, real options, and risk-sharing.

FIN 452 INTERNATIONAL FINANCE
S 3 cr. LEC 1 RCT 2
PREREQUISITE: BUS 351. For business majors: Formal admission to the College of Business.
- Focuses on the risks associated with financial management of a multinational company. Topics include: financial problems of multinational businesses, international financial environments, long-term capital commitments to international ventures, financial techniques for firm operation, and international investing.

FIN 453 FINANCIAL STATEMENT ANALYSIS
F 3 cr. RCT 5
PREREQUISITE: FIN 352 (required for finance option students) or ACTG 327.
- Analysis of income statements and balance sheets, ratios, inventory analysis, capitalization vs. expense, depreciation, leasing vs. buying, and overall financial health and earnings quality of the firm.

ESL

A C E Language Institute
(406) 585-9832
The A.C.E. Language Institute, affiliated with Montana State University, offers a full range of English as a Second Language courses. The Institute is located at 1106 South 6th (across the street from Hannon Hall). Please contact the A.C.E. Language Institute director for a complete list of classes and registration information.

FIN 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering. For business majors: Formal admission to the College of Business.
- Topics offered at the upper-division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

FIN 409 INTRODUCTION TO APPLIED INVESTING
F, S 3 cr. REC 1
PREREQUISITE: Junior standing. For business majors: Formal admission to the College of Business.
- Introduces students to the risks associated with financial management and market and investment analysis. Much of the course material is also applicable to personal financial planning.

FIN 450 REAL ESTATE AND INVESTMENT ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: BUS 351 or permission of instructor.
- For business majors: Formal admission to the College of Business.
- To prepare students for careers in real estate, construction lending, real estate valuation, acquisition and asset management, and market and investment analysis. Much of the course material is also applicable to personal financial planning.

FIN 451 ENTREPRENEURIAL FINANCE
F, S 3 cr. LEC 3
PREREQUISITE: BUS 351. For business majors: Formal admission to the College of Business.
- Study of corporate finance issues confronting entrepreneurial firms. Focus is on financial forecasting and assessing financial needs. Students utilize fundamental financial principles to make small business decisions. Topics include: strategic financing, financing alternatives, financial contracting, venture valuation, real options, and risk-sharing.

FIN 452 INTERNATIONAL FINANCE
S 3 cr. LEC 1 RCT 2
PREREQUISITE: BUS 351. For business majors: Formal admission to the College of Business.
- Focuses on the risks associated with financial management of a multinational company. Topics include: financial problems of multinational businesses, international financial environments, long-term capital commitments to international ventures, financial techniques for firm operation, and international investing.

FIN 453 FINANCIAL STATEMENT ANALYSIS
F 3 cr. RCT 5
PREREQUISITE: FIN 352 (required for finance option students) or ACTG 327.
- Analysis of income statements and balance sheets, ratios, inventory analysis, capitalization vs. expense, depreciation, leasing vs. buying, and overall financial health and earnings quality of the firm.

FIN 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering. For business majors: Formal admission to the College of Business.
- Topics offered at the upper-division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

FIN 409 INTRODUCTION TO APPLIED INVESTING
F, S 3 cr. REC 1
PREREQUISITE: Junior standing. For business majors: Formal admission to the College of Business.
- Introduces students to the risks associated with financial management and market and investment analysis. Much of the course material is also applicable to personal financial planning.

FIN 450 REAL ESTATE AND INVESTMENT ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: BUS 351 or permission of instructor.
- For business majors: Formal admission to the College of Business.
- To prepare students for careers in real estate, construction lending, real estate valuation, acquisition and asset management, and market and investment analysis. Much of the course material is also applicable to personal financial planning.

FIN 451 ENTREPRENEURIAL FINANCE
F, S 3 cr. LEC 3
PREREQUISITE: BUS 351. For business majors: Formal admission to the College of Business.
- Study of corporate finance issues confronting entrepreneurial firms. Focus is on financial forecasting and assessing financial needs. Students utilize fundamental financial principles to make small business decisions. Topics include: strategic financing, financing alternatives, financial contracting, venture valuation, real options, and risk-sharing.

FIN 452 INTERNATIONAL FINANCE
S 3 cr. LEC 1 RCT 2
PREREQUISITE: BUS 351. For business majors: Formal admission to the College of Business.
- Focuses on the risks associated with financial management of a multinational company. Topics include: financial problems of multinational businesses, international financial environments, long-term capital commitments to international ventures, financial techniques for firm operation, and international investing.

FIN 453 FINANCIAL STATEMENT ANALYSIS
F 3 cr. RCT 5
PREREQUISITE: FIN 352 (required for finance option students) or ACTG 327.
- Analysis of income statements and balance sheets, ratios, inventory analysis, capitalization vs. expense, depreciation, leasing vs. buying, and overall financial health and earnings quality of the firm.
FIN 455 INVESTMENTS
F 3 cr. RCT 3
PREREQUISITE: FIN 352. For business majors:
Formal admission to the College of Business.
- Course provides foundation for students to comprehend the objectives, policies, concepts, analyses, techniques, practices, and theories in investments, both within the U.S. financial markets and globally.
FIN 456 INVESTMENTS MANAGEMENT
S 3 cr. RCT 3
PREREQUISITE: FIN 455. For business majors:
Formal admission to the College of Business.
- Security and portfolio analyses, using fundamental and technical indicators, with evaluation of financial and economic environments. In-depth study of stocks, bonds, and derivatives. Risk hedging for both individual investors and portfolio managers, using analyses of embedded risk and returns.
FIN 457R FINANCIAL INSTITUTIONS AND MARKETS I
F 3 cr. RCT 3
PREREQUISITE: FIN 352. For business majors:
Formal admission to the College of Business.
- Security and portfolio analyses, using fundamental and technical indicators, with evaluation of financial and economic environments. In-depth study of stocks, bonds, and derivatives. Risk hedging for both individual investors and portfolio managers, using analyses of embedded risk and returns.
FIN 458 COMMERCIAL BANK MANAGEMENT
On Demand 3 cr. LEC 3
PREREQUISITE: BUS 351. For business majors:
Formal admission to the College of Business.
- Management of commercial banks and similar depository institutions, emphasizing the measurement and control of risk in asset and liability management. Course includes issues in contemporary banking.
FIN 459 CURRENT TOPICS: INVESTMENTS
On Demand 3 cr. SEM 3 May be repeated.
Max 6 credits
PREREQUISITE: FIN 352, FIN 453, FIN 455, FIN 457, and senior standing. For business majors:
Formal admission to the College of Business.
- Investigation of key issues which will determine future practices in finance.
FIN 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of Associate Dean. For business majors:
Formal admission to the College of Business.
- Directed research and study on an individual basis.
- Not to be used as a substitute for a required course.
FIN 476 INTERNSHIP
On Demand 2 - 12 cr. END
PREREQUISITE: Junior standing, formal admission to the College of Business, and consent of instructor.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Directed research and study on an individual basis.
FIN 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering. For business majors:
Formal admission to the College of Business.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
FIN 489R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY INSTRUCTION
On Demand 1 - 2 cr. RCT May be repeated.
Max 4 cr.
COREQUISITE: FIN 490. For business majors:
Formal admission to the College of Business.
- Classroom instruction associated with directed undergraduate research/creative activity projects.
FIN 490R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY
On Demand 1 - 6 cr. END May be repeated.
Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.
FIN 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr
PREREQUISITE: Graduate standing consent of instructor, approval of Associate Dean and Dean of Graduate Studies.
- Directed research and study on an individual basis.
FIN 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper-division courses and others as determined for each offering. For business majors:
Formal admission to the College of Business.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
FRCH Modern Languages, French Department of Modern Languages & Literatures (406) 994-4448
FRCH 101 ELEMENTARY FRENCH I
F, S, Su alternate years 4 cr. RCT 4
NOTE: Offered on a rotating basis with German and Spanish in Summer.
- An elementary level course designed to help students acquire basic proficiency in communicating within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures.
FRCH 102D ELEMENTARY FRENCH II
F, S, Su alternate years 4 cr. RCT 4
PREREQUISITE: FRCH 101 or equivalent, or two years of high school French. Offered on a rotating basis with German and Spanish in Summer.
- This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues.
FRCH 201D INTERMEDIATE FRENCH I
F, S 3 cr. RCT 3
PREREQUISITE: FRCH 102 or equivalent, or a minimum three years of high school French or placement interview.
- Intensive, methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate-level readings and discussions. Increased emphasis on written communication.
FRCH 202D FRENCH LANGUAGE & CULTURE
S, F 3 cr. RCT 3
PREREQUISITE: FRCH 201 or equivalent, or placement interview.
- Fourth semester French language course designed to provide basis for advanced level study of French language, literature, and culture. Application of language skills in discussions and explanations of selected readings in literature and culture.
FRCH 305 HISTOIRE CIVILISATION
S alternate years, to be offered even years 3 cr. RCT 3
PREREQUISITE: FRCH 220
- Survey of French culture from the middle ages to modern era; focus on historical, artistic, literary, and social developments. Taught in French.
FRCH 306H FRENCH: FROM REFLECTION TO REVOLUTION
On Demand 3 cr. RCT 3
- Reading and discussion of selected major works from the eighteenth century. All reading and discussions are in English. Majors may be required to do some work in French.
FRCH 320 LA FRANCE AUJOURD'HUI
S alternate years, to be offered odd years 3 cr. RCT 3
PREREQUISITE: FRCH 220
- The French presence today in social, cultural, and political settings. Taught in French.
FRCH 323 FRENCH ADVANCED GRAMMAR & COMP
F alternate years, to be offered odd years 3 cr. RCT 3
PREREQUISITE: FRCH 220
- Intensive review of French grammar to increase proficiency in various forms of written expression including business correspondence, problems of translation, and short essays.
FRCH 324 FRENCH: ADV CONVERSATIONS & PHONETICS
F alternate years, to be offered even years 3 cr. RCT 3
PREREQUISITE: FRCH 220
- Intensive conversation coupled with a practical study of French phonetics and contrastive comparison with English for teaching application. Various levels of the spoken language from slang to formal speech.
FRCH 401 FRENCH LITERATURE I
F alternate years, to be offered even years 3 cr. RCT 3
PREREQUISITE: FRCH 220
- Survey of French literature from the Middle Ages through the 18th century. Taught in French.
FRCH 402 FRENCH LITERATURE II
F alternate years, to be offered odd years 3 cr. RCT 3
PREREQUISITE: FRCH 220
- Survey of French literature of the 19th and 20th centuries. Taught in French.
COURSE DESCRIPTIONS: FRCH 450 - GDSN 368

FRCH 450 SEM: FRENCH LIT AND CULTURE
S 3 cr. SEM 3
COREQUISITE: FRCH 401 or FRCH 402
- Junior/Senior seminar. The study of Francophone literature and culture. Topic varies with instructor. Taught in French.

FRCH 490R UNDERGRADUATE RESEARCH
S 3 cr. SEM 3
PREREQUISITE: FRCH 401 or FRCH 402.
- Senior capstone course. Advanced research in the study of Francophone literature and culture. Research paper required. Taught in French. Course will address responsible conduct of research.

FRCH 497R EDUCATION METHODS
F, S
S 3 cr. LEC 3
FRCH 499R SENIOR THESIS/CAPSTONE
F, S
FRCH 499R SENIOR THESIS/CAPSTONE
F, S

F&WL
Fish & Wildlife Management
Department of Ecology
(406) 994-4548

F&W 401 INTRODUCTION TO FISH & WILDLIFE
F 1 cr. SEM 1
- An introduction to the career opportunities and current issues associated with management of fisheries and wildlife. For Fish and Wildlife Majors or those interested in the profession.

F&W 401 PRINCIPLES OF FISH & WILDLIFE MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: BIOL 101 and BIOL 102.
- Overview of history and ecological principles underlying fish and wildlife management. In-depth discussion of current issues.

F&W 480 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

F&W 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: F&W 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

F&W 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

F&W 500APPLIED POPULATION ECOLOGY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 305 or F&W 301.
- An in-depth review of (1) animal population ecology and (2) the application of theory in contemporary population management.

F&W 502 ANALYSIS OF POPULATION & HABITAT DATA
F alternate years, to be offered odd years 3 cr.
LEC 2 LAB 1
PREREQUISITE: Completion of, or concurrent enrollment in a four-hundred level statistics course.
- Study of the theory and methods of sampling and analyzing population and habitat data for vertebrates. Estimation of population size, survival, recruitment, habitat selection and home range with contemporary software packages. Computer lab.

F&W 510 FISHERIES SCIENCE
F 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 404, BIOL 415, F&W 301.
- An in-depth review of fisheries data types and the analysis and interpretation of those data as it relates to freshwater fisheries research and management.

F&W 511 ADVANCED STREAM ECOLOGY
S alternate years, to be offered even years 3 cr.
LEC 3
PREREQUISITE: BIOL 305, BIOL 404.
- Overview of physical and biological interactions in streams and how these are affected by man's activities.

F&W 513 FISHERIES HABITAT MANAGEMENT
F alternate years, to be offered even years 3 cr.
LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Techniques of protection, and restoration of stream, lake and reservoir, habitats for management of fishes and other aquatic organisms.

F&W 525 HUMAN DIMENSIONS OF FISHERIES AND WILDLIFE MANAGEMENT
S, alternate years, to be offered even years 3 cr.
LEC 3
- This course provides fisheries and wildlife management graduate students with an understanding of how social, cultural, behavioral, and demographic characteristics of humans affect fisheries and wildlife management.

GDSN
Graphic Design
School of Art
(406) 994-4501

GDSN 223 DESIGN PRINCIPLES
F 4 cr. RCT 2 STU 2
PREREQUISITE: Art 110 and Art 111 and Art 112.
- Introduction to fundamental design principles, basic layout, tools and techniques, and creative thinking.

GDSN 224 FORM & CONTENT
F 4 cr. RCT 2 STU 2
PREREQUISITE: GDSN 223.
- Further exploration of design principles with increased emphasis on typographic skills and visual communications.

GDSN 366 HISTORY OF GRAPHIC DESIGN
F 3 cr. LEC 3
PREREQUISITE: Junior standing in graphic design option or permission of instructor.
- A historical perspective of work created by graphic designers, over the past 125 years, and more particularly following the creative trends/technological breakthroughs/social achievements in Western art and design that have informed modern American design and designers.

GDSN 367 IDENTITITY SYSTEMS
F, S, Su 5 cr. STU 5
PREREQUISITE: GDSN 224 and passing portfolio review.
- Research and production of large and small-scale identity programs, focusing on how identity functions in the context of graphic design practice.

GDSN 368 ART DIRECTION
F, S, Su 5 cr. STU 5
- PREREQUISITE: GDSN 224 and passing portfolio review.
- The examination of art direction as it relates to the look and feel of contemporary advertising and marketing.
GDSN 369 PUBLICATION DESIGN
F, S, Su 5 cr. STU 5
PREREQUISITE: GDSN 224 and passing portfolio review.
- The research, development, organization, design and presentation of complex print communication documents.

GDSN 371 MOTION GRAPHICS
F, S, Su 5 cr. STU 5
PREREQUISITE: GDSN 224 and passing portfolio review.
- Explores design issues unique to contemporary digital media including organization, narrative, motion and sound.

GDSN 372 ADVANCED WEB DESIGN
F, S, Su 5 cr. STU 5
PREREQUISITE: GDSN 224 and passing portfolio review.
- Explores web design and planning, specifically: wayfinding, navigation, interactivity and content development.

GDSN 373 ILLUSTRATION
F, S, Su 5 cr. STU 5
PREREQUISITE: GDSN 224 and passing portfolio review.
- The investigation of specialized illustration techniques and concepts to create artwork in traditional formats that emphasize realistic modeling, as well as expressive and historical perspectives.

GDSN 374 DIGITAL VISUALIZATION
F, S, Su 5 cr. STU 5
PREREQUISITE: GDSN 224 and passing portfolio review.
- Examining computer based image generation techniques including photography, illustration, 3D rendering and other digital imaging methods.

GDSN 375 LETTERPRESS
F, S, Su 5 cr. STU 5
PREREQUISITE: GDSN 224 and passing portfolio review or consent of instructor.
- Utilizing vintage presses and a collection of wood and cast type, to explore uncommon aspects of type and print, including the activities of hand-setting type, preparing proof sheets and specimen sheets, and printing small editions.

GDSN 376 SCREENPRINTING
F, S, Su 5 cr. STU 5
PREREQUISITE: GDSN 224 and passing portfolio review.
- Using modern screenprinting technology as a communication medium. Including the preparation of screens, mixing pigments, and printing.

GDSN 377 DESIGN AND SOCIETY
F, S, Su 5 cr. STU 5
PREREQUISITE: GDSN 224 and passing portfolio review.
- The examination of the role of designers with local/national/global communities through a series of practical projects.

GDSN 465 PROFESSIONAL STUDIO
F 5 cr. RCT 2 STU 3
PREREQUISITE: GDSN 223, GDSN 224 and completion of junior level.
- Comprehensive projects dealing with a variety of visual communication applications. Emphasis on high standards of typography and graphic design, computer techniques, and presentation. Laptop computers are required for all upper level graphic design courses.

GDSN 491 SPECIAL TOPICS
On Demand 1-5 cr. Maximum 15 cr.
PREREQUISITE: Course prerequisites are determined for each offering.
- Courses not required in any curriculum for which there is a one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GDSN 492 INDEPENDENT STUDY
F,Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 360.
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of graphic design. Written, signed contract required prior to registering for this class.

GDSN 498 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of the director.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the graphic design field.

GDSN 499 THESIS AND PORTFOLIO
S 5 cr. RCT 2 STU 3
PREREQUISITE: GDSN 465.
- Senior capstone course. Directed undergraduate research/creative activity which may culminate in a research paper, undergraduate research paper or undergraduate thesis exhibition. Graphic design students must take this course in the spring.

GEO Geology
Department of Earth Sciences
(406) 994-3331

GEO 101N INTRODUCTION TO PHYSICAL GEOLOGY
F, S, Su 4 cr. LEC 5 LAB 1
- Examination of basic geologic processes, Earth and planets through geologic time, internal geosystems, and surficial geosystems.

GEO 103CS INTRODUCTION TO PHYSICAL GEOLOGY
F 4 cr. LEC 3 LAB 1
- Application of geologic principles to topical problems in environmental and resource geology. Topics include analysis of environmental issues such as earthquake disaster preparedness, landslides, land use, floods and human occupation, ground water withdrawal and contamination issues, volcanic and coastal hazards, and the response of landscapes and people to resource development (minerals/air/water/energy). Laboratories will be used to analyze and debate data relevant to environmental problems from a geologic perspective.

GEO 111N DINOSAURS
F alternate years, to be offered odd years 3 cr. LEC 2 RCT 1
- This course provides an introduction to dinosaur paleontology. Students will learn how hypotheses about extinct animals are formulated and tested, with comparisons to modern sedimentary environments and living animals. Recitation sections allow discussion of current research and hands-on experience with sedimentary rocks and fossils. Field trips provide additional education opportunities.

GEO 205 MINERALOGY
S 4 cr. LEC 2 LAB 2
PREREQUISITE: GEO 111, CHMY 143.
- Identification, properties, occurrence, and associations of the rock-forming minerals; introduction to crystallography (crystal classes, lattice types, and external morphology) and crystal chemistry (bonding and crystal structure types); analytical techniques including mineral optics, x-ray, and SEM analysis. Laboratory fee included.

GEO 211 EARTH HISTORY AND EVOLUTION
S 3 cr. LEC 5
PREREQUISITE: GEO 111.
- Evolution of the earth and its life from origin to present configuration. Role of plate tectonic processes in the geologic development of the continents and ocean basins. Major evolutionary developments and crises in the history of life.

GEO 290R UNDERGRADUATE RESEARCH
F, S 1-6 cr. IND
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

GEO 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GEO 306 IGNEOUS PETROLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: GEO 205.
- Introduction to the distribution, mineral associations, and chemical compositions of igneous rocks in the earth's crust and upper mantle. Emphasis is on the use of petrographic features and chemistry to identify igneous rocks and interpret rock-forming processes.

GEO 307 SEDIMENTARY PETROLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: GEO 205.
- Detailed analysis and interpretation of the mineralogy, fabric, and genesis of terrigenous clastic and carbonate sedimentary rocks. Use of thin-section, microscopy, the scanning electron microscope, and x-ray diffraction techniques are emphasized in the laboratory.

GEO 308 METAMORPHIC PETROLOGY
S 3 cr. LEC 2 LAB 1
- Introduction to the principles of metamorphic petrology; metamorphic facies, reactions, phase equilibria, processes, petrographic analysis, deformation, and interpretation of metamorphism in the context of global tectonics.

GEO 309 SEDIMENTATION AND STRATIGRAPHY
S 4 cr. LEC 3 LAB 1
PREREQUISITE: GEO 211, GEO 307, M 182.
- Physical, chemical, and biological processes and their effects on sediment dispersal, deposition, and diagenesis. Geometry and lateral and vertical relationships between sedimentary rock bodies. Labs emphasize the description and analysis of sedimentary rock bodies.
COURSE DESCRIPTIONS: GEO 310 - GEO 508

GEO 310 INVERTEBRATE PALEONTOLOGY
F alternate years, to be offered odd years
5 cr. LEC 2 LAB 1
PREREQUISITE: GEO 211.
- Investigation of invertebrate organisms and their evolution through time as preserved in the sedimentary rock record. Emphasis is on the morphology, paleoecology, evolution, and stratigraphic and environmental significance of important fossil groups. Labs stress fossil recognition.

GEO 312 DINOSAUR PALEONTOLOGY
F alternate years, to be offered odd years
5 cr. S 2 cr. C 2
PREREQUISITE: GEO 211 and BIOL 101.
- Dinosaur Paleontology covers the origin, evolution and extinction of dinosaurs. Topics of special emphasis include phylogeny, the origin of birds, and functional adaptations. Labs examine dinosaur skeletons, their novel adaptations and role in developing evolutionary trees.

GEO 315 STRUCTURAL GEOLOGY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: GEO 306 or GEO 307, M 171.
- Geometry, kinematics, and dynamics of natural rock deformation. Laboratory will focus on analytical and graphical techniques of modern structural analysis. Field trip fee required.

GEO 320 PALEONTOLOGY LAB TECHNIQUES
F alternate years, to be offered odd years
2 cr. LEC 1 LAB 1
COREQUISITE: GEO 211.
- Provides laboratory and research experience in vertebrate paleontology, including; training in fossil preparation, identification of osteological specimens, documentation (photographic and scientific illustration), molding and casting, specimen curation, and other skills necessary for professional presentation of research.

GEO 419 FIELD PALEONTOLOGY
Su alternate years, to be offered even years
2 cr. LEC 1 LAB 1
PREREQUISITE: GEO 211 or GEO 307. Consent of instructor for non-majors.
- This two-week class provides field experience in vertebrate paleontology, including sedimentology, facies analysis, measuring stratigraphic sections, microfossil screening, field identification of vertebrate and invertebrate fossils, excavation of fossil specimens, and taphonomic data collecting.

GEO 420 HYDROGEOLOGY
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: ERTH 307, GEO 411, GEO 307, GEO 309, GEOL 315. Must receive a minimum grade of "C" in these areas.
- The relationship between ground-water and other parts of the hydrologic cycle; ground-water availability, movement, chemistry, exploration, geology, and aquifer tests. The ground-water resource in terms of regional supply and human use and intervention.

GEO 429 FIELD GEOLOGY
Su 6 cr. LAB 6
PREREQUISITE: ERTH 307, GEO 211, GEO 307, GEO 309, GEOL 315. Must receive a minimum grade of "C" in these areas.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

GEO 430 PALEONTOLOGY LAB TECHNIQUES
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: GEO 312.
- Provides laboratory and research experience in vertebrate paleontology, including; training in fossil preparation, identification of osteological specimens, documentation (photographic and scientific illustration), molding and casting, specimen curation, and other skills necessary for professional presentation of research.

GEO 433 GLOBAL TECTONICS
On Demand 1 - 4 cr.
IND Maximum 12 cr.
PREREQUISITE: Junior or senior standing with geology and consent of instructor and Department Head. - Student works as a tutor and undergraduate teaching assistant in a teaching laboratory under close academic supervision. Weekly meeting focuses on geology, teaching, organization of class materials, and student supervision. Weekly lab emphasis on applying active learning concepts in a geologic laboratory context.

GEO 451 GEOLOGY INSTRUCTION
On Demand 1 - 4 cr.
IND Maximum 12 cr.
PREREQUISITE: Senior standing, consent of instructor, and approval of department head.
- Designed research and study on an individual basis.

GEO 491 SPECIAL TOPICS
On Demand 1 - 3 cr.
PREREQUISITE: Consent of instructor.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

GEO 492 INDEPENDENT STUDY
On Demand 1 - 5 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

GEO 494 SENIOR GEOLOGY SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

GEO 495 SEMINAR
On Demand 2 - 12 cr.
IND PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

GEO 499 SENIOR THESIS/CAPSTONE
F, S 3 cr. RCT 3
PREREQUISITE: Senior standing; minimum 3.0 cum gpa; faculty recommendation.
- Senior thesis provides an opportunity to conduct research under the supervision of a faculty member leading to the production of a research paper ("mini-thesis") and an oral presentation to the department or at a professional meeting. Excellent preparation for graduate school and professional work.

GEO 500 SEMINAR
On Demand 1 cr. SEM 1 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

GEO 508 DEPOSITIONAL SYSTEMS
S alternate years, to be offered odd years
3 cr. SEM 3 cr
PREREQUISITE: GEO 309.
- Facets models for terrestrial and marine depositional environments and their application to interpreting the stratigraphic record.
COURSE DESCRIPTIONS: GEO 510 - GPHY 322

GEO 510 IGNEOUS GEOCHEMISTRY
On Demand 3 cr. LEC 3
PREREQUISITE: GEO 306, consent of instructor.

- Major element, trace element, and isotopic distribution in igneous rocks obtained from natural and experimental systems. Emphasis on models describing the origin of compositional diversity in rock suites.

GEO 515 STRUCTURAL GEOLOGY
On Demand 5 cr. LEC 2 LAB 1
PREREQUISITE: GEO 315 or equivalent.

- Techniques of modern structural analysis, including strain analysis, folds and fractures, and applications of continuum mechanics.

GEO 517 TAPHONOMY: DECRYPTING THE FOSSIL RECORD
F alternate years, to be offered even years 3 cr. LEC 2 SEM 1
PREREQUISITE: Graduate standing and GEO 307 or GEO 309 and GEO 310 or GEO 312 or GEO 411 or their equivalents.

- Before one can ask questions about a fossil organism’s anatomy, paleoecology or evolution, one must clearly understand its geologic context. Taphonomy investigates the death to discovery history of fossils and the biases created by post-mortem processes to the fossil record.

GEO 520 ANCIENT OCEAN SYSTEMS
S alternate years, to be offered every year 3 cr. SEM 3
PREREQUISITE: Course limited to graduate students or senior undergraduates with permission.

- Seminar in marine geology with emphasis on ancient deep-marine outcrops.

GEO 521 HELL CREEK PALEONTOLOGY
Su 2 cr. LEC 2
PREREQUISITE: GEO 111 and consent of instructor.

- This course is an introduction to Dinosaur Paleontology and Hell Creek Formation of Eastern Montana. It will provide information and hands-on experience in field techniques used in vertebrate paleontology, including interpretation of sedimentary environments and taphonomy.

GEO 530 TECTONICS OF SEDIMENTARY BASINS
On Demand 3 cr. SEM 3
PREREQUISITE: GEO 307 and GEO 309 and GEO 315.

- This course examines the plate tectonic setting and controls on development of modern and ancient sedimentary basins. Includes investigation of sediment provenance, facies patterns, methods of basin analysis, and subsidence history.

GEO 533 GLOBAL TECTONICS
F 3 cr. LEC 3
PREREQUISITE: GEO 315.

- History of tectonic theory; modern view of plate tectonics; in-depth case studies of orogenic belts; neotectonics; geophysics. Graduate students will be required to present a term paper and oral presentation on a topic chosen in consultation with the instructor.

GEO 535 ADVANCED STRATIGRAPHY
F alternate years, to be offered odd years 4 cr. LEC 3 LAB 1
PREREQUISITE: Graduate standing.

- Weekly lecture and lab, including one-week field excursion, examines different approaches in stratigraphy used to reconstruct ancient terrains. Course emphasizes advanced correlation techniques and interpretation methods applied in sedimentary geology.

GEO 540 VOLCANOLOGY
F alternate years, to be offered even years 3 cr. LEC 2 LAB 1
- Understand processes by which magma and associated gases rise into the crust and are extruded onto the Earth’s surface and atmosphere, interpret the forms of volcanoes and their magmatic products, and provide the necessary background to perform research in volcanology.

GEO 542 COMPARATIVE OSTEOLGY
On Demand 3 cr. SEM 3
PREREQUISITE: BIOL 310, BIOL 504.

- Fossil bone histology and comparative osteology including enchondral ossification, epiphyseal ontogeny, cortical ossification, bone remodeling, special bone tissues, fossil bone content, bone architecture and biomechanics, bone chemistry and diagenesis, comparative bone morphology, and functional anatomy.

GEO 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.

- Directed research and study on an individual basis.

GEO 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined by each offering.

- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GEO 581 QUATERNARY ENVIRONMENTS
On Demand 5 cr. LEC 2 RCT 1
PREREQUISITE: ERTH 307.

- The last two million years of earth history as interpreted from geologic, biologic, and pedologic proxy data. Includes both global and regional analyses of changing climates and their effects on Earth surface processes and land forms.

GEO 583 APPLIED GEOLOGICAL HYDROLOGY
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: Graduate standing or GEO 420.

- Application of ground-water principles to ground-water resource, contamination and remediation problems.

GPHY 322 ECONOMIC GEOGRAPHY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: GEO 121 or GEOG 254.

- Historical evolution and spatial patterns of urban phenomenon; human-environment interaction in urban area; distribution of economic and social activities in the city; spatial structure of urban system in national and regional background.

GPHY 323 ECONOMIC GEOGRAPHY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: GPHY 121.

- Contemporaneous research questions and methodologies in economic geography; geographical distribution of economic activities; principles of spatial interaction; application of locational theory in urban and rural settings.
GPHY 325 CULTURAL GEOGRAPHY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: GPHY 121
- American cultural landscape evolution; origins and diffusion of American culture traits; evolution of American culture regions.

GPHY 365 GEOGRAPHICAL PLANNING
S 3 cr. LEC 3
PREREQUISITE: GPHY 141 and GPHY 121.
- Major factors, elements, principles, methods, tools, organization, and issues of urban and rural planning in a geographical context; integration of physical and human variables into the planning process.

GPHY 384 ADVANCED GIS AND SPATIAL ANALYSIS
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: GPHY 284.
- Advanced data model concepts in the context of spatial analysis. Spatial overlay analysis and synthesis in vector and raster. Error and Uncertainty. Data modeling and database design principles to support analysis and modeling applications.

GPHY 411 BIOGEOGRAPHY
S to be offered odd years 3 cr. LEC 3
PREREQUISITE: GPHY 121 or BIOL 101.
- Factors affecting the geography of plants and animals in space and time.

GPHY 425 GEOGRAPHIC THOUGHT
S 3 cr. LEC 3
PREREQUISITE: Senior standing in Geography program.
- A senior capstone course for the geography option. The exploration of the history of geographic thought; the emergence and evolution of modern academic and applied geography. Contemporary trends and issues in geography.

GPHY 431 HISTORICAL GEOGRAPHY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: GPHY 121
- Past geographies of North America. Political, cultural, economic, and urban evolution of North American regions from the colonial era to 1900.

GPHY 441R MOUNTAIN GEOGRAPHY
F alternate years, to be offered odd years 4 cr. LEC 2 LAB 2
PREREQUISITE: GPHY 111 or BIOL 101. Senior standing - restricted entry required.
- Local, regional, and global importance of mountains. Geomorphology, climatology, plants and animals of mountain environments, and their relationship to human activities.

GPHY 445 REGIONAL GEOGRAPHY
On Demand 3 cr. LEC 3
PREREQUISITE: Two of the following: GPHY 111, GPHY 141, or GPHY 121.
- A topical and regional analysis of related political subdivisions or other geographical areas. Course may be taken twice if regional emphases differ.

GPHY 446 EAST ASIA IN THE GLOBAL SYSTEM
F alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: GPHY 111, GPHY 141, GPHY 121.
- The geographical perspective on the contemporary East Asia as a region of the world and the countries involved. Systematic themes include physical environment, history, population, culture, economy, politics, social life and international relationship.

GPHY 461 TOURISM PLANNING
S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: GPHY 284 and GPHY 385.
- A geographical, economic and planning perspective about the contemporary tourism and recreation of international, national and local scales. Topics include evolution, dynamics, types and patterns, analysis tools, planning issues and policies.

GPHY 484R APPLIED GIS AND SPATIAL ANALYSIS
S 3 cr. LEC 2 LAB 1
PREREQUISITE: GPHY 284 and GPHY 384.
- Advanced spatial analysis, synthesis and modeling concepts and methods. Semester projects apply theory and concepts to a project related to student’s discipline. Students learn to develop GIS applications to address a variety of issues.

GPHY 490R UNDERGRADUATE RESEARCH
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

GPHY 491 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

GPHY 492 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Senior standing; minimum standing - restricted entry required.
- Application of field methods, geostatistics, geographic information systems, remote sensing, and computer modeling to the geography of landscapes. Measurement and modeling techniques applied to land, water and atmosphere as they relate to selected environmental patterns.

GPHY 499 SENIOR THESIS/CAPSTONE
On Demand 1 cr. SEM 1
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

GPHY 501 GIS AND ENVIRONMENTAL MODELING
On Demand 3 cr. SEM 3
PREREQUISITE: Graduate standing.
- Application of field methods, geostatistics, geographic information systems, remote sensing and computer modeling to the geography of landscapes. Selected topics include GIS software. Students specialize area explored through literature review and individual project.

GPHY 504R APPLIED GIS AND ENVIRONMENTAL MODELING
F alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
PREREQUISITE: GPHY 284 and GPHY 384.
- Advanced spatial analysis, synthesis and modeling concepts and methods. Semester projects apply theory and concepts to a project related to student’s discipline. Students learn to develop GIS applications to address a variety of issues.

GPHY 505 BIOCLIMATOGRAPHY
On Demand 3 cr. SEM 3
PREREQUISITE: GEO 211 or BIOL 303.
- The distribution of plants, as controlled by climate, geologic history and geographic location. Changes over time in distribution patterns as related to climate change and other human activities.

GPHY 520 LAND USE PLANNING
F alternate years, to be offered odd years 5 cr. SEM 3
PREREQUISITE: Graduate standing.
- History and philosophy of land use planning; application of geographical skills to contemporary land use planning issues. Selected topics include population pressure and land requirement, law, eminent domain, property right, public control over private land use, institution, and economics in land use planning.

GPHY 570 INDEPENDENT STUDY
On Demand 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.
GPHY 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GRMN
Modern Languages, German
Department of Modern Languages & Literatures
(406) 994-4448

GRMN 101 ELEMENTARY GERMAN I
F, Su alternate years 4 cr. RCT 4
NOTE: Offered on a rotating basis with French and Spanish in Summer.
- An elementary level course designed to help students acquire basic proficiency in communication within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures.

GRMN 102D ELEMENTARY GERMAN II
S alternate years 4 cr. RCT 4
PREREQUISITE: GRMN 101 or equivalent, or two years of high school German. Offered on a rotating basis with French and Spanish in Summer.
- This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues.

GRMN 201D INTERMEDIATE GERMAN I
F 3 cr. RCT 3
PREREQUISITE: GRMN 102 or equivalent, or a minimum three years of high school German, or placement interview.
- Intensive methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate-level readings and discussions. Increased emphasis on written communication.

GRMN 220D GERMAN LANGUAGE & CULTURE
S 3 cr. RCT 3
PREREQUISITE: GRMN 201 or equivalent, or a placement interview.
- Designed to follow the third semester review of grammar and basic skills. Taught through a series of carefully selected readings in German culture, civilization and literature which will provide the basis for writing essays and reports and developing advanced language skills.

GRMN 303IH ISSUES OF GERMAN CINEMA
S alternate years, to be offered every 3 cr. RCT 3
PREREQUISITE: Junior standing or consent of instructor.
- Acquaints students with the traditions of German cinema in national, European and global contexts. Theoretical film analysis of silent film, propaganda film, post-war cinema, rubble film, censored films, New German Cinema and other genres. All films, readings, and discussions in English. Mandatory weekly evening film screenings.

GRMN 315 SURVEY GERMAN LITERATURE
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: GRMN 220.
- A survey of representative works of German literature from selected literary periods before 1900.

GRMN 329 CONTEMPORARY GERMAN LITERATURE
On Demand 3 cr. LEC 3
PREREQUISITE: GRMN 220
- Literary and cultural analysis of German literary production in the twentieth century and to present.

GRMN 330 GERMAN:ADV GRAMMAR, CONVERSATION _ COMP I
F alternate years, to be offered every 5 cr. RCT 3
PREREQUISITE: GRMN 220
- In-depth review of grammar, idiomatic expression; vocabulary building practice in conversation. Short readings in German as a basis for conversation and composition. Emphasis on accuracy in grammar and expression.

GRMN 331 GERMAN: ADV GRAMMAR, CONVERSATION, COMP II
F alternate years, to be offered odd years 3 cr. RCT 3
PREREQUISITE: GRMN 220 or permission of the instructor.
- In-depth review of grammar, idiomatic expression, and conversation and writing skills. Longer readings in German. Emphasis on attaining proficiency in spoken and written German, some focus on phonetics and German for the professions.

GRMN 350D GERMAN CULTURE & CIVILIZATION
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: GRMN 220
- A survey of the great figures and periods of German art, literature, music, and public life in German-speaking countries which have made significant cultural contributions to world civilization up to 1871.

GRMN 360IH GERMAN MYTHS: THE LORELLI, FAUST, AND VAMPIRES
F alternate years, to be offered every 3 cr. LEC 3
PREREQUISITE: Junior standing or consent of instructor.
- An examination of the German mythical figures in pursuit of love, knowledge, and blood. These themes are explored through the texts from medieval legends through contemporary popular culture. Authors include Goethe, Heine, and others. Films by Murnau and Herzog. All readings and discussions in English.

GRMN 401 GERMAN-LINGUISTICS-PHONETICS
On Demand 3 cr. RCT 3
PREREQUISITE: GRMN 220
- An overview of significant linguistic concepts which contribute to an understanding of Modern German. Also a practical study of German sounds - their pronunciation, combination, and representation by written symbols. Contrastive linguistic study, German-English, for teaching application.

GRMN 450R SEM:GERMAN LITERATURE AND CULTURE
S 3 cr. SEM 3
PREREQUISITE: GRMN 330, GRMN 315, or GRMN 320.
- Senior capstone course. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

GRMN 461 TEXT AND CINEMA
F 3 cr. RCT 3
PREREQUISITE: GRMN 330 or 331 or permission of instructor.
- This seminar focuses on the cultural, historical, and linguistic elements crucial to an understanding of the relationship between text and cinema within a national and international tradition. It is designed to provide a context for majors and minors to read longer texts not otherwise taught in the curriculum, including the canonical novels of the late 19th century. Prerequisite: GRMN 331 (can be taken simultaneously). Taught in German.

GRMN 490R UNDERGRADUATE RESEARCH
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

GRMN 491 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDCF
Human Development, Child & Family
Department of Health & Human Development
(406) 994-3242

HDCF 138 SURVEY OF FAMILY FINANCE AND CONSUMER ISSUES
F 3 cr. LEC 3
- If you need to make dollars last throughout the semester, this class is for you! The course combines some basic economics with how to’s of becoming financially literate. Covers earning, using credit, spending plans, avoiding fraud, and financial planning.

HDCF 150S LIFESPAN HUMAN DEVELOPMENT F, S 3 cr. LEC 3
- Cognitive, physical, social, and emotional domains in human growth and development from conception through adulthood, aging, and death. Emphasis on classical and contemporary theory, current research, and practical applications for practitioners, teachers, and parents.

HDCF 160 EARLY CHILDHOOD THROUGH ADOLESCENT DEVELOPMENT
F, S 3 cr. LEC 3
- This course focuses on the development of children in early childhood, middle childhood and adolescence. Cognitive, psychosocial, moral and physical domains are examined in addition to developmental processes related to culture, gender, SES, ethnicity and education. Theory, research and application for practitioners are emphasized.

HDCF 218 FASHION AND TEXTILES
S alternate years, offered every 5 cr. RCT 3
- Methods of teaching textiles and apparel; wardrobe management. Planning, selection, and purchase; design principles including color, lines, and emphasis; and the care of clothing and types and characteristics of fibers, production and properties of fabrics.
COURSE DESCRIPTIONS: HDCF 219 - HDCF 400

HDCF 219 APPAREL CONSTRUCTION
S alternate years, offered odd years 5 cr.
LEC 1 LAB 2
Students will learn how to construct basic apparel. Emphasis will be placed on pattern reading and state-of-the-art construction techniques. A second emphasis will be on pedagogy techniques related to the construction of apparel and other items.

HDCF 239 CONTEMPORARY CONSUMER ISSUES
F 3 cr. LEC 3
PREREQUISITE: HDCF 138 or consent of instructor.
- Theories of consumer economics will be introduced and applied to current consumer issues such as housing, food, health care, and energy.

HDCF 250 SIGNING EXACT ENGLISH I
F 3 cr. LEC 3
- Examines the rationale and structure of S.E.E.

HDCF 263 RELATIONSHIPS AND FAMILY SYSTEMS
F 3 cr. LEC 3
PREREQUISITE: Sophomore standing.
- Relationship development across the life cycle from a family systems perspective. Relationship dynamics through major relationship transitions including couple formation, cohabitation, marriage, parenthood, death, divorce, and remarriage will be examined. The diversity of family experiences will be emphasized.

HDCF 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

HDCF 271 EARLY CHILDHOOD PARAPROFESSIONAL EXPERIENCE
F 1 cr. LAB 1 May be repeated.
PREREQUISITE: HDCF 160 and sophomore standing for ECE majors; HDCF 150 for Education majors.
- Learning strategies of positive, effective interactions while working directly with young children and their families; gaining information of early childhood education and the complex roles of early childhood educators.

HDCF 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDCF 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDCF 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

HDCF 519 THEORIES AND SKILLS FOR HELPING RELATIONSHIPS
F S 3 cr. LEC 3
PREREQUISITE: Junior standing in Health and Human Development major or consent of instructor.
- An introduction to various family, consumer science, and counseling theories, skills, and modalities. An overview of the helping profession. Development of interpersonal and professional skills for working with others.

HDCF 355 CURRICULUM DEVELOPMENT IN FAMILY AND CONSUMER SCIENCES EDUCATION
S 3 cr. LEC 2 LAB 1
PREREQUISITE: EDSD 459.
- How to plan, develop, teach, supervise, and evaluate programs in family and consumer sciences education. A second focus will be to learn about responsible actions and decision making as leaders in family, community, and work settings through the use of FCCLA.

HDCF 358 PERSONAL AND FAMILY FINANCE I
F 3 cr. LEC 3
PREREQUISITE: HDCF 138, M core, or permission of instructor.
- Planned use of financial resources to meet the goals of individuals and families. Concepts include time value of money concepts, credit, budgeting, risk management, taxation and basic investments.

HDCF 359 PERSONAL AND FAMILY FINANCE II
S 3 cr. LEC 3
PREREQUISITE: HDCF 358.
- In-depth analysis for individuals and families in risk management, retirement planning, estate planning, and investment and portfolio management.

HDCF 362 DEVELOPMENT, EDUCATION, AND WELL-BEING OF NATIVE AMERICAN CHILDREN
Su On Demand 3 cr. LEC 3
- The course emphasizes well-being indicators in Native American children from a developmental, educational, and community perspective. Exploration and understanding of deficit models and strength models of well-being are examined within the context of tribal communities.

HDCF 371 RESEARCH METHODS IN HHD
F S 1-3 cr. LEC 3
PREREQUISITE: HDCF 356.
- An introduction to research methods in Human Development and Family Science.

HDCF 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Senior standing.
- Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting class materials.
HDCF 425R FAMILY LAW AND PUBLIC POLICY
F, S 3 cr. LEC 3
PREREQUISITE: HDCF 263, HDCF 571 or equivalent, junior standing or permission of instructor.
- An in-depth review of current laws and public policies impacting family wellbeing including marriage, domestic partnership, divorce, child custody, welfare, foster care, ICWA, and adoption. The impact of workplace and health care policies on families is also examined.

HDCF 429 SMALL BUSINESS OPERATIONS IN HHID
S 3 cr. LEC 3
PREREQUISITE: HDCF 138.
- This course introduces basic finance, accounting, marketing, and management concepts for owning and operating a successful small family-owned business. Special attention is given to small, family-owned businesses involving areas of study in health and human development.

HDCF 432 SOCIAL COMPETENCE IN EARLY CHILDHOOD
F, alternate years, offered odd years 3 cr. LEC 3
PREREQUISITE: HDCF 263 and HDCF 371.
- Understanding social competence in young children in relation to familial, social and cultural contexts. Development of social skills, self-concept, peers and friendships, emotional development and resiliency.

HDCF 437 MANAGING WORK AND FAMILY
S 3 cr. LEC 3
PREREQUISITE: HDCF 371.
- The course focuses on how families acquire and use resources from work and the household to meet family goals and demands. Special attention to managing the dual demands of work and family in relation to the family’s time, money, marital, and child-rearing responsibilities.

HDCF 440 PARENTING
S, Su on demand 3 cr. LEC 3
PREREQUISITE: HDCF 263 and HDCF 371.
- Examines parenting processes and parent-child relationships based on scientific study of child development and family relations. Diverse parenting issues (e.g., parenting through divorce; parental stress and adaptation) will be explored across the lifespan using family systems and ecological frameworks.

HDCF 442 LITERACY IN EARLY CHILDHOOD
F alternate years, odd years 3 cr. LEC 3
PREREQUISITE: Junior standing in major or consent of instructor.
- The course will focus on the development of literacy from birth to five by integrating early childhood education and adult literacy into a unified approach to literacy that supports early childhood education and family literacy. Scientifically-based reading/literacy research, policy and advocacy, literacy development in children and adults, learning environments, community supports and identification and development of early literacy materials.

HDCF 447 FAMILY LIFE EDUCATION
F 3 cr. RCT/DES 3
PREREQUISITE: HDCF 371 and junior standing in the major.
- Students will gain an understanding of the general philosophy and broad principles of family life education in conjunction with the ability to plan, implement, and evaluate such educational programs. This course will be taught in accordance with the guidelines from the National Council of Family Relations on becoming a Certified Family Life Educator.

HDCF 454 PRACTICUM IN EARLY CHILDHOOD TEACHING
S 3 - 5 cr. LAB Maximum 5 cr.
PREREQUISITE: Senior standing in major and student teaching applicant screening required.
- Senior capstone course. Supervised experience in programs for young children. Students will be responsible for planning, presenting, supervising, and evaluating early childhood activities in a child development laboratory setting.

HDCF 455R ADMINISTRATION OF HUMAN SERVICE PROGRAMS
F 3 cr. LEC 3
PREREQUISITE: HDCF 371 and senior standing.
- Knowledge and skills necessary for establishing and administering various human service programs including early childhood, youth, family, and agency settings. Students will design a program including preparation of a grant application.

HDCF 458 ASSESSMENT AND INTERVENTION
S 4 cr. LEC 3 LAB 1
PREREQUISITE: HDCF 356 and senior standing or consent of instructor.
- Knowledge, application and interpretation of data in formal and informal assessment instruments; formal report writing; psychometrics; CST, IEP, IFSP, 504, FBA parent and professional roles. Linking assessment data with intervention techniques. Direct experience with children and families required.

HDCF 459 CHEMICAL DEPENDENCY TREATMENT
On demand 3 cr. LEC 3
PREREQUISITE: HDCF 263 and HDCF 371.
- Examines processes and parent-child relationships based on scientific study of child development and family relations. Diverse parenting issues (e.g., parenting through divorce; parental stress and adaptation) will be explored across the lifespan using family systems and ecological frameworks.

HDCF 466 GENDER, RACE, CLASS, AND FAMILY DIVERSITY
S 3 cr. LEC 3
PREREQUISITE: HDCF 263, HDCF 571 or equivalent, and senior standing or permission of instructor.
- Examines gender, race, social class, and diversity in family life as well as the intersections of gender, race, class, and other variables, such as geographic location (rural, urban) and household composition, using family systems, ecological, cultural, and feminist frameworks.

HDCF 466 HEALTH & MOVEMENT IN EARLY CHILDHOOD
S, alternate years, even years 3 cr. LEC 3
PREREQUISITE: HDCF 263, HDCF 571 or equivalent, and senior standing or permission of instructor.
- This course will focus on developmentally appropriate movement and health related activities in early childhood education including: designing physical activity programs and effective movement curricula in early childhood settings, appropriate teaching practices, understanding movement concepts, and helping guide children in becoming physically active and healthy for a lifetime.

HDCF 470 INDEPENDENT STUDY
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDCF 479R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 2 cr. RCT May be repeated. Maximum 4 cr.
COREQUISITE: HDCF 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDCF 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Maximum 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

HDCF 500 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HDCF 555 CURRENT RESEARCH IN CHILD AND ADOLESCENT DEVELOPMENT
On demand 3 cr. RCT 3
PREREQUISITE: Graduate standing.
- Current research, issues and trends in child and adolescent development are examined.

HDCF 556 EARLY CHILDHOOD EDUCATION: A CONSTRUCTIVIST PERSPECTIVE
On demand 3 cr. RCT 3
PREREQUISITE: Upper division course work in early childhood education or elementary education.
- To introduce the history, framework, concepts, and critiques of constructivism in early childhood education; to understand recent trends in constructivist early childhood research, theory, and practice; to apply practices in early childhood education to program planning, implementation, and evaluation.
COURSE DESCRIPTIONS: HDCF 563 - HDCO 522

HDCF 563 MULTICULTURAL AWARENESS
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
This course explores the relationships between social organizations, processes of historical change, social stratification (race, gender, sexuality), individuals and family structure.

HDCF 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Division of Graduate Education.
- Directed research and study on an individual basis.

HDCF 572 PROFESSIONAL PRACTICUM
F, S 2 - 6 cr. LAB Maximum 9 cr.
PREREQUISITE: HDCF 554, HDCF 555, graduate standing and consent of instructor.
- Practicum experience in the field of human development.

HDCF 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND, Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his/her major advisor and graduate committee.

HDCF 576 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

HDCF 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDCF 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; Maximum 5 cr.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

HDCF 589 GRADUATE CONSULTATION
F, S, Su 1-3 cr. TUT 1-5 cr.
PREREQUISITE: Master’s standing and approval of the Division of Graduate Education.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

HDCF 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.
- Directed graduate research/creative activity.

HDCO

Human Development, Counseling
Department of Health & Human Development
(406) 994-3242

HDCO 460 STUDENT LEADER TRAINING
S 2 cr. LEC 1 RCT 1
PREREQUISITE: Orientation leader status; restricted entry.
- Knowledge and skills necessary for interaction, presentation, and facilitation with regard to new student group leading, peer advising, and campus representation.

HDCO 463 STUDENT ASSISTANT TRAINING
F 1 cr. RCT 1
PREREQUISITE: Resident Assistant status; restricted entry.
- Course includes training in various aspects related to the performance of the Resident Advisor position duties. It includes areas such as self-understanding, interpersonal skills, intervention techniques, and perspectives on college students and the campus environment, which are fundamental to the effective functioning of Resident Assistants.

HDCO 464 STUDENT ASSISTANT CANDIDATE TRAINING
S 1 cr. RCT 1
PREREQUISITE: Resident Assistant candidate status; pass/fail grading; restricted entry.
- Course includes exposure to college student development theories, advising, and communication skill development areas within a residence hall setting. Emphasis is given to working with individuals and groups in a peer counseling/educational role. Resident Advisor roles and responsibilities are also addressed.

HDCO 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.

HDCO 500 SEMINAR
F, S, Su 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing in counseling program or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HDCO 502 COUNSELING ETHICS AND PROFESSIONAL ORIENTATION
Su 2 cr. RCT 2
PREREQUISITE: Graduate standing in counseling program.
- This course will prepare the student with a strong orientation to professional and ethical issues as they apply to counseling. Contents of the course will examine historical aspects of counseling professions, professional counseling roles, professional organizations, consultation models, professional preparation standards, and credentialing. It will also introduce appropriate ethical codes for conduct and study case studies representing ethical dilemmas. A counselor may face in schools, agencies, and private practice.

HDCO 503 PROFESSIONAL ISSUES IN COUNSELING
F 3 cr. SEM 3
PREREQUISITE: Graduate standing in counseling program.
- This course focuses on providing students with an understanding of the professional identity and roles of the counselor in prevention, consultation, crisis management, specialization, public policy, legal and ethical issues unique to working with schools, families, and community organizations.

HDCO 505 PROFESSIONAL ISSUES IN SCHOOL COUNSELING
F 3 cr. RCT 3
PREREQUISITE: Graduate standing in counseling program.
- Presentation of professional and ethical issues in school counseling. Group discussion and various experiential activities will provide students with numerous opportunities to understand current issues and trends in the field of school counseling.

HDCO 506 SCHOOL COUNSELING PROGRAMS
Su 5 cr. LEC 3
PREREQUISITE: Graduate standing in counseling program.
- Foundations of the school counseling profession including historical and conceptual perspectives of the field, and the knowledge and skills necessary to be a professional school counselor. Particular emphasis will be placed on a thorough understanding of planning, design, implementation, and evaluation of comprehensive school counseling programs.

HDCO 508 COUNSELING THEORIES I
Su 3 cr. LEC 3
PREREQUISITE: Graduate standing in counseling program.
- Students will learn a wide range of systems theories used in the diagnosis and treatment of individuals, couples, children, and families.

HDCO 510 COUNSELING THEORIES II
F 3 cr. LEC 3
PREREQUISITE: Graduate standing in counseling program.
- This course provides an overview of the major counseling theories and practical applications with various populations. Teaching modalities will include lecture, class discussion, study of taped counseling sessions, and small group interaction.

HDCO 521 COUNSELING SKILLS LAB
F 1 cr. LAB 1
PREREQUISITE: Graduate standing in counseling program.
- Students will learn, practice, and apply basic counseling skills in preparation for their practicum experience.

HDCO 522 GROUP COUNSELING
F 3 cr. LEC 2 LAB 1
PREREQUISITE: Graduate standing in counseling program.
- The following information will be covered in relation to group counseling: theories, research, developmental stages, therapeutic factors, leadership functions, consultation and ethics. Use of leadership skills in structured and unstructured groups will be practiced.
HDCO 523 ADDICTIONS COUNSELING
S 2 cr. RCT 2
PREREQUISITE: HDCO 510 and graduate standing in counseling program.
- This course is designed to review current developments in the field of addictions, as well as evaluate research and treatment trends within addiction practice. Students will demonstrate an understanding of addictions theory and apply it to practice cases.

HDCO 524 CONSULTATION: THEORY AND PRACTICE
Su 2 cr. RCT 2
PREREQUISITE: Graduate standing in counseling program.
- The study of consultation theories, strategies, and models. Includes specific applications related to collaboration among schools, mental health agencies, and private practitioners.

HDCO 525 COUNSELING CHILDREN AND ADOLESCENTS
S 5 cr. RCT 3
PREREQUISITE: Graduate standing in counseling program.
- Application of counseling theories and techniques to preschool and school age (K-12) children and their families. A special emphasis will be placed on implementing appropriate intervention strategies according to age, developmental level, and the counseling setting.

HDCO 526 ADVENTURE COUNSELING
On Demand 3 cr. RCT 3
PREREQUISITE: Graduate standing in counseling program.
- An introduction to the theory and practice of adventure-based counseling and experiential learning. The course will focus on the goals, concepts, and techniques of adventure work. Students will learn numerous adventure games, problem-solving initiatives, and how to design adventure programs.

HDCO 530 MIND-BODY MEDICINE AND THE ART OF SELF-CARE
S 3 cr. LEC 1 LAB STU 2
PREREQUISITE: Graduate standing or consent of the instructor and HDCO 510.
- The objectives of this course are two-fold: 1) familiarize students with mind-body interventions; and 2) practical methods for health care providers to engage in self-care.

HDCO 551 APPRAISAL
Su 3 cr. LEC 2 LAB 1
PREREQUISITE: EDUC 402, Graduate standing in counseling program.
- Topics include test standardization, reliability and validity; developing understanding of appraisal instruments and needs assessment used with individuals and systems; using information derived from selected appraisal instruments.

HDCO 554 DEVELOPMENTAL THEORY ACROSS THE LIFESPAN
F 3 cr. LEC 3
PREREQUISITE: HDCO 521 and HDCO 571.
- An introduction to the complex developmental relationships among individuals in the family across the life span. Systems, developmental, learning and personality theories across the life span are surveyed. Contextual variables on developmental processes are stressed.

HDCO 556 SEXUALITY COUNSELING
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: HDCO 510, Graduate standing in counseling program.
- Exploration of sexual issues and the counseling process. Examination of foundations needed to respond to clients’ sexual concerns.

HDCO 558 CAREER COUNSELING
Su 2 cr. LEC 2
PREREQUISITE: Graduate standing in counseling program.
- This course will prepare the student in the area of career guidance and counseling. Emphasis will be placed on the understanding of career development theories, use of occupational informational sources including computer programs, assessment of the individual and various working environments, and the design of career-centered mental programs from elementary school through retirement. The student will also be introduced to the impact social issues have on work, leisure and families.

HDCO 559 DIAGNOSIS AND MENTAL HEALTH
S 3 cr. LEC 3
PREREQUISITE: Graduate standing in counseling program.
- This course will provide students with conceptual understanding of mental disorders within physiological, developmental, familial, and social cultural contexts. Students will learn how to use DSM diagnosis in the appraisal and differential diagnosis of mental disorders.

HDCO 565 MARITAL AND RELATIONSHIP COUNSELING
F 3 cr. LEC 2 RCT 2
PREREQUISITE: HDCO 508, graduate standing in counseling program and permission of instructor.
- Theoretical foundations and interventions for working with marital and intimate relationships. Includes promotion of healthy couple relationships and treatment of couples in crisis and/or transition. Emphasizes gender roles, sexuality, and issues related to intimacy from a systemic perspective.

HDCO 566 SEXUAL ISSUES
On demand 1 cr. RCT 1
PREREQUISITE: Graduate standing in counseling program.
- Theory and practice regarding sexual issues with clients.

HDCO 568 MENTAL HEALTH METHODS & TREATMENT
S 3 cr. LEC 3
PREREQUISITE: HDCO 510 and graduate standing in counseling program.
- Mental health counseling methods for treatment of mental disorders, including adults with serious mental illness and severely emotionally disturbed children. Appraisal, treatment planning, evidence-based interventions, medications, crisis intervention, case management, consultation, referral, and professional issues/ethics in treatment of DSM disorders.

HDCO 569 ADVANCED FAMILY COUNSELING
S 3 cr. RCT 3
PREREQUISITE: HDCO 508, graduate standing in counseling program and permission of instructor.
- Advanced theoretical foundations and interventions for the practice of family therapy. Includes current research regarding family therapy and treatment. Emphasizes assessment and interventions for families dealing with mental health diagnoses, substance abuse/sexual abuse, divorce/remarriage, and child/adolescent issues.

HDCO 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing in counseling program, consent of instructor, approval of department head and Dean of Division of Graduate Education.
- Directed research and study on an individual basis.

HDCO 571 PROFESSIONAL COUNSELING PRACTICUM
F, S, Su 3 cr. LAB 3 Max repeat 15 cr.
PREREQUISITE: HDCO 508 or HDCO 521 and graduate standing in counseling program and consent of instructor.
- Supervised clinical practice with individuals, children, families, and groups. Weekly individual and group supervision.

HDCO 574 ADVANCED COUNSELING PRACTICUM/CONSULTATION
F, S, Su 1 - 5 cr. LAB
PREREQUISITE: HDCO 571 and graduate standing in counseling program and consent of instructor.
- Supervised experience in the application of advanced counseling techniques and/or consultation. Credit hours and specific requirements are tailored to meet individual needs.

HDCO 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing in counseling program.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

HDCO 576 INTERNSHIP
F, S, Su 2 - 12 cr. IND
PREREQUISITE: HDCO 571 and graduate standing in counseling program and clinical review.
- An individualized assignment arranged with an agency, school or other organization to provide guided experience in the field.

HDCO 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDCO 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a counseling organization, consent of instructor and Dean of Division of Graduate Education.
- Courses offered on a one-time basis to fulfill professional development needs of in-service educators or counselors. A specific focus is given to each course which is appropriately subtitled.

HDCO 589 GRADUATE CONSULTATION
F, S, Su 1-3 cr. TUT 1-3 cr.
PREREQUISITE: Graduate standing in counseling program and approval of the Dean of Division of Graduate Education.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.
COURSE DESCRIPTIONS: HDCO 590 - HDFN 480

HDCO 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Graduate standing in counseling program and consent of instructor

HDFN Human Development, Food/Nutrition
Department of Health & Human Development
(406) 994-3242

HDFN 146 INTRODUCTION TO SUSTAINABLE FOOD AND BIOENERGY SYSTEMS
S 3 cr. LEC 3
– A systems perspective on local, state and national food, agriculture and energy issues. Key topics include Agroecology, Sustainable Crop Production, and Sustainable Food Systems. For majors and non-majors. Cross-listed with LRES 146 and IPSS 146.

HDFN 221CS HUMAN NUTRITION
F, S 3 cr. LEC 3
– Basic concepts of human nutrition which include carbohydrates, lipids, proteins, vitamins, minerals, absorption, digestion, metabolism, and energy utilization as they relate to health and food consumption at different stages of the life cycle.

HDFN 226 CULINARY FUNDAMENTALS LAB
S 2 cr. LAB 2
COREQUISITE: HDFN 226 or equivalent course.
– Practical experiences which illustrate the principles of ingredient functionality, methods of preparation, preservation, food safety and sensory evaluation, and cultural food perspectives.

HDFN 227 CULINARY FUNDAMENTALS LAB
S 2 cr. LAB 2
COREQUISITE: HDFN 226 or equivalent course.
– Practical experiences which illustrate the principles of ingredient functionality, methods of preparation, preservation, food safety and sensory evaluation, and cultural food perspectives.

HDFN 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDFN 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
– Classroom instruction associated with directed undergraduate research/creative activity projects.

HDFN 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
– Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

HDFN 321 NUTRITION IN THE LIFE CYCLE
F 3 cr. LEC 3
PREREQUISITE: HDFN 221.
– Nutritional needs and health concerns during the different stages of life: pregnancy, lactation, infancy, preschool years, middle childhood, adolescence, adulthood, and later maturity. Special reference to agencies offering nutrition services.

HDFN 322 CULINARY SKILLS AND MANAGEMENT
F 3 cr. LEC 3
PREREQUISITE: HDFN 221, HDFN 226, and HDFN 227 or consent of instructor.
– Principles of quantity food procurement, production, and presentation. Emphasizes food safety and sanitation principles and organizational management in dietetics professions.

HDFN 325 CULINARY MANAGEMENT PRACTICUM
S 3 cr. LEC 3
PREREQUISITE: HDFN 221, HDFN 226, HDFN 227, and HDFN 322 or consent of instructor.

HDFN 351 NUTRITION AND SOCIETY
S 3 cr. LEC 3
PREREQUISITE: HDFN 221.
– Factors in the community influencing nutritional status, techniques to assess community nutritional needs, and methodology for planning, implementing, and evaluating community nutrition programs. Cultural food issues emphasized. Major community nutrition project completed for a public or private agency.

HDFN 400 SEMINAR
F 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Senior standing.
– Senior capstone course for food and nutrition students in the dietetics program. Emphasis on establishing a professional identity, preparing a portfolio, and transitioning to a career in the field of human services. Includes dietetic internship application preparation.

HDFN 401 NUTRITIONAL ASSESSMENT AND COUNSELING
S 3 cr. LEC 3
PREREQUISITE: HDFN 319 and HDFN 321.

HDFN 411 NUTRITION FOR SPORTS AND EXERCISE
F 3 cr. LEC 3
PREREQUISITE: HDFN 221 and HDPE 221, or BIOL 207/208 plus junior standing.

HDFN 421 MACRONUTRIENT METABOLISM
F 3 cr. LEC 3
PREREQUISITE: HDFN 221, BCHM 340, BIOL 207.
– Digestion, absorption, and metabolism of macronutrients, metabolic pathways utilizing carbohydrates, fats, and proteins, and changes that occur in metabolism under different physiological conditions.

HDFN 422 MICRONUTRIENT METABOLISM
S 3 cr. LEC 3
PREREQUISITE: HDFN 421, and HDFN 425.
– Digestion, absorption, and metabolism of micro-nutrients, metabolic roles of vitamins and minerals, and changes that occur in metabolism under different physiological conditions.

HDFN 425 MEDICAL NUTRITION THERAPY I
F 3 cr. LEC 3
PREREQUISITE: HDFN 401.
– Examination of metabolic and physiological changes in selected conditions and implications for medical nutrition therapy. Extensive case studies utilized to facilitate critical thinking for appropriate nutritional care.

HDFN 426 MEDICAL NUTRITION THERAPY II
S 3 cr. LEC 2 LAB 1.
PREREQUISITE: HDFN 425.
– Senior capstone course. Application of principles of clinical nutrition. Supervised practice in a hospital for one week under the supervision of a registered dietitian (requires relocation for one week).

HDFN 445R CULINARY MARKETING:
FARM TO TABLE
S alternate years, to be offered even years 3 LEC 3.
PREREQUISITE: HDFN 221, HDFN 227, or permission of instructor.
– Emphasizes hands-on food experience, including market garden tending and harvesting, distribution by community supported agriculture, food marketing and retail at farmers’ markets, culinary practice with seasonal garden produce and food preservation, educational outreach and culinary demonstrations, and independent research projects.

HDFN 451R SUSTAINABLE FOOD SYSTEMS
S alternate years, to be offered even years 3 LEC 3.
PREREQUISITE: HDFN 221, HDFN 371 or consent of instructor.
– This course examines the connections among the food industry, agriculture, and the environment and considers the sustainability of food choices. Students gain a systems perspective on current nutrition problems such as hunger, obesity, and disordered eating. Students conduct independent research.

HDFN 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
– Directed research and study on an individual basis.

HDFN 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
HDFN 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-2 cr. Credit may be repeated. Max. 4 cr.
PREREQUISITE: HDFN 490.
Course assignment associated with directed undergraduate research/creative activity projects.

HDFN 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. Credit may be repeated. Max. 12 cr.
Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

HDFN 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
Topics offered at the graduate level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

HDFN 511 EXERCISE METABOLISM AND NUTRITION
S 3 cr. LEC 3
PREREQUISITE: BIOL 207 or BIOL 208, HDFN 411, CHMY 125.
This course examines how cellular demands influence the need for carbohydrates, amino acids, lipids, vitamins, and minerals, how the availability of these nutrients influences adaptations, and the influence of these adaptations on exercise performance and disease risk.

HDFN 524 ADOLESCENT NUTRITION
S 2 cr. LEC 2
This is an online course designed to provide teachers strategies for incorporating nutrition education into their curriculum. Course participants explore nutrition science relevant to adolescent health, gain exposure to quality education resources and investigate school wellness issues and strategies.

HDFN 526 NUTRITION FOR FITNESS AND PERFORMANCE
F 3 cr. LEC 3
PREREQUISITE: HDFN 222I, BIOL 208I, CHMY 121N BCHM 370.
Examines energy metabolism and physical activity. Use of nutrition strategies to meet the energy, power, output, and nutrient demands of exercise, and athletic performance. Examines behavioral relationships that affect fitness and health, including disordered eating and the female athlete triad, evaluation of nutrition information and dietary supplements, with extensive use of internet resources.

HDFN 545 EXPLORATION OF FOOD BIOTECHNOLOGY
On Demand 2 cr. LEC 2
This course will delve into the history, techniques, applications and ethical concerns associated with the rapidly growing areas of biotechnology in food production, food processing and agriculture. All course participants will receive food biotechnology curriculum materials for incorporation into the high school biology classroom.

HDFN 551 GLOBAL FOOD PERSPECTIVES
F alternate years, to be offered even years 3 cr. LEC 3
Explores the making of the American diet by examining the impact of global historical events, cultural trends, economic pressures and political activities. Students think critically about the relationship between health and the food supply, proposing solutions to common food problems.

HDFN 570 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Division of Graduate Education.
Directed research and study on an individual basis.

HDFN 575 RESEARCH OR PROFESSIONAL PAPER PROJECT
F, S, Su 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

HDFN 576 INTERNSHIP
On Demand 2-12 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

HDFN 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
Courses not offered in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDFN 588 PROFESSIONAL DEVELOPMENT
On Demand 1-3 cr. LEC 3
PREREQUISITE: Graduate standing, teaching experience and/or current employment in school organization, consent of instructor and Dean of Division of Graduate Education.
Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled.

HDFN 589 GRADUATE CONSULTATION
On Demand 1-3 cr. IND
PREREQUISITE: Graduate standing in nutrition major.
This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who needs additional faculty or staff time or help.

HDFN 590 MASTER’S THESIS
F, S, Su 1-10 cr. IND
PREREQUISITE: Master’s standing.
Directed graduate research/creative activity.

HDFP Human Development, Family Financial Planning Courses
Department of Health & Human Development
(406) 994-3242

HDFP 505 FAMILY SYSTEMS
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
This class explores the family as a system within the broader context of society. The developmental stage of the family will be the framework for studying the family system over the family life cycle and for exploring critical aspects of the family such as communication, economics, relationship quality, and interaction with other systems. We will also explore how family science approaches different issues and what scientists choose to study about families. This course is offered as a distance-delivered course from North Dakota State University.

HDFP 510 FUNDAMENTALS OF FINANCIAL PLANNING
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
This course provides an overview of family financial planning by integrating concepts and issues with planning and counseling applications. Students will be introduced to the key concepts of family financial planning, including: insurance, tax investments, retirement, and estate planning. The family financial planning process is introduced with an emphasis on the integration and application of concepts in meeting individual and family financial goals and objectives. Other topics presented include an ethics overview, compensation trends within the industry, and regulatory frameworks. This course is offered as a distance-delivered course from Kansas State University.

HDFP 515 INSURANCE PLANNING FOR FAMILIES
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
The course covers risk management concepts, tools, and strategies for individuals and families, as well as ethical considerations. Case studies provide experience in selecting insurance. This course is offered as a distance-delivered course from the University of Nebraska.

HDFP 520 INVESTING FOR THE FAMILY’S FUTURE
F 3 cr. LEC 5
PREREQUISITE: Graduate standing.
The course covers various aspects of the principles of investments and their application to family financial planning. Topics include risk analysis, risk reduction, expected returns of various investments, and the nature of securities markets and investment companies. This course is offered as a distance-delivered course from Iowa State University.

HDFP 525 RETIREMENT PLANNING, EMPLOYEE BENEFITS AND THE FAMILY
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
The course covers retirement planning for the individual and the family. Topics include qualified retirement plans, nonqualified plans, IRAs and other plans that offer tax advantages to the individual and family. This course is offered as a distance-delivered course from the University of Nebraska.

HDFP 530 ESTATE PLAN FOR FAMILY
S 3 cr. LEC 5
PREREQUISITE: Graduate standing.
The course covers the basics of estate planning for families including understanding the basic elements of estate planning, analyzing case studies of estate planning situations, and developing skills to work with families on estate planning problems.

HDFP 540 PERSONAL INCOME TAXATION
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
The course covers the basics of personal income taxation including taxation terminology, taxation issues in investments, taxes and retirement planning, tax management techniques, tax implications in marriage and other close relationships, and other tax topics related to family financial well-being.
HDFP 545 FAMILY ECONOMICS
Su 3 cr. LEC 3
PREREQUISITE: Graduate standing.
This course will cover the major issues relative to the economics of families, including household production and human capital development. It will also cover the economics of crises, public policy and family life cycle spending, saving and borrowing. A theoretical and research perspective will be utilized to illuminate the concepts in the course. This course is offered as a distance-delivered course from South Dakota State University.

HDFP 550 HOUSING/REAL ESTATE
Su 5 cr. LEC 3
PREREQUISITE: Graduate standing.
An overview of the role of housing and real estate in the financial planning process from a theoretical perspective. Taxation, legal aspects, mortgages, and financial calculations related to home ownership and real estate investments are included. New and emerging issues in the context of housing and real estate will be emphasized. The role of ethics in financial planning with housing and real estate will also be included. This course is offered as a distance-delivered course from Oklahoma State University.

HDFP 555 FINANCIAL COUNSELING
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
This course emphasizes the development of professional skills for assisting individuals and families to become responsible financial managers through the financial counseling process. Professionals with financial counseling preparation may assist in preventing, alleviating, and/or eliminating financial problems. This course is offered as a distance-delivered course from North Dakota State University.

HDFP 560 PROFESSIONAL PRACTICES
IN FAMILY FINANCIAL PLANNING
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
This course will cover the professional practice of family financial planning including the process of planning and counseling, ethics of professional practice, types of organizations offering planning and counseling services, and the evaluation of effectiveness in planning and counseling. This course is offered as a distance-delivered course from Kansas State University.

HDFP 572 FINANCIAL PLANNING-CASE STUDIES
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
This course is a capstone course in the FFP masters and involved the analysis and presentation of case studies that require the application of all material gained in the masters courses to the financial planning process for families. This course is offered as a distance-delivered course form Kansas State University.

HDFP 575 PROFESSIONAL PAPER
F, S, Su 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

HDFP 576 PROFESSIONAL PRACTICUM IN FAMILY FINANCIAL PLANNING
F, S 3 cr. LEC 3
PREREQUISITE: Graduate standing and consent of instructor.
Practicum experience in the field of family financial planning.

HDFP 590 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F 1-3 cr. RCT may be repeated.
Classroom instruction associated with directed undergraduate research/creative activity projects.

HDFP 591 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
S 1-6 cr. RCT may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

HDFP 606 RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.
COURSE DESCRIPTIONS: HDHL 490R - HDPE 319

HDHL 490R UNDERGRADUATE RESEARCH/Creative Activity
F, S 1 - 6 cr. RCT May be repeated. Maximum 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

HDHL 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Division of Graduate Education.
- Directed research and study on an individual basis.

HDHL 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.

HDHL 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; Maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Division of Graduate Education.
- Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled.

HDHL 589 GRADUATE CONSULTATION
On Demand 1 - 3 cr. IND. May be repeated; Maximum 5 cr.
PREREQUISITE: Graduate standing in health major.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

HDHL 590 MASTER’S THESIS
F, S 1 - 10 cr. IND
PREREQUISITE: Master’s standing.
- Directed graduate research/creative activity.

HDPE Human Development, Physical Education
Department of Health & Human Development
(406) 994-3242

HDPE 102 PARAPROFESSIONAL EXPERIENCE I
S 1 cr. LAB 1
- Observation of teaching and data collection in elementary, middle, and high school physical education/health enhancement classes. Placement of students to assist in youth coaching or intramural programs.

HDPE 105 LIFE SKILLS FOR STUDENT ATHLETES
F, S 2 cr. LEC 2
- This course is designed to introduce student athletes to psychological and educational theories and models associated with learning, self-management, personal and career development, and stress, coping and health. Through this course, student athletes will identify and address issues that pertain to learning and development among college students and issues that are unique to you as a student athlete.

HDPE 184 VARSITY ATHLETICS
F S 1 cr. LAB 1 Maximum repeat 2 cr.
- The participation in an intercollegiate sport which requires a minimum of two to three hours of meeting/participation per week per athletic season.

HDPE 210 EXERCISE PROGRAMMING FOR OLDER ADULTS
S 3 cr. LEC 2 LAB 1
- Students will examine the special exercise-related needs of older adults and learn how to safely and effectively meet those needs. The lab will provide practical experience working with older adults in the MSU “Young at Heart” exercise program for seniors.

HDPE 221 HEALTH ANATOMY AND PHYSIOLOGY
F 3 cr. LEC 3
- This course will focus on the key elements of anatomy and physiology necessary for students in allied health professions, specifically those who will work in the areas of community health, health enhancement education, health promotion, and kinesiology. The aim of this course is for students to demonstrate working knowledge of the muscular, skeletal, nervous, cardiovascular, and respiratory systems, and to demonstrate an understanding of the endocrine and digestive systems and body metabolism.

HDPE 222 FOUNDATIONS OF EXERCISE SCIENCE
S 3 cr. LEC 3
- The aim of this course is to integrate the subdisciplines of exercise science (nutrition, biomechanics, exercise physiology, motor control, and exercise psychology) from the perspectives of definitions, basic science, and application to health, fitness, and athletic performance.

HDPE 224 TEACHING MOVEMENT CONTENT
S 3 cr. 2 LEC 1 LAB
- Practice skills in music fundamentals; teaching and learning folk, square, social, and various types of rhythmic activities and movement exploration.

HDPE 251 TEACHING FITNESS AND PHYSICAL ACTIVITY CONCEPTS
S 3 cr. LEC 3
- Teaching practices for physical activity and fitness concepts appropriate for children and adolescents in school and recreational programs. Content includes pedagogical methods, strategies, styles, and techniques that encourage individuals to participate in and adhere to physical activity programs.

HDPE 267 INTRODUCTION TO COACHING
F, S 3 cr. LEC 3
- Introductory coaching course which will cover basic information from the beginning level in the American Coach Effectiveness Program.

HDPE 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

HDPE 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDPE 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDPE 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

HDPE 304 TECHNOLOGY APPLICATIONS IN HEALTH ENHANCEMENT
S 3 cr. LEC 3
- Skills, knowledge, and applications necessary for integrating technology into developmentally appropriate teaching practices in Health Enhancement. Identifies theories, principles, and strategies for the integration of technology into physical education, physical activity, and health settings.

HDPE 305 LEADERSHIP FOR STUDENT ATHLETES
S, to be offered even years 2 cr. LEC 2
PREREQUISITE: HDPE 105 and junior standing
- Intended for student athletes and will focus on understanding and applying principles of leadership to performance. This course will enhance the student’s ability to understand fundamental principles of leadership and apply those principles to their academic, athletic, and professional career. Specific attention will be paid to understanding individual strengths of student personality and translating those strengths into leadership positions.

HDPE 314 HEALTH ENHANCEMENT FOR ATYPICAL POPULATIONS
S 3 cr. LEC 3
PREREQUISITE: HDPE 221
- Health enhancement (physical education and health) issues for school-aged populations who have physical, mental, and/or emotional disabilities. This course is specifically for future teachers in the public schools.

HDPE 316 FOOTBALL COACHING THEORY
S 1 cr. LEC 1
- Basic fundamentals and techniques used in coaching football.

HDPE 317 BASKETBALL COACHING THEORY
F 1 cr. LEC 1
PREREQUISITE: HDPE 267.
- This course is set up to provide the student a working knowledge of basketball coaching techniques and philosophies. The course should assist the student in developing his/her own basketball coaching philosophy.

HDPE 318 SOCCER COACHING THEORY
F 1 cr. LEC 1
PREREQUISITE: HDPE 267.
- A working knowledge of soccer coaching tactics and techniques.

HDPE 319 VOLLEYBALL COACHING THEORY
S 1 cr. LEC 1
PREREQUISITE: HDPE 267.
- A working knowledge of volleyball coaching tactics and techniques.
HDPE 320 ANATOMICAL KINESIOLOGY
F S 4 cr. LEC 3 LAB 1
PREREQUISITE: BIOL 207 or HDPE 221, and M core or permission of instructor.
- Emphasizes the effects of joint structures and muscles on movement of the upper extremity, lower extremity, and spine while providing an introduction to the principles of biomechanics.

HDPE 322 EXERCISE PHYSIOLOGY
F S 4 cr. LEC 3 LAB 1
PREREQUISITE: Grade of “C” or better in BIOL 207 or HDPE 221, or permission of instructor.
- Topics include factors and mechanisms involved with causing changes and adaptations in the physiological responses associated with training and participation in strength and endurance sports and activities. Lectures and labs emphasize explaining common observations and practices from the physiological view point.

HDPE 325R BIOMECHANICS
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F 3 cr. LEC 3 PHYS 205 and HDPE 320.
COREQUISITE: HDCC 371 and STAT 217.
- This course emphasizes the effects of structure, motion, forces and their effects on and within the human body using both qualitative and quantitative analyses. Additional emphasis will be placed on the development of critical thinking skills associated with biomechanics-related research and interpretation.

HDPE 362 TRACK & FIELD THEORY
F 2 cr. LEC 2
PREREQUISITE: HDPE 267.
- The technique of all track and field events. Emphasis on teaching progressions in all events. Classroom sessions include development of training schedules, tactics, strategy, philosophy, meet organization, and officiating.

HDPE 367 COACHING APPLICATION
S 1 cr. RCT 1 Maximum 3 cr.
PREREQUISITE: HDPE 267.
- Assignment of prospective coaches to specific sports. Discussion and feedback on planning and implementation in practical setting.

HDPE 415 MANAGEMENT IN HEALTH ENHANCEMENT AND FITNESS
S 3 cr. LEC 5
PREREQUISITE: Junior standing.
- Management of sports, fitness, and physical education programs, including budget and finance, supplies and equipment, marketing and public relations, facilities, legal liability, stress and time management, and functions of sport management.

HDPE 425 HEALTH PSYCHOLOGY
F S 3 cr. SEM 3
PREREQUISITE: PSYX 100 and SOCI 101.
- The study and application of theoretical models of exercise and health with emphasis on behavior change in the individual and group levels.

HDPE 430 INSTRUCTIONAL DESIGN IN HEALTH ENHANCEMENT
F 3 cr. LEC 3
PREREQUISITE: HDHL 230, HDHL 240, HDPE 224, HDPE 251, EDEL 355 and upper division standing and acceptance into the professional teacher education program.
- A conceptual and practical approach to the design, implementation, and maintenance of various curricula for future teachers. No longer “R” core beginning Spring 2011.

HDPE 436 PRINCIPLES OF STRENGTH AND CONDITIONING
F S 3 cr. LEC 3
PREREQUISITE: BIOL 207 or HDPE 221.
- Emphasizes the use of critical thinking skills for exercise development and progressions based on fundamental principles from kinesiology, biomechanics, exercise physiology, motor control, and motor learning. Practical application of this material to the areas of personal training, physical therapy, health enhancement teaching, and exercise physiology is emphasized.

HDPE 445R APPLIED SPORT PSYCHOLOGY
S 3 cr. LEC 3
PREREQUISITE: HDPE 267 and HDCC 371 or consent of instructor.
- The application of basic principles of sport psychology for teachers and coaches, with specific emphasis on motivation, anxiety, arousal, and selected groups of athletes.

HDPE 465 EXERCISE TESTING AND PRESCRIPTION
S 4 cr. LEC 3 LAB 1
PREREQUISITE: HDPE 322, BIOL 208, STAT 216, with grade “C” or better in each course, or permission of instructor.
- Senior capstone course. Students are familiarized with the hands-on training and theoretical background needed to competently assess levels of health/fitness in an “apparently healthy” population. Lecture/lab content is structured to prepare students for taking the ACSM Health/fitness exam.

HDPE 467 ADVANCED CONCEPTS IN COACHING
F S 3 cr. LEC 3
PREREQUISITE: HDPE 267, HDPE 367 or coaching experience.
- The primary goal of this course is to implement the content of an advanced coach certification curriculum in conjunction with the Montana High School Association (MHSA). The class is intended for experienced coaches who wish to examine current issues in coaching such as the female athlete, sportmanship, or coach/parent relationships in detail.

HDPE 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

HDPE 475 SENIOR SEMINAR PROFESSIONAL ISSUES
F S 3 cr. LEC 3
COREQUISITE: HHD 476.
- Senior capstone course for majors in exercise, wellness, and athletic training. Establishing a professional identity and transitioning to a career in the field of human services.

HDPE 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDPE 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S 1 - 2 cr. RCT May be repeated. Maximum 4 cr.
COREQUISITE: HDPE 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDPE 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. RCT May be repeated. Maximum 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

HDPE 500 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HDPE 501 THEORIES AND MODELS IN HEALTH
S 3 cr. LEC 5
- Understanding and application of theory and models in the promotion of health. The course will focus on applications at the individual, organizational, community, and environmental levels.

HDPE 506 EXERCISE AND CHRONIC DISEASE
S alternate years odd years 3 cr. LEC 5
PREREQUISITE: HDPE 314, graduate standing.
- Theory and practice in the effects of exercise on various diseases, disabilities, and atypical conditions.

HDPE 515 EXERCISE PERFORMANCE AND NUTRITION
F 3 cr. LEC 5
PREREQUISITE: Knowledge in areas of anatomy and physiology, upper division courses in one or combination of: exercise physiology, biochemistry, or nutrition.
- This class covers selected topics in exercise physiology, nutrition, and metabolism related to environmental influences on physiological function and the use of nutritional supplements during exercise and the environmental influences on physiological function and metabolism will be addressed.

HDPE 520 CURRICULUM DESIGN
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- This course provides an overview of the curricular design process necessary to create traditional and nontraditional curricular models currently popular in health enhancement, health promotion, and community health.

HDPE 545 GRADUATE EXERCISE PHYSIOLOGY
F 3 cr. LEC 5
PREREQUISITE: Graduate standing; undergraduate exercise physiology.
- This course defines and explains a conceptual mechanistic-driven model that explains the basis for maximizing human performance. The instructor relies heavily on readings from the current research literature and student participation to understand the plethora of topics covered.

HDPE 567 PROFESSIONAL ISSUES IN COACHING
S, Su 3 cr. LEC 3
PREREQUISITE: HDPE 267, HDPE 367 or three years of successful coaching in public schools.
- In depth examination of at least one sub-topic from the Montana High School Coach Certification curriculum—i.e., prevention, care and rehabilitation of injuries, risk management in sport; sociological and psychological aspects of coaching; coaching the female athlete.
COURSE DESCRIPTIONS: HDPE 570 - HHD 551

HDPE 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor and approval of department head and Dean of Division of Graduate Education.
- Directed research and study on an individual basis.

HDPE 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

HDPE 576 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum credits unlimited.
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

HDPE 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDPE 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Division of Graduate Education.
- Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled.

HDPE 589 GRADUATE CONSULTATION
F, S 1-3 cr. TUT 1-3 cr.
PREREQUISITE: Master’s standing and approval of the Dean of Division of Graduate Education.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

HDPE 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND May be repeated.
PREREQUISITE: Master’s standing.
- Directed graduate research/creative activity.

HHD
Health & Human Development
Department of
Health & Human Development
(406) 994-3242

HHD 100 SPECIAL ACTIVITY
On Demand 1 cr. LAB 1 May be repeated
- Special Activity classes offered as needed using the unique skills of the instructional faculty in any given semester.

HHD 105 AIKIDO FUNDAMENTALS
On Demand 1 cr. LAB 1 Maximum 2 cr.
- The fundamentals of Japanese Aikido as taught by the World Aikido Headquarters will be explored.

HHD 110 POCKET BILLIARDS
On Demand 1 cr. LAB 1
- Pocket billiard fundamentals, most popular games, and appropriate rules will be stressed. Fee required.

HHD 117 BOWLING FUNDAMENTALS
On Demand 1 cr. LAB 1
- Bowling fundamentals will be stressed along with bowling etiquette and equipment. Fee required.

HHD 128 DANCE, SOCIAL
F, S 1 cr. LAB 1
- Traditional and popular styles of ballroom dancing, including jitterbug, polka, waltz, cha cha, western dance, and foxtrot.

HHD 145 FLY FISHING
On Demand 1 cr. LAB 1
- Basic skills and knowledge of fly fishing including; casting, entomology, habitat, stream ethics, tackle, tactics, and strategy.

HHD 161 SKIING, SNOWBOARDING, AND TELEMARKING
S 1 cr. LAB 1
- Instruction at all levels of skill from beginner to advanced. Fee required. Transportation, tickets, and equipment not included.

HHD 173 WELL-BEING:
PRINCIPLES AND PRACTICES
F, S 3 cr. RCT 3
- Freshman-level course introduces students to six majors in Health and Human Development as they relate to the principles and practices of the departmental human well-being model. Ethics, written and oral communications and the culture of professionalism will be addressed. Non-majors welcome.

HHD 203D DANCE AS CULTURAL EXPRESSION
F 3 cr. LEC 3
- Dance in a variety of cultures will be identified and examined taking into consideration many of the factors that have influenced its development (geography, climate, music, sociological values, and customs).

HHD 207IA DANCE APPRECIATION
F 3 cr. LEC 3
- Dance as a performing art; its historical development; the way dance makes statements about man and the environment through the use of music, art, movement, literature, and theater.

HHD 261 SKIING, CROSS COUNTRY
S 1 cr. LAB 1
- The course provides instruction in preparation and execution of the various skills involved in cross country skiing from the beginner through advanced depending on the student's ability and skill level. Fee required.

HHD 276 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum 12 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience within the field.

HHD 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HHD 476 INTERNSHIP
F, S, Su 1 - 12 cr. IND
PREREQUISITE: Consent of internship director in academic area.
- An individualized professional assignment arranged for specific discipline. Some academic areas will offer specific sections in sequence for their students. All students must receive department permission prior to registration, and register for a senior seminar in their major area.

HHD 501 PROFESSIONAL COMMUNICATION SKILLS IN HEALTH AND HUMAN DEVELOPMENT
F 3 cr. LEC 5
PREREQUISITE: Graduate standing in HHD.
- Students will develop written and verbal communication skills as they relate to scholarly pursuits in the areas of health and human development. They will also gain a working understanding of the various types of grants and their applications within public and private settings. Students will develop skills needed to write a successful grant concept paper and will have a working knowledge of the various components of a grant proposal and research papers and thesis.

HHD 512 RESEARCH DESIGN IN HEALTH AND HUMAN DEVELOPMENT
S 3 cr. LEC 5
- A study of the tools necessary to conduct research in the movement sciences and health fields. Includes the writing of a research proposal.

HHD 550 SPORT PHYSIOLOGY
F 3 cr. LEC 3 (Offered On-Line)
PREREQUISITE: Graduate standing in HHD.
- Course will provide an overview of the bioenergetics of muscular work, neuromuscular and cardiorespiratory function, physical training and performance in various environments, nutrition and ergogenic aids, body composition, temperature regulation, endocrine response, and sport testing techniques utilizing virtual laboratory experiences.

HHD 551 SPORT NUTRITION
F 3 cr. LEC 3 (Offered On-Line)
PREREQUISITE: Graduate standing in HHD.
- Course will provide an overview of macronutrient and micronutrient metabolism and function, popular ergogenic aids and sports performance, nutritional quackery, nutritional recommendations for improved physical performance, fluid and electrolyte needs, thermoregulation, and nutritional analyses and consultation techniques.
HIST, HSTA, HSTR

History
Department of History & Philosophy
(406) 994-4395

HSTA 101H AMERICAN HISTORY I
F, Su 4 cr. LEC 3 RCT 1
- European exploration, Pre-Columbian Native Americans, the American Colonial, Revolutionary, Early National, Jacksonian, and Civil War periods, in the context of world history.

HISTA 102H AMERICAN HISTORY II
F, S 4 cr. LEC 3 RCT 1
- Reconstruction after the Civil War, industrialization during the late 19th century, and the domestic and international transformation of the U.S. during the 20th century in the context of world history.

HISTR 101IH WESTERN CIVILIZATION I
F, Su 4 cr. LEC 3 RCT 1
- Survey of the ancient Near East, Greece, Rome, and the European world to the end of Reformation. Emphasis on social, economic, and cultural history.

HISTR 102IH WESTERN CIVILIZATION II
F, S 4 cr. LEC 3 RCT 1
- Reconstruction after the Civil War, industrialization during the late 19th century, and the domestic and international transformation of the U.S. during the 20th century in the context of world history.

HISTR 130D LATIN AMERICAN HISTORY
S 4 cr. LEC 3 RCT 1
- The history of Latin America from the Pre-Columbian period to the present day, focused primarily on the period since Independence in the 1820’s. The course examines the origins and legacies of economic and political inequalities both within Latin America and the “first world”, with attention to questions of class, race, ethnicity, and gender.

HISTR 140D MODERN ASIA
S 4 cr. LEC 3 RCT 1
- Survey of the social, political, and economic history of East Asia (China and/or Japan) in the 19th and 20th century.

HISTR 145D HISTORY OF JAPAN
F, Su 4 cr. LEC 3 RCT 1
- The political and cultural development of Japan from earliest time to the present. Special attention will be given to Japanese relations with Asia and the West.

HSTA 160D INTRODUCTION TO THE AMERICAN WEST
F alternate years, to be offered odd years 4 cr. LEC 5 RCT 1
- The American West examines the conquest settlement and development of the territory west of the Mississippi River. Readings, discussion, and lecture focus on the diversity of peoples who came to the West and the ways in which race and gender shaped their experiences.

HST 160D MODERN WORLD HISTORY
F 4 cr. LEC 3 RCT 1
- Introduction to themes important for understanding the world in the 20th century through an examination of commodities from 1000 - present: world systems, global interconnections, identity and difference, the rise of mass society, technology, and the environment.

HISTR 205CS SCIENCE, TECHNOLOGY, AND RISK
On Demand 3 cr. LEC 3
- Examines the history, science, and ethics of risk, focusing on the complex relationship of science, technology, and risk in modern age. Includes exploration of knowledge production in science and technology; case studies such as industrial health and safety, the atomic age, “natural” disasters, and global warming to understand how risk has been defined, perceived, and remedied; and team research projects on such topics as automobile safety, earthquakes, and maquiladoras.

HISTR 207CS SCIENCE & TECHNOLOGY IN WORLD HISTORY
On Demand 3 cr. LEC 3
- Surveys the role of science and technology in relation to social, political, and economic change in global history. Special attention is given to the historical development of scientific and technological knowledge, the ways different societies have linked ideas of progress and science, and how history can provide valuable perspective to contemporary debates over potentially revolutionary scientific and technological practices.

HSTR 289RH SCIENCE, ENVIRONMENT, TECHNOLOGY, SOCIETY: COMMON EXPERIENCE
S 3 cr. SEM
- Science and technology have become pervasive investigators of social change. This course aims to understand the nature, causes, and consequences of the growth of science and technology from a humanistic perspective, including recent advances in stem-cell research, the human genome, atomic energy and weapons, and space technology. We will explore the immense social, cultural, political, and economic consequences of these advances and how they have affected our relationship to the natural world.

HSTR 292CS DARWINIAN REVOLUTION
On Demand 3 cr. LEC 3
- Covers the history, philosophy, and our current understanding of the biological sciences, focusing especially on the theory of evolution. Explores Darwin’s ideas, the manner in which he came to them, his argument’s explanatory power, and the diverse ramifications of evolutionary theory, including the modern debates in science and religion, stem cell research, cloning, sociobiology, and other tricky contemporary issues.

HSTA 290R UNDERGRADUATE RESEARCH
F, S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

HISTR 290R UNDERGRADUATE RESEARCH
F, S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

HISTA 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HISTR 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HISTA 311 EARLY AMERICA
On Demand 3 cr. LEC 3
PREREQUISITE: HSTA 101.
- The development of the British American colonies and the establishment of the U.S. before 1800. Topics include pre-Columbian Native Americans, the European invasion and settlement of America, the social, economic and political evolution of the colonies, the American Revolution, and the establishment of the new nation.

HISTA 316 AMERICAN CIVIL WAR ERA
On Demand 3 cr. LEC 3
PREREQUISITE: HSTR 101 or HSTR 102.
- Political, economic, and social developments leading to sectional division. Breakdown of political accommodation, Civil War, and Reconstruction.

HISTR 318 GILDED AGE TO 1940
On Demand 3 cr. LEC 3
PREREQUISITE: HSTR 101 or HSTR 102.
- This course explores the social, economic, and political development of the U.S. from 1877 to 1940, including the rise of big business, urbanization, progressive reform, the Great Depression, and the New Deal.

HISTA 322 AMERICAN HISTORY: WWI TO PRESENT
On Demand 3 cr. LEC 3
PREREQUISITE: HSTR 101 or HSTR 102.
- Political, cultural, and economic history of the U.S. since the end of World War II.

HISTR 322 19TH CENTURY EUROPE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HSTA 101 or HISTA 102.
- Ideas and events in Britain and on the continent from the Congress of Vienna to the outbreak of World War I. Social and intellectual ideas as well as political and economic events.

HIST 324 20TH CENTURY EUROPE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HSTA 101 or HISTA 102.
- Events and forces in 20th century Europe from World War I to the present. The rise of fascism, communism, and the interwar crisis along with post-World War II developments.
COURSE DESCRIPTIONS: HSTR 330 - HSTR 431

HSTR 330 HISTORY OF MEXICO
On Demand 3 cr. LEC 3.
PREREQUISITE: Take one of the following: HSTR 101, HSTR 102 or HSTR 130.
- This course examines the historical processes that resulted in the creation of Modern Mexico: pre-Columbian civilization, European conquest, colonialism, and the struggle over nation building since independence in 1821.

HSTR 340 AGE OF THE SHOGUNS
On Demand 3 cr. LEC 3
PREREQUISITE: HSTR 140 or HSTR 145.
- Exploration of the political, cultural, and diplomatic issues involved in the development of the Tokugawa state.

HSTR 342 JAPAN'S LONG 19TH CENTURY
On Demand 3 cr. LEC 3
PREREQUISITE: HSTR 140 or HSTR 145.
- Investigates the revolutionary changes that Japan underwent between the 1770's and 1910.

HSTR 345 MODERN CHINA
F 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HSTA 160, HSTR 102 or HSTR 140.
- Social, political, and economic history of the People's Republic of China.

HSTR 346 MODERN INDIA, PAKISTAN, AND BANGLADESH
S 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HSTA 160, HSTR 102 or HSTR 140.
- Social, economic, political, and intellectual history of India, Pakistan, and Bangladesh during the 19th and 20th centuries.

HSTR 348 BRITAIN 1485-1688
On Demand 3 cr. LEC 3
PREREQUISITE: Sophomore standing and HSTR 102.
- History of the British Isles from prehistory to 1714. Topics of study include the Reformation, Civil War, unification of Scotland and England and rise of Britain as a world power.

HSTR 350 MODERN BRITAIN
On Demand 3 cr. LEC 3
PREREQUISITE: Sophomore standing and one of the following: HSTR 160 or HSTR 102.
- The emergence and fall of Britain as a world power. Topics of study include industrialization, the slow emergence of democracy in Britain, the role of the family in Victorian Britain, and the impact of the empire within Britain.

HSTR 353 MODERN FRANCE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HSTR 160, HSTR 101 or HSTR 102.
- An interdisciplinary course which focuses on the construction of the modern French nation-state.

HSTR 359 RUSSIA TO 1917
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HSTR 101 or HSTR 102.
- Emergence of Russia as a modern nation and developments which led to the Bolshevik Revolution.

HSTR 362 MODERN GERMANY
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HSTR 101 or HSTR 102.
- An in-depth look at the economic, social, and political developments of modern Germany.

HSTR 366 MIDDLE EAST/20TH CENTURY
On Demand 3 cr. LEC 3
PREREQUISITE: One of the following: HSTR 160, HIST 101, HIST 102 or PSCL 230.
- Investigate major diplomatic, economic, cultural and religious themes from the Middle East in the 20th century. Students will choose topics and countries of interest for specific, instructor-guided research. The Arab-Israeli conflict will be one case study.

HSTR 372 THE WORLD AT WAR
F, alternate years, to be offered even years 3 cr.
PREREQUISITE: HSTR 101, or HSTR 102, or HSTR 101, or HSTA 102, or HSTA 101.
- The First World War examined through political, military, technological, and social history, in the contexts of the early decades of the 20th century and consequences up to the present.

HSTR 376 TWENTIETH CENTURY WAR
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HSTR 100, HSTR 101 or HSTR 102.
- A 20th century perspective; the world wars of the century; The Cold War; and the world at war into the present.

HSTA 406 McCARTHY/IKE/TRUMAN
3 cr. SEM 3
PREREQUISITE: HSTR 101 or HSTR 102.
- An analysis of the ways the Truman and Eisenhower administrations dealt with anti-communism, with a focus on McCarthyism.

HSTA 407 GENDER
3 cr. LEC 3
PREREQUISITE: HSTA 101 or HSTA 102.
- The Scientiﬁc Revolution in Europe. Topics of study include the relationships between religion and science, science and gender, and technological change and the structure of society.

HSTA 412 AMERICAN THOUGHT/CULTURE
On Demand 3 cr. LEC 3
PREREQUISITE: HSTR 101 or HSTA 324, or HSTA 412.
- The emergence of modern science in Europe and America. Topics of study include the relationships between science, gender, ethnicity, and race.

HSTA 417 SCI TECH SOC 1500-1800
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HSTR 101, HSTR 101, HSTR 102, HSTR 282.
- The emergence of modern science in Europe and America. Topics of study include the relationships between science, gender, ethnicity, and race.

HSTR 419 MODERN SCIENCE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HSTR 102, HSTR 102, HSTR 352, HSTR 324, or HSTA 412.
- The emergence of modern science in Europe and America. Topics of study include the relationships between science, gender, ethnicity, and race.

HSTR 423 EUROPEAN INTELLECTUAL HISTORY
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HSTR 101 or HSTR 102.
- The ideologies and major thinkers who have inﬂuenced European history from the French Revolution to the present day.

HSTR 430 LATIN AMER SOC HISTORY
On Demand 3 cr. SEM 3
PREREQUISITE: HSTR 130.
- Social history of Latin America from colonial times to the present with a focus on social history methodology, theories of economic development and social change, and on the experiences of Latin America’s diverse popular classes.

HSTR 431 RACE IN LATIN AMERICA
On Demand 3 cr. SEM 3
PREREQUISITE: One of the following: HSTR 130, HIST 101 or HIST 102.
- This course explores the history of race relations in Latin America, focusing on the traditional links between “race” and power. Topics include examinations of Indigenous, African, and European cultures/ethnicities, from the Conquest to the present day.
HSTR 432 COLONIAL LATIN AMERICA
F 3 cr. SEM 3
PREREQUISITE: HSTR 130 and Junior standing or permission of instructor.
- This seminar-style course examines the colonial period in Latin America, from 1492-1821. Important themes include cross-cultural contact and conflict, the development of a colonial economy, religious and cultural change, institutional and political history, and the organization of colonial society.

HSTR 433 LATIN AMERICAN PERSPECTIVES
S 3 cr. LEC 5
PREREQUISITE: HSTR 130.
- This course approaches historical developments, literature, and constructions of identity in twelfth-century Latin America. Taught in English with Spanish reading/writing option. Focus will vary by professor.

HISTR 434 GENDER, SEXUALITY, AND SOCIAL CHANGE IN LATIN AMERICAN HISTORY
On Demand 3 cr. LEC 3
PREREQUISITE: Background in Latin American and/or Women’s Studies.
- An exploration of the ways in which transformations in the historical construction of gender and sexuality shaped and were shaped by broader processes of socioeconomic, political, and cultural change in Latin American history.

HISTR 435 GENDER IN ASIA
S 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HISTR 160, HSTR 101, HSTR 102 or HSTR 140.
- Analysis of gender relations, the family, the struggle by women in Asia to achieve civil rights and social reform, the problems of working women and various alternatives to western feminism. Focus on the 19th and 20th centuries.

HISTR 444 JAPANESE WOMEN’S HISTORY
On Demand 3 cr. SEM 3
PREREQUISITE: HSTR 140 or HSTR 145
- The role of women in Japanese history from ancient time to the present.

HISTR 445 SCIENCE, TECHNOLOGY, AND ENVIRONMENT IN JAPAN
On Demand 3 cr. SEM 3
PREREQUISITE: HSTR 140 or HSTR 145
- The role of women in Japanese history from ancient time to the present.

HISTR 446 SCIENCE & MEDICINE IN CHINA
F to be offered alternate years, 2008 3 cr. LEC 5
PREREQUISITE: HSTR 140 or HSTR 145 or consent of instructor.
- An exploration of the transformations of medicine, technology, and natural knowledge in imperial and modern China.

HISTA 450 HISTORY OF AMERICAN INDIAN
On Demand 3 cr. LEC 3
PREREQUISITE: HSTA 101 or HSTA 102.
- Indian affairs in America from 1600-1970. Emphasis on white reaction to the American Indians and the effect of the European invasion on Indian culture.

HISTA 460 MONTANA AND THE WEST
On Demand 3 cr. LEC 3
PREREQUISITE: HSTA 101 or HSTA 102.
- A survey of Montana history which will cover the development of the territory and state, and will examine the social, economic, cultural, and political patterns that connect Montana with the rest of the American West.

HISTA 461 TRANS-MISSISSIPPI WEST
On Demand 3 cr. LEC 3
PREREQUISITE: HSTA 101 or HSTA 102.
- Exploration of major themes in the development of the American West, including conquest and settlement, economic development, racial and ethnic diversity, urbanization, and popular culture.

HISTA 468 HISTORY OF YELLOWSTONE
On Demand 3 cr. LEC 3
PREREQUISITE: HSTA 101 or HSTA 102.
- Historical analysis of changing perceptions of nature on development of Yellowstone and of the Park’s place in the context of a modernizing American nation.

HISTA 468 THE MAKING OF MODERN TURKEY
S, Alternate years 3 cr. LEC 3
PREREQUISITE: Lower division HSTR (non-US history) course or junior standing or consent of the instructor.
- This course focuses upon the major political, cultural, social, and economic developments taking place in the history of Turkey from its establishment in 1923 up to the present day. Of particular importance to this course is the question of what the study of Turkey’s modern history can teach us about the modern era more generally.

HISTA 470 AMERICAN ENVIRONMENTAL HISTORY
On Demand 3 cr. LEC 3
PREREQUISITE: HSTA 101 or HSTA 102.
- Survey of changing perceptions and uses of the natural world from the colonial era to the present.

HISTA 482 HISTORY OF AMERICAN TECHNOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HSTA 101 or HSTA 102.
- This course examines the historical development of technology in U.S. history, focusing on issues of the environment, concepts of progress, consumerism, power, work, and freedom. In addition to standard historical sources, the course uses popular films, novels, and art to discuss the changing meaning and significance of technology in America.

HISTA 482 ANIMAL HISTORIES
F, S alternate years, 3 cr. LEC 3
PREREQUISITE: Junior standing or consent of instructor.
- An intensive and creative research experience, this course allows students to explore the multidisciplinary role of history by investigating the interrelationship of human and nonhuman animals in a historical setting.

HISTA 484 WORLD ENVIRONMENTAL HISTORY
F, S alternate years, 3 cr. LEC 3
PREREQUISITE: HSTA 160, 145, 140 or 130.
- This course examines the intersection of the natural world with major themes in world history and places typical subjects in environmental history, including diseases, agriculture, pollution, and environmentalism in global context.

HISTA 486 MUSEUM HISTORY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing.
- An examination of the development of American museums and their relationship to other exhibitionary forms including wild west shows and world’s fairs. The course also introduces students to theoretical arguments about the nature and function of cultural representations.

HISTA 490 UNDERGRADUATE RESEARCH
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior standing in History and consent of department head. Course will address responsible conduct of research.

HISTA 492 INDEPENDENT STUDY
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HISTA 492 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HISTA 492 INDEPENDENT STUDY
On Demand 1 - 4 cr. IND Minimum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

HISTA 492 INDEPENDENT STUDY
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

HISTA 498 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

HISTA 499R SEMINAR CAPSTONE: HISTORICAL METHODOLOGY
F, S 5 cr. SEM 3
PREREQUISITE: Senior standing, HSTR 160, HSTR 101 or HSTR 102 and HSTR 103 or HSTA 102.
- Senior capstone course. History majors practice sound research and writing methods, using appropriate bibliographical tools and in light of contemporary historiography.

HISTA 499R SEMINAR CAPSTONE: HISTORICAL METHODOLOGY
F, S 5 cr. SEM 3
PREREQUISITE: Senior standing, HSTR 160, HSTR 101 or HSTR 102 and HSTR 103 or HSTA 102.
- Senior capstone course. History majors practice sound research and writing methods, using appropriate bibliographical tools and in light of contemporary historiography.
COURSE DESCRIPTIONS: HIST 500 - I&ME 271

HIST 500 SEMINAR
On Demand (No credits, pass/fail). SEM 1.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HIST 502 PUBLIC HISTORY
F On Demand 3 cr. SEM 3
PREREQUISITE: May be repeated. Maximum 6 cr.
- Advanced readings and discussion in the practice of public history, including oral history, historic preservation, and museum studies.

HIST 503 HISTORY OF AMERICA BEFORE 1860
F 3 cr. SEM 3 May be repeated, not to exceed 6 credits.
PREREQUISITE: HSTA 311 or HSTA 416.
- Topics in the social, cultural, economic, and political history of Early America in the Atlantic world.

HIST 504 TOPICS IN ENVIRONMENTAL HISTORY
On demand 3 cr. SEM 3 May be repeated. Maximum 6 cr.
- Advanced readings and discussions in environmental history.

HIST 505 U.S. HISTORY 1860 TO PRESENT
S 3 cr. LEC 3 May be repeated. Maximum 6 cr.
PREREQUISITE: Graduate Standing.
- Graduate research and analysis of important issues in recent American history.

HIST 506 TOPICS IN HISTORY OF SCIENCE, TECHNOLOGY, & SOCIETY
On demand 3 cr. SEM 3 May be repeated. Maximum 6 cr.
- Advanced readings and discussion in the history of science, technology, and society.

HIST 507 HISTORICAL WRITING
On demand 3 cr. SEM 3
PREREQUISITE: HIST 540 or equivalent.
- Advanced seminar in contemporary historiography, historical theory, and narrative style.

HIST 512 TOPICS IN WORLD HISTORY
F 3 cr. SEM 3
PREREQUISITE: Graduate standing. May be repeated. Maximum 6 cr.
- Examination of topics of current scholarly concern in history other than United States.

HIST 513 TOPICS IN SOCIAL AND CULTURAL HISTORY
S 3 cr. SEM 3
PREREQUISITE: Graduate standing. May be repeated. Maximum 6 cr.
- Examination of topics in social and cultural history of current scholarly concern.

HIST 515 THE AMERICAN WEST
S 3 cr. LEC 3
PREREQUISITE: HSTA 464 or equivalent. May be repeated. Maximum 6 cr.
- Directed readings and analysis of major problems in the history of the American West.

HIST 540 HISTORICAL METHODS
F 3 cr. LEC 3 May be repeated. Maximum 6 cr.
- Consideration of historical thinking, the uses of evidence and historical methodology.

HIST 540 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head, and Dean of Graduate Studies.
- Directed research and study on an individual basis.

HIST 575 PROFESSIONAL PAPER
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

HIST 576 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

HIST 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HIST 588 PROFESSIONAL DEVELOPMENT
On Demand 1-3 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

HIST 589 GRADUATE CONSULTATION
F, S, Su 5 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

HIST 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND May be repeated.
PREREQUISITE: Master’s standing.

HIST 601 DISSERTATION WORKSHOP
F 1 cr. SEM 1
- Presentation and discussion of dissertation research and writing.

HIST 689 DOCTORAL READING AND RESEARCH
On Demand 3-4 cr. IND May be repeated; maximum 15 cr.
- Presentation and discussion of dissertation research and writing.

HIST 690 DOCTORAL THESIS
On Demand 1-10 cr. IND May be repeated.

HUM Humanities
Department of History & Philosophy
(406) 994-4395

HUM 294 GENDER & SEXUALITY
On Demand 3 cr. SLEC
- The role of gender in human culture - in social organizations, views of nature, perception of self and arts, and technologies. Sexuality as paradigmatic image.

HUM 298 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

I&ME Industrial & Management Engineering
Department of Mechanical & Industrial Engineering
(406) 994-2203

I&ME 101 INTRODUCTION TO INDUSTRIAL ENGINEERING
F 1 cr. LEC 1
PREREQUISITE: Must be taken the first year enrolled in IE program.
- Overview of the industrial engineering profession. Lectures will concentrate on tools and methods of industrial engineering, and their application in manufacturing and service industries.

I&ME 142 INTRODUCTION TO PRODUCTION SYSTEMS
S 2 cr. LEC 1 LAB 1
PREREQUISITE: Must be taken the first year enrolled in IE program.
COREQUISITES: ME 117
- Introduction to systems design and improvement methods. Lectures concentrate on data gathering; diagramming; facility layout with flow time and inventory relationships. Diagramming software used. Case studies and plant tours may be part of lab activities.

I&ME 264 INTRODUCTION TO MODELS AND COMPUTERS IN INDUSTRIAL ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: CS 160, M 172.
- Introduction to model formulation and numerical solution methods in industrial engineering. Emphasis on decisions, constraints, and objectives in problem solving. Introduction to relational database design and computer decision support.

I&ME 271 MICROCOMPUTERS IN INDUSTRY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: CS 160 or equivalent.
- Basic skills in the programming and application of fundamental automation technologies, including digital logic, programmable logic controllers, microprocessors, robotics and flexible manufacturing systems. Laboratories are “mini” design problems where theory is implemented via software and hardware control of industrial devices.
I&ME 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

I&ME 300 PROFESSIONAL PRACTICE AND RESPONSIBILITY
F 2 cr. SEM 2
PREREQUISITE: Junior standing in IE.
- Transition to professional practice. Career planning, professional ethics, social responsibility, communications, job interviewing, and related professional topics.

I&ME 313 WORK ANALYSIS & DESIGN
S 3 cr. LEC 2 LAB 1
PREREQUISITE: WRIT 101W; I&ME 142 for IE majors.
- Course analysis and design methods for occupational tasks to improve productivity, workplace health, and safety. Topic areas include fundamental aspects of work standards development, ergonomics, and industrial safety. The labs demonstrate example applications of these topic areas.

I&ME 325 ENGINEERING ECONOMY
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing, M 171 or M 165, WRIT 101W, COM 110 or CLS 101; or instructor approval.
- Methods for comparing and evaluating capital investment alternatives. Concepts include the time value of money, rates of return, cash flows, increments, depreciation, influences of taxes, inflation and deflation, depreciation, replacement analysis. Emphasis is placed upon evaluating various engineering alternatives. Some open-ended design problems are included.

I&ME 344 CONCURRENT ENGINEERING
On Demand 3 cr. LEC 3
PREREQUISITE: Engineering or Technology Junior or Senior standing.
- The business environment, process management, design process, manufacturability, life cycle designs, quality, compressing the design-to-market cycle, process integration, coordination and communication, world class design, manufacturing, and marketing.

I&ME 350 APPLIED ENGINEERING DATA ANALYSIS
F, S, Su 2 cr. LEC 2
PREREQUISITE: M 166 or M 172.
- An overview of data variability and applied statistical experimental design with analysis techniques for a broad range of engineering disciplines. Topics include essential probability distributions, experimental design strategies, hypothesis testing, and regression with applications to traditional engineering functions.

I&ME 354 ENGINEERING PROBABILITY AND STATISTICS I
F 3 cr. LEC 3
PREREQUISITE: M 172, junior standing, or instructor approval.
- Understanding the statistical nature of engineering processes. Emphasis on proper data collection and classification, characteristics of variables and their distributions, joint probability distributions, and establishing hypotheses and statistical significance over engineering design specifications.

I&ME 355 ENGINEERING STATISTICS LAB
F 1 cr. LAB 1
PREREQUISITE: M 172, junior standing, or instructor approval.
- Laboratory experience emphasizing the design and analysis of engineering data. Includes Excel applications software.

I&ME 364 PRINCIPLES OF OPERATIONS RESEARCH I
F 3 cr. LEC 3
PREREQUISITE: M 221 or M 273. I&ME 264.
- Formulation of models and optimization techniques to facilitate engineering management decisions. Resource allocation, transportation and multiple goals via networks, linear, and integer programming with primal-dual emphasis. Introduction to EOQ and probabilistic inventory models.

I&ME 373 PRODUCTION INVENTORY COST ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: One of the following: M 161, M 165, M 171.
- Industrial cost systems, accounting processes, and cost estimation; cost analysis of manufacturing processes, economic decision making and uses of cost information in making product design and product line decisions.

I&ME 410 USER-CENTERED DESIGN
S 3 cr. LEC 2 LAB 1
PREREQUISITE: I&ME 313; for IE majors; I&ME 413 or consent of instructor for non-majors.
- This course demonstrates the processes of integrating the psychology of the user into the design process as well as conducting usability testing to evaluate the design success. It emphasizes the need to understand the needs, capabilities, and emotions of the user to produce usable and desirable designs.

I&ME 413 ERGONOMICS & HUMAN FACTORS ENGINEERING
F 3 cr. LEC 3
PREREQUISITE: Junior standing; I&ME 313 for IE majors or equivalent.
- Applications of ergonomics and human factors engineering. Topics include principles of biomechanics, bioinstrumentation, physiology, psychophysics, design error, and motivational theory for work applied to common problems faced by engineers. Emphasis on design and analysis of occupational systems and consumer products which best “fit” job tasks or user requirements to human capabilities. Safety and legal issues of products and work environments (e.g., OSHA) are also covered.

I&ME 422 INTRODUCTION TO SIMULATION
F 3 cr. LEC 3
PREREQUISITE: CS 160 or equivalent, I&ME 354 or equivalent, I&ME 264 for IE majors.
- Discrete simulation modeling methodology; random number generation, sampling, output analysis, validation, and verification; application to varied systems design and analysis problems. Crosslisted with CS 422.

I&ME 425 ENTREPRENEURSHIP AND ECONOMIC FEASIBILITY
F 3 cr. LEC 3
PREREQUISITE: I&ME 325 or consent of instructor.
- In-depth analysis of managerial decision-making methods culminating in a comprehensive economic feasibility study. Emphasis on entrepreneurship, sensitivity analysis, cost-volume-profit analysis, taxation, and computer application. Applications are demonstrated in a design project.

I&ME 434 PROJECT AND ENGINEERING MANAGEMENT
F 3 cr. LEC 3
PREREQUISITE: I&ME 325 or consent of instructor.
- Fundamental principles of planning, estimating, budgeting, scheduling, implementing, evaluation, and controlling engineering and research projects. Common engineering management concerns such as labor scheduling, human resources management, and related governmental compliance also explored.

I&ME 442 FACILITY AND MATERIAL HANDLING SYSTEMS DESIGN
F 3 cr. LEC 3
PREREQUISITE: I&ME seniors in their last full academic year, I&ME 313, ME 116, ME 255.
- Senior capstone course. The first course in the senior capstone sequence. Principles and techniques for planning and designing production facilities and material handling systems. Product and process analysis, requirements, layout and support facilities. Computer-aided analysis and design.

I&ME 444R SENIOR DESIGN PROJECT
S 2 cr. LEC 1 RCT 1
- Senior capstone course. Second course in senior capstone sequence. A comprehensive open-ended team design project emphasizing the use of computers to plan and evaluate facility designs, their location, and materials handling systems. Technical and economic feasibility studies. Oral and written communication emphasized.

I&ME 445R INDEPENDENT I&ME SENIOR DESIGN
S 1 cr. IND 1
COREQUISITE: Concurrent enrollment in I&ME 444R required.
- Senior capstone course. Independent study associated with I&ME 444R.

I&ME 445 ENGINEERING PROBABILITY AND STATISTICS II
S 3 cr. LEC 3
PREREQUISITE: I&ME 354 and I&ME 355.
- Identification, characterization, and analysis of variation in engineering data. Includes inferential statistics, goodness of fit, applications of non-parametric statistics, curve fitting, regression, and the design of engineering experiments. A team design project is required.

I&ME 458 PRODUCTION AND ENGINEERING MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: I&ME 264.
- Design and management of efficient production/delivery systems for goods and services, emphasizing quantitative analysis and systems approaches. Topics include forecasting, inventory management, production planning, scheduling, material planning, and lean manufacturing systems; plus introduction to organization and management theory.
I&ME 464 PRINCIPLES OF OPERATIONS RESEARCH II
S 3 cr. LEC 3
PREREQUISITE: I&ME 354 and I&ME 364
Advanced formulation of models, optimization techniques and application to engineering design and operations management decision making. Nonlinear and integer programming algorithms. Stochastic models including advanced queuing and general markov processes. Integration of models and relational databases for decision support.

I&ME 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 3 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of IE faculty and department head.
- Directed research and study on an individual basis.

I&ME 471 COMPUTER INTEGRATED MANUFACTURING
S 3 cr. LEC 2 LAB 1
PREREQUISITE: I&ME 271 or ME 315, ME 255; or consent of instructor.
- Computers and their applications to computer-integrated manufacturing systems. Fundamentals of manufacturing, automation, numerical control production systems, industrial robotics, material handling and storage, flexible manufacturing systems, CAD/CAM, and future automated factories. Laboratories include software design and implementation, as well as the application of “off the shelf” software emphasizing creativity in the control of industrial machines.

I&ME 477 QUALITY ASSURANCE
S 3 cr. LEC 3
PREREQUISITE: I&ME 354 or I&ME 350 or consent of instructor.
- Statistical and non-statistical aspects of quality assurance assessment. Includes classical SPC and process improvement via control charts. Also includes product and process design through planned experimentation and simple experimental designs (ANOVA). Limited use of case studies. A design project or course capstone paper demonstrating significant elements of the course is required.

I&ME 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

I&ME 499R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: I&ME 499.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

I&ME 548 PLANNING AND SCHEDULING
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CS 160 or equivalent, and M 221 or I&ME 366; or consent of instructor.
- Introduction to planning and scheduling problems; formulation, objectives, and constraints; manual and computer scheduling methods; general purpose scheduling algorithms; industrial applications.

I&ME 554 APPLICATION & DESIGN OF INDUSTRIAL EXPERIMENTS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: I&ME 354 or I&ME 454.
- Statistical analysis for managerial decision-making as applied to engineering and industry. Hypotheses testing and estimation ANOVA, randomized complete block designs, full-bloned and fractional factorial designs with blocking and confounding, random factors experiments, and introductions to nested and split-plot designs.

I&ME 558 MANAGERIAL FORECASTING & DECISION ANALYSIS
On Demand 3 cr. LEC 3
PREREQUISITE: I&ME 354 or I&ME 454.
- Time series analysis through classical approaches including regression, smoothing models, and advanced time series models. Technical applications emphasized in concepts, tools, and methods. Includes investigations into financial and dependent data. Approaches designed for managers to test real applications for making decisions.

I&ME 567 OPTIMIZATION TECHNIQUES
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: I&ME 364, CS 160 or equivalent.
- Classical principles of differential calculus are applied in solving nonlinear optimization problems. Search strategies for identifying local and global optimal, and presentation of algorithms. Motivates the use of more accurate nonlinear models for cost revenue, design, etc.

I&ME 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

I&ME 571 MANAGEMENT ENGINEERING SYSTEMS
F alternate years, to be offered even years 3 cr. SEM 3
PREREQUISITE: I&ME 458, or instructor approval.
- Students will explore various facets of designing effective organizational and management systems. Topics will include: classical and open system organization theory, socio-technical systems theory, congruence, technology and innovation management, knowledge management, and continuous improvement in organizations. Students will complete an independent research project in addition to course readings and in-class discussion.

I&ME 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, major advisor, and graduate committee.
COURSE DESCRIPTIONS: I&ME 576 - JPNS 325

I&ME 576 INTERNSHIP
On Demand 1-3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of graduate program coordinator.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

I&ME 577 QUALITY ASSURANCE & VARIABILITY REDUCTION
On Demand 3 cr. LEC 3
PREREQUISITE: I&ME 477, or instructor approval.
- Theory, applications, and case studies in quality assurance and reliability. Topics include variability reduction, Total Quality Management, Quality function deployment; Shainan, Shewhart, and other techniques; sequential experimentation; other experimental designs are emphasized. A capstone course design project is required.

I&ME 580 SPECIAL TOPICS
On Demand I - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

I&ME 589 GRADUATE CONSULTATION
F, S, Su 1 - 3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

I&ME 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

I&ME 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

ICS
Intercultural Studies
Office of International Programs
(406) 994-4031

ICS 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-3 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ICS 404 INTERCULTURAL EXPERIENCE
On Demand 1 - 3 cr. LEC RCT
- Students must spend a minimum of three weeks in a non-US cultural setting, and must be accompanied by one or more MSU faculty members. Number of credits to be awarded will be determined by the Director of International Programs.

ICS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis of intercultural and/or global issues.

ICS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ICS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: ICS-490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ICS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

ICS 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Independent study on topics related to intercultural and/or global issues.

ICS 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ICS 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

JPNS
Modern Languages, Japanese
Department of
Modern Languages & Literatures
(406) 994-4448

JPNS 101 ELEMENTARY JAPANESE I
F 4 cr. RCT 4
- Elementary course designed to help students acquire basic language skills in Japanese: reading, writing, listening, speaking. Introduction to Japanese writing systems (hiragana, katakana, kanji). Emphasis on establishing correct pronunciation and grasp of grammar. Cultural perspectives such as greetings, simple dialogues.

JPNS 102D ELEMENTARY JAPANESE II
S 4 cr. RCT 4
PREREQUISITE: JPNS 101 or equivalent, or placement interview with instructor.
- Continuation of JPNS 101. Expansion of cultural knowledge.

JPNS 150 JAPANESE CULT & CIVILIZ
On Demand 3 cr. LEC 3
PREREQUISITE: WRIT 101W or consent of instructor.
- Survey of Japanese society, literature, art, and religion from earliest times to the modern period. All readings and discussions in English. No knowledge of Japanese necessary.

JPNS 201D INTERMEDIATE JAPANESE I
F 4 cr. RCT 4
PREREQUISITE: JPNS 102 or equivalent, or placement interview with instructor.
- Review of skills acquired in elementary Japanese, followed by additional study of grammatical patterns and vocabulary acquisition. Emphasis on gaining basic conversational skills and improving reading.

JPNS 202D INTERMEDIATE JAPANESE II
S 4 cr. RCT 4
PREREQUISITE: JPNS 201 or equivalent, or placement interview with instructor.
- Continuation of JPNS 201. Students who successfully complete this course will have “survival” skills for daily life in Japan, and will be ready for more advanced course work using authentic materials.

JPNS 305 JAPANESE: ADVANCED CONVERSATION
S 3 cr. RCT 3
PREREQUISITE: JPNS 202 or placement interview with instructor.
- Review and further development of communication skills with an emphasis on both speaking and writing for various occasions. Cultural and social topics are explored through authentic materials to enhance knowledge of Japan and its people.

JPNS 320 CLASSICAL JAPANESE LITERATURE
On Demand 3 cr. RCT 3
PREREQUISITE: WRIT 101W or consent of instructor.
- Study of poetry, drama, and narrative from earliest times to mid-nineteenth century. All readings and discussions in English. No knowledge of Japanese necessary.

JPNS 321 MODERN JAPANESE LITERATURE
On Demand 3 cr. RCT 3
PREREQUISITE: WRIT 101W or consent of instructor.
- Study of novels, short stories, and poems written by Japanese authors from the mid-nineteenth century onward. Covers Japan’s initial encounter with the West and the establishment of individual identity. All readings and discussions in English. No knowledge of Japanese necessary.

JPNS 325 WOMEN IN JAPANESE LIT & CULT
On Demand 3 cr. RCT 3
PREREQUISITE: WRIT 101W or consent of instructor.
- A study of Japanese women writers and images of women in Japanese culture from earliest times to the present. No knowledge of Japanese necessary.
LIBR 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 4 cr. IND Maximum 8 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean of Libraries, and Dean of Graduate Education.
- An individual assignment arranged with an agency, business, school, or other organization to provide guided experience in the field.

LIBR 576 INDEPENDENT STUDY
F, S, Su 1 - 4 cr. IND Maximum 8 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean of Libraries, and Dean of Graduate Education.
- Directed research and study on an individual basis.

LIBR 570 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 4 cr. IND Maximum 8 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean of Libraries, and Dean of Graduate Education.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

LIBR 576 INTERNSHIP
F, S, Su 1 - 4 cr. IND Maximum 8 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean of Libraries, and Dean of Graduate Education.
- Directed research and study on an individual basis.

LRES Land Resources & Environmental Sciences
Department of Land Resources & Environmental Sciences
(406) 994-7060

LRES 110 LAND RESOURCES & ENVIRONMENTAL SCIENCES
F 3 cr. LEC 3
- Introduction to land resources and environmental sciences associated with managed and natural landscapes. Students will learn how to identify scientific questions from issues, and how to develop scientifically-based objective information for answering environmental and land management questions. The class is a survey of agroecology, environmental biology, land rehabilitation, land resource analysis, and soil and water science. Students must be proficient in basic algebra and have an understanding of biological principles.

LRES 146 INTRODUCTION TO SUSTAINABLE FOOD AND BIOENERGY SYSTEMS
S 3 cr. LEC 3
- A systems perspective on local, state and national food, agriculture and energy issues. Key topics include Agroecology, Sustainable Crop Production, and Sustainable Food Systems. For majors and non-majors. Crosslisted with HDFN 156 and PSPP 146.

LRES 291N SOIL RESOURCE
F 3 cr. LEC 2 LAB 1
PREREQUISITE: M 097 or equivalent.
- Soils and their properties as components of landscapes and ecosystems. Application of soils knowledge to problems in environmental sciences and management of agricultural, wildland, and urban landscapes.
COURSE DESCRIPTIONS: LRES 244CS - LRES 442R

LRES 244CS INTRODUCTION TO WATER RESOURCES
F 3 cr. LEC 3
- An introduction to the science, uses, policy and management of fresh water resources, including hydrologic and ecologic processes, and related historic, policy, law and socioeconomic aspects. The course is intended for majors in the sciences, social sciences, and other disciplines.

LRES 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

LRES 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required, but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LRES 290R UNDERGRADUATE RESEARCH
F, S, Su 1 - 4 cr. IND May be repeated.
Maximum 12 cr.
PREREQUISITE: Freshman or sophomore standing and approval of instructor. Course will address responsible conduct of research.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or other creative project.

LRES 310 PROFESSIONAL PREPARATION
S 1 cr. LEC 1
PREREQUISITE: Junior standing.
- Preparation for graduate school and the professions. Creating a professional portfolio, goal, and plan; ethics; resume and cover letter; citizenship; graduate school requirements and procedures; finding job; internship; interactions with professionals; learning and contributing to one's discipline.

LRES 344 WATER QUALITY
S 3 cr. LEC 3
PREREQUISITE: CHMY 121 OR CHMY 151 and college-level algebra or equivalent.
- Physical, chemical and biological water quality parameters and their applications to diverse water quality applications. The course provides a scientific overview of the spectrum of water quality parameters important in surface water systems.

LRES 351 NUTRIENT CYCLING
S 3 cr. LEC 3
PREREQUISITE: LRES 201, CHMY 143.
- Soil characteristics and processes that control biogeochemical nutrient cycling, availability to plants, nutrient transport, and environmental impact of nutrients. Principles of plant nutrition, nutrient requirements, fertilizer materials, and practices for management of agricultural, forestry, horticultural, and rangeland systems.

LRES 355 SOIL & ENVIRONMENTAL CHEMISTRY
S alternate years, to be offered odd years 3 cr. LEC 2 REC 1
PREREQUISITE: CHMY 211, LRES 201.
- Survey course covering behavior of inorganic and organic constituents in soil and water systems. Applications will focus on integration of chemical and biological processes that govern biogeochemical cycling, bioremediation, bioavailability, and transport of chemicals in managed, natural, and contaminated systems. Problem solving, team projects, and discussion of current literature will be emphasized in recitation.

LRES 357 GPS FUNDAMENTALS & APPLICATIONS IN MAPPING
F, S 3 cr. LEC 1, LAB 2
PREREQUISITE: GPHY 284.
- Theory and application of the global positioning system to mapping in natural resource and land management sciences. Lab and term mapping project include hands-on experience with GPS receivers and work with Pathfinder Office and Arc GIS software. Students must be proficient with basic computer and file management skills and must be proficient with the latest version of ArcGIS software.

LRES 401 INTEGRATED PEST MANAGEMENT
S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: BIOL 204; and one of the following: BIOL 100, BIOL 101, or BIOL 102.
- Management of insects and other pests via an integration of control strategies. Emphasis on chemical, cultural, and biological control; host plant resistance; sampling; use of economic principles; and new biotechnological developments in pest management. ID and biology of key insect pests.

LRES 415 MICROBIAL DIVERSITY, ECOLOGY & EVOLUTION
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BCHM 340, MR 301 or consent of instructor.
- The diversity of prokaryotic and eucaryotic microorganisms will be explored from both classical phenotypic and contemporary genotypic perspectives. The linkage between microbial diversity, its evolutionary origins, and its ecological value will be emphasized. Cross listed with MB 415.

LRES 421 HOLISTIC THOUGHT & MANAGEMENT
S 4 cr. LEC 4
PREREQUISITE: Junior standing.
- Application of holism and systems thinking to natural and human resource management issues. Use of Holistic Management for decision-making, research, and policy formation. Use of real case studies involving BioRegions Program work in Greater Yellowstone, Japan, Mongolia, Nepal, or other locations.

LRES 425 REMOTE SENSING AND DIGITAL IMAGE PROCESSING
F 3 cr. LEC 2 LAB 1
PREREQUISITE: Junior standing or consent of instructor.
- Theory and application of remote sensing, the electromagnetic spectrum, earth-energy interactions, and operation of multispectral sensors. Applications include basic photo interpretation and satellite image analysis for agriculture, environmental assessment, forestry, geology, rangeland, urban, wildlife, and others.

LRES 428 CROPPING SYSTEMS & SUSTAINABLE AGRICULTURE
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: LRES 201 and either PSPP 341 or PSPP 342.
- Senior capstone course. Conventional cropping systems in the Northern Plains are analyzed, integrating land management and crop production knowledge. Sustainable agriculture issues are raised and alternative management strategies are explored, emphasizing no-till and organic systems. Students will gain a solid understanding of crop diversity, including effects on nutrient and water cycling, and crop pest management. The agronomic challenges of implementing alternative cropping systems will be featured in instructional methods. Students will gain “hand-on” research experience by completing an agronomy experiment during the semester.

LRES 430 NATURAL RESOURCE LAW
S 3 cr. LEC 3
PREREQUISITE: Junior standing, WRIT 201 or WRIT 221, or consent of instructor.
- Examines major natural resources laws, emphasizing the federal model. A modified case study approach is used to review legislation and related court cases governing natural resources, including water, minerals, timber, range, wildlife, recreation, and wilderness.

LRES 441 CAPSTONE 1: FIELD APPLICATIONS IN LRES
S 1 cr. LEC 1
PREREQUISITE: LRES major; Senior standing only.
- Senior capstone course, first of two required semesters. Provides disciplinary and interdisciplin ary knowledge, experiences, and skills related to Land Resource and Environmental Sciences. Topic of course will be current land management issue in the local area, and students will develop a research project to be conducted in the following fall. Course emphasizes writing and presentation skills, scientific methods, review of primary literature and planning a field project.

LRES 442R CAPSTONE 2: FIELD APPLICATIONS IN LRES
F 3 cr. LEC 3
PREREQUISITE: LRES 441.
- Senior capstone course, second of two required semesters. Provides disciplinary and interdisciplin ary knowledge, experiences, and skills related to Land Resources and Environmental Sciences. Topic of course will be current land management issue in local area, and students will conduct field and laboratory analyses and provide a report to local agencies. Course emphasizes field measurement and analysis techniques related to soils, plants, water, and microclimate, writing and presentation skills, and application of basic science to land management decisions.
COURSE DESCRIPTIONS: LRES 443 - LRES 528

LRES 443 WEED ECOLOGY & MANAGEMENT
F 3 cr. LEC 2 LAB 1
PREREQUISITE: M 121, PSPP 102, STAT 216 or PSPP 318
- The principles of weed ecology including plant population demographics, biotic and abiotic regulating mechanisms, and plant community temporal and spatial dynamics in managed ecosystems. Weed population model construction, spreadsheet calculations and thorough assessment of pest threshold theory. The study of ecologically-based weed management approaches including cultural, mechanical, biological, and chemical control practices.

LRES 444 WATERSHED HYDROLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: GPHY 111, LRES 110, LRES 201 (or equivalent understanding)
- Introduction to watershed hydrology. The course will examine how rainfall and snowmelt become streamflow, evapotranspiration, and groundwater with an emphasis on hydrological processes. Discussion will revolve around state of the science, linkages to other disciplines, and management implications. Topical areas include: water balances, snow hydrology, hydrogeology, hyporheic zones, riparian zones, runoff process, and biogeochemical budgets.

LRES 445 WATERSHED ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: LRES 443 and STAT 216 or PSPP 318 or permission of instructor.
- Conceptual and quantitative analysis of watersheds processes with an emphasis on modeling surface water hydrology and water resources management. Watershed modeling concepts including analysis of time series, spatially variable data, model calibration, and uncertainty analysis will be studied and demonstrated.

LRES 448 STREAM RESTORATION ECOLOGY
F 3 cr. LEC 1 RCT 2
PREREQUISITE: BIOL 101, and either ARNR 240 or BIOL 303.
COREQUISITE: LRES 461 or BIOL 424 or consent of instructor.
- Students will critically assess the definitions, assumptions, goals, appropriateness, and outcomes implicit in stream restoration projects in relation to ecosystem processes and dynamics in rivers and streams. Students will synthesize course concepts in the creation of a restoration proposal to be submitted to a local stream manager for consideration.

LRES 452 SOIL & ENVIRONMENTAL MICROBIOLOGY
5 alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHMY 145, LRES 201, and MB 301.
- Microorganisms in soil environments: Emphasis on soil microbial ecology, plant-microbe interactions, biotransformations of inorganic or organic contaminants.

LRES 453 SOIL & ENVIRONMENTAL PHYSICS
F alternate years, to be offered odd years 5 cr. LEC 2 LAB 1
PREREQUISITE: LRES 201 recommended, M 170 or equivalent, computer literacy.
- Soil physical properties and processes governing distribution and transport of water, heat, and soluble chemicals. Topics include water content and potential, infiltration, surface energy balance, evaporation, temperature and heat flow, saturated and unsaturated water and chemical flow. Laboratory stresses measurements and analyses.

LRES 454 LANDSCAPE PEDOLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: LRES 201.
- Processes leading to the formation and spatial distribution of soils on the landscape. Describing, classifying, and mapping soils. Management issues related to organic and mineral soil materials. The course includes a substantial hands-on field component.

LRES 457 ADVANCED GPS MAPPING FOR GIS
F 3 cr. LAB 3
PREREQUISITE: GPHY 294 and LRES 357.
- Advanced topics and techniques in GPS/GIS data collection, emphasizing data quality and documentation. Advanced datalogging options, complex offsets, external sensors, carrier phase data collection, mobile Internet, and GPS/GIS applications and base station setup. Course emphasizes topic research and presentation, and service-learning project work.

LRES 458 TEACHING APPLICATIONS IN LRES
F 1 cr. RCT 1
PREREQUISITE: LRES 201.
- Application of teaching philosophies and methods through classroom, laboratory, and field teaching experiences.

LRES 460 SOIL REMEDIATION
S 3 cr. LEC 3
PREREQUISITE: LRES 201 or permission of instructor.
- Principles of soil remediation in impacted landscapes. Soil reconstruction practices are presented for drastically disturbed lands. Treatment science is presented to repair soil systems contaminated by metals and salt as a result of resource extraction and landscape disturbance by man. Protection of water resources are examined as related to sediment loss control, acid rock drainage science and treatment, and effective handling of geologic stratum. A field trip to a contaminated landscape will demonstrate ongoing soil remediation practices.

LRES 461 RESTORATION ECOLOGY
F 3 cr. LEC 3
PREREQUISITE: BIOL 101, and either ARNR 240 or BIOL 303.
- Review of ecosystem structure and function, and community and population processes in intact systems, along with the effects of major disturbances on natural systems. Restoration amendments will be discussed in terms of their effects on ecosystem structure and function. The course includes case studies, and focuses on plant and soil systems.

LRES 470 INDEPENDENT STUDY
On demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

LRES 476 INTERNSHIP
F, S, Su 2 - 4 cr. IND.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

LRES 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LRES 490 UNDERGRADUATE RESEARCH/Creative Activity
F, S 1 - 4 cr. IND May be repeated. Maximum 12 cr.
PREREQUISITE: Junior or Senior standing and approval of instructor.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. USP scholarships or project support grants are available in many cases. Course will address responsible conduct of research.

LRES 500 SEMINAR
F, S, Su 1 cr. SEM Maximum 6 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Students prepare, present, and critique scientific presentations.

LRES 507 BIOLOGICAL RISK ASSESSMENT
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BIOL 101, BIOL 305, STAT 401.
- Principles of risk analysis, including risk assessment, perception, communication, and management. Emphasis on human toxicology, ecotoxicology, dose-response relationships, exposure analysis, environmental fate, and deterministic and probabilistic risk assessment. Case studies will include examples from pesticides, biotechnology, and invasive species.

LRES 515 MICROBIAL ECOLOGY
S alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: LRES 415.
- Critical review of literature on the distribution and activity of microorganisms in natural microbial communities based on microbial adaption and physical, chemical and biological features of the microenvironment. A critical discussion of literature and approaches. Crosslisted with MB 515.

LRES 525 APPLIED REMOTE SENSING
S 3 cr. LEC 2 LAB 1
PREREQUISITE: LRES 426 or consent of instructor.
- Applications of remote sensing for graduate students, including advanced studies of multispectral and hyperspectral sensors and image processing algorithms. Emphasis is on using remote sensing technologies for solving applied land resource issues.

LRES 528 BRIDGING PRINCIPLES AND PRACTICES OF SUSTAINABLE CROPPING SYSTEMS
F alternate years, to be offered odd years 1 cr. REC 1
PREREQUISITE: Any graduate student or undergraduate student with approval from the instructor.
- The course goal is to elevate agricultural students’ awareness of peer-reviewed literature that demonstrates application of principles to address issues of sustainability in cropping systems. The course will use a student-lead discussion format to highlight issues and principles in a series of papers that the class will read. The course will emphasize the practical interaction among agronomy, ecology, economics, and sociology to create an awareness of the interdisciplinary issues associated with sustainability in agriculture.
LRES 529 CROPPING SYSTEMS AND SUSTAINABLE AGRICULTURE
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: LRES 201 and either PNRP 341 or PNRP 342; graduate standing or consent of instructor.
- Cropping systems integrate resource use and crop production knowledge. Agricultural issues are raised and alternative management strategies explored, emphasizing crop diversification. Students will compute systems level crop water use efficiency and submit an independent review paper on sustainable crop production.

LRES 530 NATURAL RESOURCE LAW
S 3 cr. LEC 3
PREREQUISITE: none
- The course examines major natural resources laws, emphasizing the federal model. A modified case study approach is used to review legislation and related court cases governing natural resources, including water, minerals, timber, range, wildlife, recreation, and wilderness.

LRES 535 TECHNIQUES OF SPATIAL ANALYSIS
F alternate years, to be offered every year 5 cr. LEC 2 LAB 1
PREREQUISITE: STAT 410 or consent of instructor.
- Exploration and understanding of analytical techniques needed to deal with spatially correlated data. Emphasis is placed on practical applications within geographic information systems and image processing.

LRES 543 AGROECOLOGY/ APPLIED PLANT ECOLOGY
S alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 305, M 171, LRES 443, STAT 216
- Focus on the principles and theories of population and community ecology as they relate to invasive plant species in natural and agroecosystems. Measuring plant interference and assessing population interactions and dynamics through empirical and theoretical models. Review theory and methodology concerning plant population demographics, dispersal, and natural trait selection. Examine the role of biodiversity and evolution in determining sustainable management of ecosystems.

LRES 545 WATERSHED ANALYSIS
S 3 cr. LEC 2 LAB 1
PREREQUISITE: LRES 444 and STAT 216 or PSPP 318
- Conceptual and quantitative analysis of watershed processes with an emphasis on modeling surface water hydrology and water resources management. Watershed modeling concepts including analysis of water quality models, spatially variable data, model calibration, and uncertainty analysis will be studied and demonstrated. The course will emphasize critical analysis of current hydrologic computational methods and hands-on use of watershed models.

LRES 546 QUANTITATIVE METHODS FOR ENVIRONMENTAL MODELING
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: STAT 410 and LRES 444
- Introduction and application of numerical skills desirable for watershed and environmental modelers, including applied time series analysis, applied spatial statistics, probabilistic approaches to data analysis, uncertainty analysis and introductory programming skills. The course will focus on the use of real-life and relevant environmental/watershed case studies and examples to illustrate theory.

LRES 552 ADVANCED SOIL & ENVIRONMENTAL MICROBIOLOGY
S alternate years, to be offered every even years 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Advanced laboratory course. Microorganisms are targeted for isolation and characterization, emphasizing those not normally encountered in general microbiology laboratory. Biogeochemical cycling, contaminant biodegradation, extremophiles, and plant-microbe interactions are typical topics investigated. Students employ classic and novel cultivation approaches, identifying microbes based morphology, physiology, and phylogeny. Crosslisted with MB 552.

LRES 553 PLANT & SOIL WATER RELATIONSHIPS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BIOL 430/PSPP 450 recommended.
- Status and transport of water in the soil-plant-atmosphere continuum, including cellular and whole plant water relations, root and plant interactions with the environment, plant canopy biophysics, measurements and instrumentation, advanced current topics of particular interest.

LRES 554 SOIL-LANDSCAPE MODELING
S alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
PREREQUISITE: LRES 445 and STAT 410.
- Quantitative soil-landscape modeling with an emphasis on multi-variate spatial statistics, digital terrain modeling, and underlying landscape processes. The course is built around “hands-on” projects and discussions of peer-reviewed literature.

LRES 555 AQUEOUS GEOCHEMISTRY
S alternate years, to be offered odd years 3 cr. LEC 2 REC 1
PREREQUISITE: CHMY 211, CHMY 228, LRES 201 or equivalent.
- Advanced coverage of aqueous geochemistry in terrestrial and aquatic systems including chemical processes such as complexation, precipitation-dissolution, sorption-desorption, partitioning, oxidation-reduction and gas-water equilibria. Applications of these principles will be demonstrated in subject areas including biogeochemical cycling, bioremediation, contaminant fate and transport, salt-affected soils and wetland processes. Recitation will focus on current literature, applied problems, and case studies.

LRES 556 ENERGETICS IN AQUATIC SYSTEMS
S On demand 2 cr. LEC 2
PREREQUISITE: CHMY 125 or BCHM 340, M 170, BIOL 404, and BIOL 427.
- Covers advanced aspects of heat flow, light penetration, advection, and diffusion dynamics of gases and nutrients within a liquid, and gas transfer at the air-water interface. Examines how aquatic microorganisms (bacteria and algae) reciprocate with each other and with their surrounding environment. Particular emphasis is placed on physiological adaptations by organisms to changing environmental conditions. The course stresses how these processes relate to the biological component of aquatic systems.

LRES 557 THERMAL BIOLOGY IN YELLOWSTONE NATIONAL PARK
Su 2 cr. LEC 1 REC 1
PREREQUISITE: B.S. Science/Science Education; Enrollment limited to M.S. Science Education Graduate Program
- A survey of the ecology of important organisms common in thermal habitats of Yellowstone National Park, including a review of different life forms (prokaryotes and eukaryotes) and their modes of metabolism, and the physical, and chemical habitats that define their environment. Course includes lecture, laboratory, and field components. Students will be asked to design curricula for K-12 audiences.

LRES 560 ENVIRONMENTAL REGULATION & LAND RECLAMATION DESIGN ANALYSIS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: LRES 460, LRES 461.
- State and federal legislation and regulation influence on land rehabilitation processes and project design. Advanced land rehabilitation problem solving and design including data quality control, erosion control, landscape assessment using spatial analysis, wetland evaluation, management of toxic soil, and repair of contaminated riparian zones.

LRES 561 belowground plant ecology
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: STAT 401 or equivalent; BIOL 305 or equivalent; BIOL 450, PSPP 450 or equivalent.
- Application of basic ecological principles to belowground interactions of plant communities. Topics include plant competition, belowground herbivory, plant-microbe interactions including mycorrhizae, and diversity/productivity links in soil systems. Case studies will include invasive species, plants growing on metal-contaminated substrates, and grassland species interactions.

LRES 562 LAND REHABILITATION FIELD PROBLEMS
Su alternate years, to be offered odd years 2 cr. LEC 2
PREREQUISITE: LRES 460, LRES 461.
- Extended field trip to numerous drastically disturbed sites across the Northern Plains. On-site review of land rehabilitation problems, solutions, and methodologies. Participation by industry, regulatory agency staff, and rehabilitation professionals will occur at most sites.

LRES 569 ECOLOGY OF INVASIVE PLANTS IN THE GYE
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: none
- Current theories on what makes species invasive and what ecosystem conditions invite or resist non-indigenous plant species will be considered. Direct involvement in field research associated with testing methodology for monitoring the invasive potential of several exotic species in the otherwise pristine mountain environments.

LRES 570 INDEPENDENT STUDY
On demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head, and Dean of Graduate Studies.
- Directed research and study on an individual basis.

LRES 575 PROFESSIONAL RESEARCH PAPER
On Demand 1-4 IND Maximum 6 cr.
PREREQUISITE: Graduate standing
- A research or professional paper project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, the major advisor, and graduate committee.
LS 576 INTERNSHIP
On demand 2 - 4 IND Maximum 12 cr.
PREREQUISITE: Graduate standing, consent of instructor and approval of department head, and Dean of Graduate Studies.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in a field of study.

LS 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LS 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan), but who need additional faculty or staff time or help.

LS 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

LS 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

LS
Liberal Studies
University College
(406) 994-7835

LS 101US WAYS OF KNOWING
F 3 cr. SEM 3
- Introduction to the processes of academic inquiry through examination of topics in disciplines encompassed by the Fine Arts, Humanities, Natural Sciences, and Social Sciences.

LS 102 INTRO TO LIBERAL STUDIES
S 1 cr. SEM 1
PREREQUISITE: University Seminar (US Course) or consent of instructor.
- An introduction to the history and philosophy of liberal education and a review of the Fine Arts, Humanities, Social and Natural Science disciplines. The LS degree components and options will be explained, as will career opportunities.

LS 298R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S 1 cr. RCT May be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

LS 301 INTEGRATIVE SEMINAR
F S 1 cr. SEM 1 Maximum 3 cr.
PREREQUISITE: University Seminar and sophomore standing.
- The integration of knowledge, theories, and concepts across different disciplines in the Fine Arts, Humanities, Natural Sciences, and Social Sciences.

LS 401 SENIOR PROJECT
F S 4 cr. SEM 4
PREREQUISITE: CLS 101 or LS 101 and LS 301.
- Senior capstone course. Opportunity for Liberal Studies majors to apply knowledge and experiences acquired throughout the program in researching and designing solutions to contemporary public policy issues.

LS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
- Directed research and study on an individual basis.

LS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. SEM Maximum 12 cr.
PREREQUISITE: Course prerequisites are dependent on the offering.
- Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: LS 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

LS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

LS 501 INTEGRATIVE SEMINAR
F S 1 cr. SEM 1 Maximum 3 cr.
PREREQUISITE: University Seminar and sophomore standing.
- The integration of knowledge, theories, and concepts across different disciplines in the Fine Arts, Humanities, Natural Sciences, and Social Sciences.

LS 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

LS 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

LS

Military Aerospace Studies
Air Force ROTC
Department of Military Aerospace Studies
(406) 994-4022

MAS 110 FOUNDATIONS OF THE AIR FORCE I
F 1 cr. LEC 1
COREQUISITE: MAS 115.
- A study of the organization and mission of the U.S. Air Force with emphasis in oral/written communication, and leadership.

MAS 111 FOUNDATIONS OF THE AIR FORCE II
S 1 cr. LEC 1
COREQUISITE: MAS 116.
- Continuing study of the organization and mission of the U.S. Air Force with emphasis in oral/written communication, and leadership.

MAS 115 LEADERSHIP LABORATORY 115
F 4 cr. LAB 4
PREREQUISITE: Consent of instructor and approval of department head.
COREQUISITE: MAS 110.
- Laboratory exercises introduce: uniform wear, drill and ceremonies, physical fitness training, and military customs and courtesies.

MAS 116 LEADERSHIP LABORATORY 116
S 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of Department Head.
COREQUISITE: MAS 111.
- Laboratory exercises introduce: uniform wear, drill and ceremonies, physical fitness training, and military customs and courtesies.

MAS 209 FIELD TRAINING, 5 WEEK
Su 5 cr. LAB 3
PREREQUISITE: Approval of Department Head.
- Substitute for the General Military Course. Selection during Fall or Spring semesters by head of department. Conducted on an Air Force base. Study of U.S. Air Force mission and organization, career opportunities, customs and courtesies, drill and ceremonies, survival, physical fitness training and small arms training.

MAS 210 THE EMPLOYMENT OF AIR & SPACE POWER I
S 1 cr. LEC 1
COREQUISITE: MAS 215.
- Focuses on factors contributing to the development of air power from its earliest beginnings through the Korean war; the evolution of air power competencies, functions, and doctrine, with emphasis in communication skills.

MAS 211 THE EMPLOYMENT OF AIR & SPACE POWER II
S 1 cr. LEC 1
COREQUISITE: MAS 216.
- Continuing study of development of air power from the Vietnam conflict through present day, with emphasis in communication skills.

MAS 212 FLIGHT GROUND SCHOOL
S 2 cr. LEC 2
PREREQUISITE: Approval of instructor. (This MAS course is available only through Burns Telecom Center under separate registration).
- Basics required for learning to fly single-engine land type aircraft. Covers material tested on the FAA Private Pilot written exam, to include performance, the science of flight, meteorology, FAA regulations, navigation, and the physiology of flight.

MAS 213 FLIGHT TRAINING
F 1 cr. LAB 1
PREREQUISITE: Approval of instructor. (This MAS course is available only through Burns Telecom Center under separate registration).
- Practical application of material taught in MAS 212. Flight training from an MSU-approved instructor to include all that is required to achieve solo flight (15 hours flying). Fee will include tuition and flight instruction; students must pay for their own aircraft rental.

MAS 214 INSTRUMENT GROUND SCHOOL
S 2 cr. LEC 2
PREREQUISITE: Private Pilot Certificate or permission of instructor. (This MAS course is available only through Burns Telecom Center under separate registration).
- An introduction to flight under IFR conditions. Course includes basic instrument flying, flight instruments, IFR charts and approach plates, IFR regulations and procedures, ATC clearances and IFR flight planning. Completion of the course will prepare the student for the Instrument Knowledge Exam.
MAS 215 LEADERSHIP LABORATORY 215
F 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
- Laboratory exercises include group leadership problems, drill and ceremony, customs and courtesies, physical fitness training, and field training preparation activities.

MAS 216 LEADERSHIP LABORATORY 216
S 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
CORQUISITE: MAS 211.
- Laboratory exercises include group leadership problems, drill and ceremony, customs and courtesies, physical fitness training and field training preparation activities.

MAS 260 USAF AEROSPACE WEAPONS
S 2 cr. LEC 2
- The study of the weapons systems employed by the United States Air Forces. It also presents the basics of their integration and employment at the operations level.

MAS 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of the director.

MAS 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MAS 281 LEADERSHIP AND FITNESS
FS 2 cr. LAB 2
- An introduction to leadership principles and practice through organized group fitness. Leadership and Fitness uses group fitness workouts as a means to improve personal fitness, examine leadership techniques, and give students a hands-on leadership experience by personally leading the group.

MAS 309 FIELD TRAINING, 4 WEEK
F 2 cr. LAB 2
PREREQUISITE: MAS 110, MAS 111, MAS 210, MAS 211 and junior standing.
- Required for all AFROTC cadets except those who have completed MAS 209. Orientation on an Air Force base, flying orientation, survival and small arms training, physical training, drill and ceremonies.

MAS 310 AIR FORCE LEADERSHIP AND MANAGEMENT I
F 3 cr. LEC 3
CORQUISITE: MAS 315.
- Study of leadership and quality management fundamentals, professional knowledge and leadership ethics, with emphasis in communication skills.

MAS 311 AIR FORCE LEADERSHIP AND MANAGEMENT II
S 3 cr. LEC 3
CORQUISITE: MAS 316.
- Continuation of the study of leadership and quality management fundamentals, professional knowledge and leadership ethics, with emphasis in communication skills.

MAS 315 LEADERSHIP LABORATORY 315
F 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
CORQUISITE: MAS 310.
- Laboratory includes advanced group leadership problems, planning and orchestrating cadre corps activities.

MAS 316 LEADERSHIP LABORATORY 316
S 0 cr. LAB 0.
PREREQUISITE: Consent of instructor and approval of department head.
CORQUISITE: MAS 311.
- Laboratory includes advanced group leadership problems, planning and orchestrating cadre corps activities.

MAS 410 NATIONAL SECURITY AFFAIRS/
PREPARATION FOR ACTIVE DUTY I
F 5 cr. LEC 3
PREREQUISITE: Approval of department head (for students not pursuing a commission in the U.S. Air Force)
CORQUISITE: MAS 415.
- Examination of need for national security, analyzes the evolution and formulation of the American defense policy, strategy, and joint doctrine; methods for managing conflict; overviews of regional security, arms control, and terrorism. Also focus on the military as a profession, officership, military justice system, and current issues affecting military professionalism. Communication skills are emphasized.

MAS 411 NATIONAL SECURITY AFFAIRS/
PREPARATION FOR ACTIVE DUTY II
S 3 cr. LEC 3
PREREQUISITE: MAS 410, approval of department head (for students not pursuing a commission in the U.S. Air Force)
CORQUISITE: MAS 416.
- Continuation of MAS 410.

MAS 415 LEADERSHIP LABORATORY 415
F 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
CORQUISITE: MAS 410.
- Laboratory component includes advanced group leadership problems and commanding and supervising all cadre corps activities.

MAS 416 LEADERSHIP LABORATORY 416
S 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
CORQUISITE: MAS 411.
- Laboratory component includes advanced group leadership problems and commanding and supervising all cadre corps activities.

MAS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

MAS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

M Mathematics
Department of Mathematical Sciences
(406) 994-3601

The Department of Mathematical Sciences enforces prerequisites. By University policy, in order for any course to serve as the prerequisite you must earn a “C” or better. In addition to the specific prerequisites listed, students in 100 level Math courses and STAT 216 may also meet the prerequisite with the appropriate Math ACT, Math SAT, or Math Placement Exam score. Specific levels and scores for these courses can be found at: http://www.math.montana.edu/undergrad/documents/MHierarchy.pdf.

M 065 PREALGEBRA (COT)
F, S 4 cr. LEC 4
- This instructor-taught course covers basic concepts relating to fractions, decimals, ratios, proportions, percent, selected geometry topics, topics of signed numbers, and linear equations. The course is offered as a review and/or preparation for further studies in Mathematics. Offered in partnership with the COT in Bozeman. This course is equivalent to M 085. Pass/Fail course.

M 065 PREALGEBRA (TRIO)
F, S 3 cr. LEC 3
PREREQUISITE: Available only to TRIO students.
- Instructor-taught course covering topics in problem solving, integers, fractions, decimals, percents, variable expressions, linear equations, and selected geometry topics. Offered through TRIO Student Support Services SUB 146.

M 096 SURVEY OF ALGEBRA (COT)
F, S, Su 4 cr. LEC 4
PREREQUISITE: M 065 or M 085 or Math Placement Test within the past 12 months.
- This instructor-taught course initiates development in students' ability to organize and select relevant thought processes and systematically solve problems while preparing students for studies in other courses. Topics include linear equations and inequalities and their graphs, systems of linear equations, exponents, polynomials, factoring, rational expressions, and square roots. Offered in partnership with the COT in Bozeman. This course is equivalent to M 097.

M 097 SURVEY OF ALGEBRA (Mastery Learning)
F, S 3 cr. IND 3
PREREQUISITE: M 065 or M 085 or Math Placement Test within the past 12 months.
- A flexible paced course designed for a wide range of students needing anything from extensive practice to a quick review of algebraic concepts and problem solving. Students have access to a variety of resources as well as a personalized course webpage to keep track of their progress. Topics include linear equations and inequalities and their graphs, systems of linear equations and inequalities, exponents, polynomials, factoring, rational expressions, and square roots.

M 121Q COLLEGE ALGEBRA
F, S, Su 3 cr. LEC 3
PREREQUISITE: M 097 or Math Placement Test within the past 12 months.
- Further development of algebraic skills through the study of linear, quadratic, polynomial, exponential, and logarithmic functions.
M 155Q MATHEMATICS FOR K-8 TEACHERS I  
F, S on demand 4 cr. LEC 4  
PREREQUISITE: M 097 or Math Placement Test within the past 12 months.  
- An introduction to problem solving, sets, rational and irrational numbers, operations functions, numeration systems as mathematical structures, and introductory number theory for prospective elementary school teachers.

M 156Q MATHEMATICS FOR K-8 TEACHERS II  
F, S on demand 4 cr. LEC 4  
PREREQUISITE: M 155.  
- Introductory coordinate geometry, constructions, congruence and similarity, concepts of measurement, problem solving, probability, and statistics for prospective elementary school teachers.

M 145Q MATHEMATICS FOR THE LIBERAL ARTS  
F, S, Su 3 cr. LEC 3  
PREREQUISITE: M 097 or Math Placement Test within the past 12 months.  
- Basic skills in applicable mathematics including linear, quadratic and exponential models; financial mathematics, trigonometry and some elementary statistics.

M 147Q LANGUAGE OF MATHEMATICS  
S 3 cr. LEC 3  
PREREQUISITE: M 097 or Math Placement Test within the past 12 months.  
- Reading comprehension and writing skills in the language of mathematics; vocabulary, grammar, syntax and logic; emphasis on understanding, expressing, proving, and thinking mathematical thoughts.

M 149Q SECRETS OF THE INFINITE  
F, S 3 cr. LEC 3  
PREREQUISITE: M 097 or Math Placement Test within the past 12 months.  
- Intriguing problems, puzzles, and paradoxes studied from an historical perspective. Hands-on thought experiments follow mathematical ideas as they evolved from ancient beginnings into their modern contexts. Topics vary by semester.

M 151Q PRECALCULUS  
F, S, Su 4 cr. LEC 4  
PREREQUISITE: M 121 or Math Placement Test within the past 12 months.  
- Functions, graphs, and the use symbols for expressing mathematical thoughts. Polynomials, rational, exponential, logarithmic, and trigonometric functions.

M 160Q SURVEY OF CALCULUS  
F, S 4 cr. LEC 4  
PREREQUISITE: M 121 or Math Placement Test within the past 12 months.  
- A survey of basic calculus including limits, differentiation, and integration with applications to business, biology, and social science problems.

M 165Q CALCULUS FOR TECHNOLOGY I  
F, S 3 cr. LEC 3  
PREREQUISITE: M 151 or Math Placement Test within the past 12 months.  
- Calculus with emphasis on problems of interest to engineering technologists. Includes analytic geometry, differentiation, and introduction to integration.

M 166Q CALCULUS FOR TECHNOLOGY II  
F, S 3 cr. LEC 3  
PREREQUISITE: M 165.  
- Calculus with emphasis on problems of interest to engineering technologists. Includes integration, infinite series, and differential equations.

M 171Q CALCULUS I  
F, S, Su 4 cr. LEC 4  
PREREQUISITE: M 151 or Math Placement Test within the past 12 months.  
- Functions, elementary transcendental functions, limits and continuity, differentiation, applications of the derivative, curve sketching, and integration theory.

M 172Q CALCULUS II  
F, S, Su 4 cr. LEC 4  
PREREQUISITE: M 171.  
- Methods of integration, applications of the integral, Taylor’s theorem, infinite sequences and series, polar coordinates.

M 181Q HONORS CALCULUS I  
F 4 cr. LEC 4  
PREREQUISITE: M 151 with an “A” grade, 700 on the SAT Math exam, 31 on the ACT Math exam, or consent of the instructor.  
- Honors section of M 171. Topic coverage parallels M 171 but with a greater emphasis on theory and more difficult problems.

M 182Q HONORS CALCULUS II  
F 4 cr. LEC 4  
PREREQUISITE: M 171 with an “A” grade or M 181 with a “B” grade.  
- Honors section of M 172. Topic coverage parallels M 172 but with a greater emphasis on theory and more difficult problems.

M 221 INTRODUCTION TO LINEAR ALGEBRA  
F, S, Su 5 cr. LEC 5  
PREREQUISITE: M 166 or M 172.  
- Matrix algebra, systems of linear equations, determinants, vector algebra and geometry in Euclidean 3-space, eigenvalues, eigenvectors.

M 242 METHODS OF PROOF  
F, S 3 cr. LEC 5  
PREREQUISITE: M 172.  
- Reasoning and communication in mathematics, including logic, generalization, existence, definition, proof, and the language of mathematics. Topics include functions, relations, set theory, recursion, algebra, number theory, and other areas of mathematics.

M 273Q MULTIVARIABLE CALCULUS  
F, S 4 cr. LEC 4  
PREREQUISITE: M 172.  
- Topics in two and three dimensional geometry. Manipulation and application of vectors. Functions of several variables, contour maps, graphs, partial derivatives, gradients, double and triple integrations, vector fields, line integrals, surface integrals, Green’s Theorem, Stokes’ Theorem, the Divergence Theorem.

M 274 INTRODUCTION TO DIFFERENTIAL EQUATIONS  
F, S 4 cr. LEC 4  
PREREQUISITE: M 172.  
- An introduction to qualitative, quantitative, and numerical methods for ordinary differential equations. Topics include modeling via differential equations, linear and nonlinear first order differential equations and systems, elementary phase plane analysis, forced oscillations, and Laplace transform techniques.

M 283Q HONORS MULTIVARIABLE CALCULUS  
F 4 cr. LEC 4  
PREREQUISITE: M 182 with a ‘B’ grade, M 172 with an ‘A’ grade, AP Calculus BC-exam with a 5, or consent of the instructor.  
- Honors section of M 273. Topic coverage parallels M 273 but with a greater emphasis on theory and more difficult problem solving.

M 294 HONORS INTRODUCTION TO DIFFERENTIAL EQUATIONS  
S 4 cr. LEC 4  
PREREQUISITE: M 283 with a ‘B’ grade, M 273 with an ‘A’ grade, or consent of the instructor.  
- Honors section of M 274. Topic coverage parallels M 274 but with a greater emphasis on theory and more difficult problem solving.

M 290R UNDERGRADUATE RESEARCH  
F, S, Su 1 - 8 cr. IND  
PREREQUISITE: Consent of the department head.  
- Directed undergraduate research. Course will address responsible conduct of research.

M 291 SPECIAL TOPICS  
On Demand 1 - 4 cr. Maximum 12 cr.  
PREREQUISITE: None required but some may be determined necessary.  
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

M 328 HIGHER MATHEMATICS FOR SECONDARY TEACHERS  
F 3 cr. LEC 5  
PREREQUISITE: M 242.  
- Concepts, processes, and proof relevant to school mathematics, including number theory, abstract algebra, combinatorics and probability; NCTM Standards and a focus on content for teachers in secondary schools.

M 329 MODERN GEOMETRY  
S 3 cr. LEC 5  
PREREQUISITE: M 242.  
- A study of Euclidean and non-Euclidean geometries, chosen from, hyperbolic, spherical, projective, finite, transformational, and fractal geometries; computer tools for geometry; NCTM Standards and a focus on content for teachers in secondary schools.

M 330 HISTORY OF MATHEMATICS  
F alternate years, to be offered every even years 3 cr. LEC 5  
PREREQUISITE: M 273 and M 274 or consent of instructor.  
- Topics will be selected from the entire span of history from Egyptian, Babylonian, and Greek times through the 20th century. The course may focus on milestones that lead to the development of modern mathematics as well as the contributions of great mathematicians from ancient times until today. Some ideas will require mathematical sophistication at the upper division level.

M 333 LINEAR ALGEBRA  
F 3 cr. LEC 5  
PREREQUISITE: M 242.  
M 348 TECHNIQUES OF APPLIED MATHEMATICS I
F 3 cr. LEC 3
PREREQUISITE: M 273 and M 274.
- An introduction to advanced analytical techniques frequently used by scientists and engineers to study ordinary differential equations and two-point boundary value problems. Topics include series solution techniques, method of Frobenius, Laplace transforms, Fourier series, and boundary value problems.

M 349 TECHNIQUES OF APPLIED MATHEMATICS II
S 3 cr. LEC 3
PREREQUISITE: M 348.
- Science and engineering majors often encounter partial differential equations in the study of heat flow, vibrations, electric circuits, and similar areas. Topics include Sturm-Liouville theory, partial differential equations boundary value problems, and Laplace Transform methods.

M 381 ADVANCED CALCULUS I
F 3 cr. LEC 3.
PREREQUISITE: M 275 and either M 242, M 333, or consent of instructor.
- A rigorous development of calculus with formal proofs. Functions, sequences, limits, continuity, differentiability, and integration.

M 382 ADVANCED CALCULUS II
S 3 cr. LEC 3.
PREREQUISITE: M 381.
- A rigorous development of multivariate calculus. Differentiable functions, inversion theorem, multiple integrals, line and surface integrals, infinite series.

M 386R SOFTWARE APPLICATIONS IN MATHEMATICS
F 3 cr. LEC 3.
PREREQUISITE: M 221, M 275, and M 274.
- An introduction to modern mathematical and scientific computing. Software such as MAPLE and MATLAB will be used to explore, solve, and visualize solutions of standard mathematical problems as well as simple models of various physical and/or biological systems.

M 420 GEOMETRY, MEASUREMENT, AND DATA IN THE MIDDLE GRADES
F alternate odd years, to be offered even years 3 cr. LEC 3.
PREREQUISITE: M 242 or EDSD 461 or EDSD 471, or M 136 and 3 credits from elementary math option.
- Develop content knowledge necessary to teach standards-based middle school mathematics. Investigate the underlying conceptual structure of topics in algebra and number appropriate to middle school. Explore the use of manipulative materials and technologies, and discuss related pedagogical issues and national standards.

M 421 ALGEBRAIC THINKING AND NUMBER SENSE IN THE MIDDLE GRADES
F alternate odd years, to be offered even years 5 cr. LEC 3.
PREREQUISITE: M 242 or EDSD 461 or EDSD 471, or M 136 and 3 credits from elementary math option.
- Develop algebraic knowledge necessary to teach standards-based middle school mathematics. Investigate the underlying conceptual structure of topics in algebra and number appropriate to middle school. Explore the use of manipulative materials and technologies, and discuss related pedagogical issues and national standards.

M 422 MATHEMATICAL MODELING FOR TEACHERS
F 3 cr. LEC 3.
PREREQUISITE: Junior or senior standing in mathematics education, or consent of instructor
- Senior capstone course. Overview of the modeling process including simulation, review of relevant technology, relevant mathematics including difference equations and recursion, strategies to initiate modeling, activities, modeling in the secondary curricula, and the classroom assessment of modeling activities. Emphasis on technology and authentic applications using precollege mathematics.

M 431 ABSTRACT ALGEBRA I
S 3 cr. LEC 3.
PREREQUISITE: M 333.
- Senior capstone course. The integers, integers modulo n, the Euclidean algorithm. Groups, subgroups, normal subgroups, quotient groups, homomorphism and isomorphism theorems, and abelian groups. Rings, ideals, homomorphism and isomorphism theorems. Integral domains, fields, and fields of quotients.

M 441 NUMERICAL LINEAR ALGEBRA & OPTIMIZATION
F 3 cr. LEC 3.
PREREQUISITE: M 221 and M 273.

M 442 NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS
S 3 cr. LEC 3.
PREREQUISITE: M 221 and M 274.

M 450 APPLIED MATHEMATICS I
F alternate years, to be offered odd years 3 cr. LEC 3.
PREREQUISITE: M 273 and M 274.
- An introduction to modern methods in applied mathematics. Topics include introductions to dimensional analysis and scaling, perturbation and WKB methods, boundary layers, calculus of variations, stability, and bifurcation analysis.

M 451 APPLIED MATHEMATICS II
S alternate years, to be offered even years 3 cr. LEC 3.
PREREQUISITE: M 450.
- This is the second semester of a course that introduces modern methods in applied mathematics. Topics involve methods for linear and nonlinear partial differential equations, including introductions to Green’s functions, Fourier analysis, shock waves, conservation laws, maximum and minimum principles, and integral equations.

M 454 INTRODUCTION TO DYNAMICAL SYSTEMS I
F alternate years, to be offered even years 3 cr. LEC 3.
PREREQUISITE: M 273 and M 274.

M 455 INTRODUCTION TO DYNAMICAL SYSTEMS II
S alternate years, to be offered odd years 3 cr. LEC 3.
PREREQUISITE: M 454.
- Gradient systems, Poincare’-Bendixson theory, Poincare’ maps, structural stability and chaotic systems.

M 472 INTRODUCTION TO COMPLEX ANALYSIS
S alternate years, to be offered even years 3 cr. LEC 3.
PREREQUISITE: M 273 and M 274.
- An introduction to the techniques of complex analysis that are frequently used by scientists and engineers. Topics include complex numbers, analytic functions, Taylor and Laurent expansions, Cauchy’s theorem, and evaluation of integrals by residues.

M 490R UNDERGRADUATE RESEARCH
F, S 1 - 6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior standing in mathematics and consent of department head.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

M 491 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

M 492 INDEPENDENT STUDY
F, S, Su 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

M 494 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting material.

M 497 EDUCATIONAL METHODS/TEACHING FELLOWSHIP
F, S 1 - 2 cr. IND.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- As co-teachers of a Mathematics or Statistics course, students will learn and have the opportunity to practice classroom teaching strategies as well as mentoring skills.

M 498 INTERNSHIP
F, S, Su 2 - 12 cr. IND.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.
M 500 SEMINAR
F, S. Su 1 cr. SEM 1 Maximum 6 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

M 501 INTERMEDIATE PROBABILITY & STATISTICS
F 3 cr. LEC 3
PREREQUISITE: STAT 422 or M 382.

M 502 INTERMEDIATE MATHEMATICAL STATISTICS
S 3 cr. LEC 3
PREREQUISITE: STAT 501 or M 501.

M 503 ADVANCED LINEAR ALGEBRA
S 3 cr. LEC 3
PREREQUISITE: M 333 or consent of instructor.
- Topics include abstract vector spaces, diagonalization, Schur’s Lemma, Jordan canonical form and spectral theory for finite dimensional operators.

M 504 ABSTRACT ALGEBRA
S 3 cr. LEC 3
PREREQUISITE: M 431 or consent of instructor.
- The theory of groups, rings and fields with particular emphasis on finite groups, polynomial rings and fields of characteristic zero.

M 505 PRINCIPLES OF MATHEMATICAL ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: M 382 or consent of instructor.
- Principles of analysis in Euclidean spaces and metric spaces.

M 509 STOCHASTIC PROCESSES
S alternate years, to be offered every year 3 cr. LEC 3
PREREQUISITE: STAT 421.
- Conditional probability theory, discrete and continuous time markov chains including birth and death processes and long run behavior; Poisson processes; queuing systems; system reliability. Cross-listed with STAT 509.

M 511 GENERAL TOPOLOGY
F 3 cr. LEC 3
PREREQUISITE: M 382 or consent of instructor.
- Definition of a topology, relative topology, metric topology, quotient topology, and the product topology. Connectedness, local connectedness, components and path components. Compactness and local compactness, countability and separation axioms, the Urysohn Lemma, metrization and compactification.

M 512 GEOMETRIC & ALGEBRAIC TOPOLOGY
S 3 cr. LEC 3
PREREQUISITE: M 311 or consent of instructor.
- Topics in continuous theory, topics in dimension theory, covering spaces and the fundamental group, simplicial complexes, topics in homology and cohomology theory.

M 516 LANGUAGE OF MATHEMATICS FOR TEACHERS
Su alternate years, to be offered odd years 3 cr. LEC 3 Distance format.
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
- Features of the language of mathematics, particularly as they apply to high school and middle school curricula. Examination of written and oral mathematical proofs; current research on language use in mathematics; analysis of school students’ use of language. Focus on NCTM’s Communication and Reasoning and Proof standards in relation to mathematical language.

M 517 ADVANCED MATHEMATICAL MODELING FOR TEACHERS
S alternate years, to be offered odd years 3 cr. LEC 3 Distance format.
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
- Focus on the use of modeling to solve real-world problems. Topics include the modeling process, an overview of relevant technology, strategies to initiate modeling in the secondary classroom, and classroom assessment of modeling activities. Extensive use of mathematics to explore application areas, leading to the construction of original models.

M 518 STATISTICS FOR TEACHERS
Su 3 cr. LEC 3 Distance format.
PREREQUISITE: Graduate standing in mathematics or science education, teaching endorsement in mathematics or science, or consent of instructor.
- Stochastic concepts including probabilistic underpinnings of statistics, measures of central tendency, variability, correlation, distributions, sampling, and simulation. Exploratory data analysis including experiments, surveys, measures of association and inferential statistics. Discussion of methods for teaching statistics in secondary mathematics and science.

M 520 STANDARDS-BASED MATHEMATICS FOR TEACHERS
S alternate years, to be offered even years 3 cr. LEC 3 Distance format.
PREREQUISITE: Graduate standing in mathematics or science education, teaching endorsement in mathematics, or consent of instructor.
- Study of key content themes and connections in algebra, geometry, probability/data analysis, number, and measurement with a focus on the NCTM process standards. Exploring, extending, designing, and teaching standards-based classroom activities for middle/high school students and reflecting on student outcomes.

M 521 LEARNING THEORIES IN MATHEMATICS FOR TEACHERS
F alternate years, to be offered odd years 3 cr. LEC 3 Distance format.
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
- Examine theories of learning as they apply to the mathematics classroom. The course focuses on theories of and research about learning, human development, personality and motivation. The theories and research are used (a) to understand mathematics learning among students of all cultural, linguistic and socioeconomic backgrounds, and (b) to formulate effective teaching and learning strategies.

M 522 ASSESSMENT OF MATHEMATICS FOR TEACHERS
S alternate years, to be offered odd years 3 cr. LEC 3 Distance format.
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
- Develop the relationship and distinction between the mathematics that underlies the structure of number and the learning and teaching of number structure in schools. Explore representation, abstraction, and basic proof in the context of number and operations. Develop foundations of the real number system and examine relevant research about students’ understanding of number.

M 524 LINEAR ALGEBRA FOR TEACHERS
Su alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
- Algebraic systems, special matrices, determinants, vector spaces, and linear programming. Includes applications relevant to industry and business and connections to topics in secondary mathematics.

M 525 ANALYSIS FOR TEACHERS
Su alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
- Study of calculus concepts and processes from graphical, numerical and algebraic perspectives. Extensive use of activities and projects. Modeling and technology are incorporated throughout the course.

M 526 DISCRETE MATHEMATICS FOR TEACHERS
Su alternate years, to be offered even years 3 cr. LEC 3 Distance format.
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
- A study of classical topics in discrete mathematics, chosen from combinatorics, probability, graph theory, and other areas relevant to secondary mathematics. Emphasis on problem solving and justification.

M 527 GEOMETRY FOR TEACHERS
Su alternate years, to be offered even years 3 cr. LEC 3 Distance format.
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
- Geometry of transformations including Euclidean motions and similarity, projective geometry, geometrical topology and geometry of inversion.
M 528 CURRICULUM DESIGN  
S alternate years, to be offered every 3 cr. LEC 3  
Distance format.  
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.  
- Focuses on the design, implementation, and evaluation of curricula in mathematics. Includes historical changes and trends in mathematics curriculum and an examination of current research.

M 529 ASSESSMENT MODELS AND ISSUES  
F alternate years, to be offered odd years 3 cr. LEC 3  
Distance format.  
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.  
- Examines critical K-12 issues including: alignment and interaction of assessment with standards, curriculum, and instruction; role of assessment systems at local, state, and national levels; evaluation of assessment tools and programs; equity considerations in assessment.

M 533 HISTORY OF MATHEMATICS FOR TEACHERS  
F alternate years, to be offered even years 3 cr. LEC 3  
Distance format.  
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.  
- Focus on the history of mathematics as a context for classroom instruction. Includes the changing nature of mathematics, classical problems, proofs and mathematical processes, and the development of teaching units that incorporate the history of mathematics.

M 534 RESEARCH IN MATHEMATICS EDUCATION  
F alternate years, to be offered even years 3 cr. LEC 3  
EDG 506.  
- Examination of quantitative and qualitative research findings and methodology in mathematics education. Review of current trends and literature. Writing for publication and proposals.

M 535 TECHNOLOGY AND MATHEMATICS FOR TEACHERS  
Su alternate years, to be offered odd years 3 cr. LEC 3  
PREREQUISITE: EDG 506.  
- Focus on the history of mathematics as a context for classroom instruction. Includes the changing nature of mathematics, classical problems, proofs and mathematical processes, and the development of teaching units that incorporate the history of mathematics.

M 540 INTRODUCTION TO CALCULUS ON MANIFOLDS  
F alternate years, to be offered odd years 3 cr. LEC 3  
PREREQUISITE: M 505 and M 505 or consent of instructor.  
- An introduction to: manifolds and their atlases, fiber bundles, vector fields, tensor fields and differential forms, the exterior and Lie derivatives, Stokes Theorem, and de Rham cohomology.

M 544 PARTIAL DIFFERENTIAL EQUATIONS I  
F alternate years, to be offered odd years 3 cr. LEC 3  
PREREQUISITE: M 382 and M 451, or consent of instructor.  
- An expanded survey of the origins of a large number of scientific and mathematical partial differential equations and an overview of the theoretical techniques which are available to solve them.

M 545 PARTIAL DIFFERENTIAL EQUATIONS II  
S alternate years, to be offered every even years 3 cr. LEC 3  
PREREQUISITE: M 544 and M 547.  
- Linear partial differential equations and the function spaces and functional analysis which one uses to study them. Topics include: Holder and Sobolev functions, Sobolev and Poincare inequalities, embedding density, semigroup theory for evolution equations.

M 547 REAL ANALYSIS  
F 3 cr. LEC 3  
PREREQUISITE: M 382 or M 505.  

M 551 COMPLEX ANALYSIS  
S 3 cr. LEC 3  
PREREQUISITE: M 505.  
- Analytic functions and conformal maps, contour integrals, Cauchy's theorem, Cauchy's integral formula, the maximum modulus theorem, harmonic functions, Taylor's theorem and Laurent series. Classification of singularities, the residue theorem and evaluation of definite integrals, Rouche's theorem and the argument principle.

M 560 METHODS OF APPLIED MATHEMATICS I  
F alternate years, to be offered every even years 3 cr. LEC 3  
PREREQUISITE: M 451.  

M 561 METHODS OF APPLIED MATHEMATICS II  
S alternate years, to be offered odd years 3 cr. LEC 3  
PREREQUISITE: M 560.  
- Calculus of variations, Hamilton's principle, asymptotic and perturbation methods, transform techniques and scattering theory. Partial differential equations, Green's functions, separation of variables and transform methods.

M 570 INDEPENDENT STUDY  
F, S, Su 1 - 3 cr. IND Maximum 6 cr.  
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.  
- Directed research and study on an individual basis.

M 571 ACTION RESEARCH IN MATHEMATICS EDUCATION  
Su 2 cr. LEC 2  
PREREQUISITE: Graduate standing in mathematics education and consent of instructor.  
- Focuses on the design, implementation, and evaluation of curricula in mathematics. Includes historical changes and trends in mathematics curriculum and an examination of current research.

M 572 IMPROVING MATHEMATICS EDUCATION: CAPSTONE PROPOSAL  
F 2 cr. LEC 2  
PREREQUISITE: M 571, graduate standing in mathematics education and consent of instructor.  
- With guidance from faculty, students pursue a problem in the context of their classroom, school or district which impinges on student achievement in mathematics. Students work with a faculty advisor to characterize the problem, complete a review of relevant literature, and create an action research proposal to address the problem and evaluate outcomes of the proposed intervention.

M 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT  
F, S, Su 1 - 4 cr. IND Maximum 6 cr.  
PREREQUISITE: Graduate standing.  
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

M 576 INTERNSHIP  
F, S, Su 2 - 12 cr. IND Maximum credits unlimited  
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.  
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

M 577 IMPROVING MATHEMATICS EDUCATION: CAPSTONE PROJECTS  
Su 5 cr. LEC 3  
PREREQUISITE: M 571/572 sequence, graduate standing in mathematics education, teaching endorsement in mathematics and consent of instructor.  
- With guidance from faculty, students conduct action research addressing a problem in the context of their classroom, school or district which impinges on student achievement in mathematics. Students work with a faculty advisor to implement an intervention, collect and analyze data resulting from the intervention, and summarize results. Findings are presented orally to peers and faculty.

M 580 SPECIAL TOPICS  
On Demand 1 - 4 cr. Maximum 12 cr.  
PREREQUISITE: Upper division courses and others as determined for each offering.  
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

M 581 NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS I  
F 3 cr. LEC 3  
PREREQUISITE: M 442.  
- Finite difference and finite element solution techniques for elliptic, parabolic, and hyperbolic partial differential equations, numerical linear algebra.

M 582 NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS II  
S 3 cr. LEC 3  
PREREQUISITE: M 581.  
- A continuation of topics from M 581.

M 584 FUNCTIONAL ANALYSIS I  
F alternate years, to be offered every even years 3 cr. LEC 3  
PREREQUISITE: M 547.  
- Banach spaces, fixed point theorems, Hilbert spaces, the Dirichlet principle, generalized Fourier series, and spectral theory.
M 585 FUNCTIONAL ANALYSIS II
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: M 584.
- The Hahn-Banach theorem, variational principles, weak convergence, uniform boundedness theorem, the open mapping theorem and the implicit function theorem.

M 586 PROBABILITY THEORY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: M 547.

M 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Courses offered on a one time basis to fulfill professional development needs of inservice educators. A specific focus is given to each course which is appropriately subtitled.

M 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND 3
PREREQUISITE: Master’s standing.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time.

M 590 MASTER’S THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

M 591 TOPICS IN APPLIED MATHEMATICS I
F 3 cr. LEC 3
PREREQUISITE: Graduate standing and consent of instructor.
- Topics may include numerical solution of linear and nonlinear problems, eigenvalue problems, continuation methods, numerical optimization, computational mechanics, spectral methods, bifurcation theory, invariant manifold theory, index theory, nonlinear analysis, reaction-diffusion equations, nonlinear oscillations, asymptotic methods and perturbation methods.

M 592 TOPICS IN APPLIED MATHEMATICS II
S 3 cr. LEC 3
PREREQUISITE: Graduate standing and consent of instructor.
- Topics may include numerical solution of linear and nonlinear problems, eigenvalue problems, continuation methods, numerical optimization, computational mechanics, spectral methods, bifurcation theory, invariant manifold theory, index theory, nonlinear analysis, reaction-diffusion equations, nonlinear oscillations, asymptotic methods and perturbation methods.

M 595 DYNAMICAL SYSTEMS I
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: M 563.
- Topics in differential equations including existence and uniqueness, continuous dependence on parameters, extendability, the existence and stability of equilibria and limit cycles and the Poincare-Bendixon theorem.

M 596 DYNAMICAL SYSTEMS II
S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: M 595.
- Topics include: Hartman’s theorem, invariant manifold theory, Smale-Birkhoff theorem, horseshoe chaos, and the Melnikov method. Topics in discrete dynamical systems may also be covered.

M 597 TOPICS IN MATHEMATICS I
F 3 cr. LEC 3
PREREQUISITE: Graduate standing and consent of instructor.
- Topics selected from: differential topology, differential geometry and complex dynamics.

M 598 TOPICS IN MATHEMATICS II
S 3 cr. LEC 3
PREREQUISITE: Graduate standing and consent of instructor.
- Topics selected from: continuum theory, symbolic dynamics, ergodic theory and low dimensional topology.

M 689 DOCTORAL READING & RESEARCH
F, S, Su 5 - 3 cr. IND Maximum 15 cr.
PREREQUISITE: Doctoral standing.
- This course may be used by doctoral students who are reading research publications in the field in preparation for doctoral thesis research.

M 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

MB Microbiology
Department of Microbiology
(406) 994-2903

MB 100 CAREERS IN MICROBIOLOGY
F 1 cr. LEC 1
- The course introduces students to educational and career opportunities in the fields of medical, molecular, ecological, and environmental microbiology. The course introduces students to the various options in the microbiology degree program. It will emphasize the differences in the options and the employment opportunities in each once a degree has been obtained.

MB 101N UNSEEN UNIVERSE: MICROBES
F, S 3 cr. LEC 2 LAB 1
- Beneficial and harmful effects of microorganisms on individual health, public health, food and water quality; are relevant to an informed citizen of the 21st century. Current news topics and historical perspectives are emphasized. Laboratory exercises investigate microbial activity in our everyday world.

MB 105CS MOLECULES OF LIFE
S 3 cr. LEC 3
- Introduction to uses of biological molecules for improving health and agriculture. Gene therapy and DNA fingerprinting are discussed in relation to social/moral issues. Intent of course is to help students develop a rational approach to evaluate cost/benefits of biotechnology to society.

MB 110CS INTRODUCTION TO BIOTECHNOLOGY
F 3 cr. LEC 2 SEM 1
- Introduction to an ever growing industry. Course is designed to demonstrate the current significance of biotechnology. Course is a multi-lecture series dealing with ethics, business, and scientific technology. Cross-listed with VTMB 101 and PS 101.

MB 201 INFECTIOUS DISEASES
F, S 3 cr. LEC 3
- Introduction to the world of microorganisms; procaryotic cell structure, function and genetics; the immune response; immunochemistry, epidemiology, treatment and control of important infectious diseases of humans.

MB 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MB 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MB 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

MB 301 GENERAL MICROBIOLOGY
F, S 5 cr. LEC 3 LAB 2
PREREQUISITE: BIOL 102.
COREQUISITE: CHMY 211 or CHMY 321.
- An introduction to major topics and subdisciplines in microbiology including microbial diversity and classification, microbial anatomy and physiology, microbial genetics, microbial ecology, medical microbiology and immunology, epidemiology and public health, and biotechnology.

MB 400 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: MB 301 and junior standing.
- Senior capstone course. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material. When taken in the senior year, this course fulfills the senior capstone course requirement.

MB 401 IMMUNOLOGY
F 3 cr. LEC 5
COREQUISITE: CHMY 211 or CHMY 321.
- Fundamentals of cellular and molecular immunology including consideration of structure, genetics and function of immunoglobulins, T-cell receptors and major histocompatibility antigens; regulation of the immune response; transplantation and immunological diseases.

MB 402 IMMUNOLOGY LABORATORY
F 2 cr. LAB 1
PREREQUISITE: MB 401 (may be taken as corequisite).
- A laboratory study of basic and clinical immunology.
COURSE DESCRIPTIONS: MB 403 - MB 462

MB 403 Virology
F 4 cr. LEC 3 LAB 1
PREREQUISITE: BCHM 340.
- Fundamentals of virology with emphasis on animal viruses. Consideration of the molecular aspects of structure, multiplication, and host response to viral infection. The laboratory emphasizes principles and laboratory applications of molecular virology.

MB 405 Hematology
F 3 cr. LEC 3
PREREQUISITE: BIOL 102, BIOL 207 or BIOL 208. MB 401 and BCHM 540 are recommended.
- A study of the function, biochemistry, cell biology, and pathology of blood and its constituents.

MB 406 Hematology Laboratory
F 1 cr. LAB 1
PREREQUISITE: BIOL 207 or BIOL 208.
- Methods of examining white blood cells, red blood cells, and platelets. Also included is the examination of abnormal blood cells, hemostasis, and florescent antibody cell sorting analysis.

MB 407 Microbiology Instructing
F, S, Su 2 cr. LEC 2
PREREQUISITE: MB 405.
- Instruction and practice in effective teaching methods; practice in preparing laboratory materials, assisting a class and grading.

MB 408 General Parasitology
S alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
- Study of the life cycles, biochemistry, molecular parasitology, pathology, identification and treatment of the major parasitic groups, including parasitic protozoa, monogeneans, digenocanes, cestodes, nematodes, acanthocephalans, and parasitic arthropods.

MB 415 Microbial Diversity, Ecology & Evolution
S alternate years, to be offered even years 5 cr. LEC 5
PREREQUISITE: MB 301, BCHM 340, or consent of instructor
- The diversity of procaroytic and eucaryotic microorganisms will be explored from both classical phenotypic and contemporary genotypic perspectives. The linkage between microbial diversity, its evolutionary origin, and its ecological value will be emphasized. Crosslisted with LRES 415.

MB 420 Microbial Physiology
F 3 cr. LEC 3
PREREQUISITE: BCHM 340, MB 301.
- An in-depth examination of microbial cell structure and function, biosenergetics, intermediary metabolism and its control, and the orchestration and regulation of cellular functions that enable microbes to adapt to and survive in their environment.

MB 430 Medical Bacteriology
S 2 cr. LAB 2
PREREQUISITE: MB 430.
- Laboratory methods designed to teach techniques used in culturing and identifying bacterial pathogens and normal flora from clinical specimens. Procedures used to test the antibiotic susceptibility of pathogenic bacteria.

MB 431 Medical Bacteriology Lab
S 12-13 cr. LEC 1 LAB 1
PREREQUISITE: MB 430.
- Topics include a review of normal hematopoiesis; red blood cell, white blood cell, and platelet disorders; body fluid overview; and an introduction to hematology instrumentation.

MB 432 Clinical Microbiology
S 5 cr. LEC 2 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Topics include a review of medical microbiology, virology, mycology, parasitology, and clinical laboratory testing procedures.

MB 433 General Parasitology
S 4 cr. LEC 3
PREREQUISITE: MB 301, BCHM 340 or equivalent.
- The study of fungal structure, physiology and taxonomy, disease and host-parasite relationships; and procedures used to isolate and identify pathogenic fungi. Also, the study of biology, pathogenesis, diagnosis and treatment of medically important parasites.

MB 449 Microbial Genetics
S 3 cr. LEC 3
PREREQUISITE: MB 301, BCHM 340.
- The students will become familiar with concepts in microbial genetics, including DNA replication, RNA, and protein biosynthesis. Other concepts covered in the course include bacteriophage and plasmid biology, gene regulation, mobile genetic elements, and the fundamentals of genetic engineering.

MB 450 Research Methods in Microbiology
S 4 cr. LEC 3 LAB 1
PREREQUISITE: BCHM 340.
- Fundamentals of research methodology for undergraduate and graduate students in microbiology and related disciplines. Theory and application of techniques, reagents, and instrumentation will be emphasized in the lecture and laboratory. The emphasis in the course will be on recombinant DNA methodology, and the safe and effective use of radioisotopes.

MB 452 Clinical Immunohematology I
S 2 cr. LEC 1 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Basic techniques in blood banking. Topics to be included are: ABO/Rh typing, antibody identification, transfusion therapy and reactions, donor collection and component preparation.

MB 453 Clinical Hematology & Body Fluids I
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Topics include a review of medical microbiology, virology, mycology, parasitology, and clinical laboratory testing procedures.

MB 454 Clinical Microbiology I
Su 5 cr. LEC 2 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Topics include a review of medical microbiology, virology, mycology, parasitology, and clinical laboratory testing procedures.

MB 455 Clinical Chemistry I
Su 5 cr. LEC 2 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Topics include an introduction to theories and principles with emphasis on all body systems, and the role of instrumentation in the clinical chemistry laboratory.

MB 456 Essentials of Clinical Lab Practice
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Provides an orientation to the program, safety information, phlebotomy training, and an overview of management practices. Also includes instruction in hemostasis, molecular diagnostics and urinalysis.

MB 460 Clinical Laboratory Science Summer Practicum
Su 12-13 cr. LEC 1 LAB 1
PREREQUISITE: To take this course, students must be accepted into a professional training program.
- MB 460 is a clinical laboratory science course, which will be conducted at affiliate training programs during the summer of a student’s senior year. It includes student lecture and laboratory instruction in clinical immunohematology, clinical chemistry, medical mycology, phlebotomy and phlebotomy techniques. Students will perform patient laboratory testing under the guidance of trained professionals.

MB 461 Clinical Laboratory Science Professional Training I
F 12-13 cr. LEC 1 LAB 1
PREREQUISITE: MB 460.
- MB 461 is the first semester of professional training at a clinical laboratory hospital affiliate. Students will review basic and advanced information in immunohematology, clinical chemistry, clinical hematology, clinical microbiology, clinical immunology, medical mycology, and phlebotomy techniques. Students will perform patient laboratory testing under the guidance of trained professionals.

MB 462 Clinical Laboratory Science Professional Training II
S 12-13 cr. LEC 1 LAB 1
PREREQUISITE: MB 461.
- MB 462 is the second semester of professional training at a clinical laboratory hospital affiliate. Students will learn financial and quality management information of the clinical laboratory and study advanced immunohematology, clinical chemistry, clinical microbiology, and clinical hematology. During this course, students will perform patient laboratory testing under the guidance of trained professionals.
MB 463 LAB PRACTICE II
F 1 cr. LAB 1
PREREQUISITE: Students must be accepted to the MMLS training program.
- Essential skills for performing phlebotomy, laboratory specimen collection, handling and preparing samples for laboratory analysis and interpersonal communication skills will be emphasized.

MB 464 CLINICAL HEMATOLOGY II
F 2 cr. LAB 2
PREREQUISITE: Students must be accepted to the MMLS training program.
- Blood cell identification, manual and automated procedures for the assessment of hematologic disease will be emphasized. Students will begin to learn to assess, interpret and correlate hematologic data with disease.

MB 465 CLINICAL HEMOSTASIS
F 1 cr. LAB 1
PREREQUISITE: Students must be accepted to the MMLS training program.
- Laboratory skills using manual and automated procedures will be emphasized. Students will assess, interpret and correlate data as it relates to normal and abnormal hemostasis and anticoagulant therapy.

MB 466 CLINICAL MICROBIOLOGY II
F 3 cr. LAB 3
PREREQUISITE: Students must be accepted to the MMLS training program.
- The ability to differentiate pathogens from commensals and perform identification procedures and antimicrobial susceptibility testing are emphasized along with an introduction to specialized and automated testing.

MB 467 CLINICAL CHEMICAL AND URINALYSIS II
F 3 cr. LAB 3
PREREQUISITE: Students must be accepted to the MMLS training program.
- Manual and automated procedures for determining chemical analyses in blood and body fluids and the associated disease conditions will be emphasized along with an introduction to specialized and automated testing.

MB 468 CLINICAL IMMUNOHEMATOLOGY II
F 2 cr. LAB 2
PREREQUISITE: Students must be accepted to the MMLS training program.
- Maintenance of blood components and performing routine and basic problem solving procedures in the blood bank will be emphasized. Correlation of immunohematology theory and disease with testing and transfusion practices and patient care will be covered.

MB 469 CLINICAL IMMUNOLOGY/SEROLOGY
F 1 cr. LAB 1
PREREQUISITE: Students must be accepted to the MMLS training program.
- Assessment, interpretation and clinical significance of immunology principles and techniques and their correlation to laboratory data and patient disease will be emphasized.

MB 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

MB 471 CLINICAL HEMATOLOGY III
S 2 cr. LAB 2
PREREQUISITE: Students must be accepted to the MMLS training program.
- Competency in performing testing and the ability to assess, interpret, and correlate hematologic data with other patient information to recommended additional testing, diagnosis, and probable treatment option for the patient will be emphasized.

MB 472 CLINICAL CHEMISTRY III
S 2 cr. LAB 2
PREREQUISITE: Students must be accepted to the MMLS training program.
- Achieve entry level knowledge of disease processes, and exhibit professional competencies in clinical chemistry laboratory procedures and the operation of laboratory instrumentation.

MB 473 IMMUNOHEMATOLOGY III
S 2 cr. LAB 2
PREREQUISITE: Students must be accepted to the MMLS training program.
- Attain competency and the ability to correlate testing data to theory and initiate advanced techniques where appropriate. Students will demonstrate entry level competency by managing the daily aspects of blood bank operation.

MB 474 CLINICAL MICROBIOLOGY III AND MOLECULAR DIAGNOSTICS
S 3 cr. LAB 3
PREREQUISITE: Students must be accepted to the MMLS training program.
- Competently identify and provide susceptibility data for microorganisms isolated from human specimens including clinically significant yeasts, molds, parasites, viruses, and mycobacterium. Perform molecular diagnostic techniques available.

MB 475 LAB PRACTICE III
S 2 cr. LAB 2
PREREQUISITE: Students must be accepted to the MMLS training program.
- A two week rotation in a small hospital laboratory provides an opportunity to experience a different work environment and practice laboratory skills.

MB 477 LABORATORY MANAGEMENT
S 1 cr. LEC 1
PREREQUISITE: Students must be accepted to the MMLS training program.
- General management policies, principles, and procedures necessary for efficient operation of a clinical laboratory will be emphasized along with federal and state regulations which govern the clinical laboratory.

MB 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MB 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MB 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MB 528 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. END May be repeated. Max 12 cr.
PREREQUISITE: Senior standing.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

MB 500 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material. There are separate sections for departmental seminar, general/environmental and biomedical microbiology journal clubs and graduate reading; consult the Department of Microbiology Graduate Student Handbook for specific requirements.

MB 501 PRINCIPLES & TECHNIQUES OF ANIMAL EXPERIMENTATION
F 3 cr. LEC 2 LAB 1
PREREQUISITE: MB 301.
- Ethical, humane, anatomical, physiological, environmental and legal considerations involved in the use of laboratory animals will be discussed and information on non-animal alternatives provided. Bio-methodological procedures, including anesthetic and surgical techniques will be demonstrated and/practiced in the laboratory.

MB 515 ADVANCED MICROBIAL ECOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: MB 415/LRES 415.
- Critical review of literature on the distribution and activity of microorganisms in natural microbial communities based on microbial adaption and physical, chemical and biological features of the environment. A critical discussion of literature and approaches. Crosslisted with LRES 515.

MB 520 MICROBIAL PHYSIOLOGY
F 3 cr. LEC 3
PREREQUISITE: MB 301 and BCHM 340.
- An in-depth examination of microbial cell structure and function, bioenergetics, and intermediary metabolism and control. Students will also be expected to consider biochemical function within the context of genomic sequences, and be able to formulate predictions for carbon and energy flow.

MB 525 ADVANCED IMMUNOLOGY
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: MB 401.
- Recent advances in immunology, immunogenetics, immunopathology, molecular and cellular immunology. Crosslisted with VTM 501.

MB 528 ADVANCED GENETICS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: MB 420 or equivalent.
- Recent advances in microbial genetics with an emphasis on molecular genetics and eukaryotic gene expression.
MB 535 GENOMIC ANALYSIS
F 4 cr. LEC 3 Lab 1
PREREQUISITE: Permission of instructor needed.
- The quantity of sequence information deposited into databases necessitates that scientists train in both discovery and hypothesis-based research that utilizes these resources. This class will cover experimental design, database searching and management, sequence alignment, molecular pattern recognition, and phylogenetics.

MB 536 EXPLORING MICROBIOLOGY
F 3 cr. ONLINE 3
PREREQUISITE: MB 301 and one of MB 415, MB 420, or MB 449 or equivalent
PREREQUISITE: BS in Biology or equivalent degree
COREQUISITE: Graduate standing or petition approval from the Vice Provost of Graduate Education.
- Fundamentals of microbiology including history, microscopy, prokaryote and eukaryote and cells, viruses and other acellular agents, microbial evolution, and diversity will be studied. This course is intended for middle/high school/lower level college teachers and others in education roles e.g. nature facilities.

MB 537 ADVANCED IN MOLECULAR EVOLUTION
F 3 cr. LEC 3
PREREQUISITE: MB 420 or 449 or 450 or 528 or 538 or BIOL 402 or BCHM 340 or BCHM 441 or VTMB 421.
- The educational objectives of this course are to provide graduate students with a basic introduction to molecular evolution. The study of molecular evolution encompasses the origin and evolution of life on earth at the molecular level.

MB 538 CELL AND MOLECULAR BIOLOGY
Su 2 cr. LAB 2
PREREQUISITE: MB 301, BCHM 340 or BIOL 402, MB 506, or the equivalent.
COREQUISITE: Graduate standing or petition approval from the Vice Provost of Graduate Education.
- An inquiry-based laboratory in prokaryotic and eukaryotic C&M provides training in microbiological techniques such as DNA, phylogenetic analyses, growth, cell cycle regulation, gene expression, protein purification, and immunoassays. Current literature and laboratory discussions cover molecular approaches for investigating complex cellular mechanisms.

MB 539 INFECTION AND IMMUNITY
Su alternate years, to be offered every year
5 cr. IND 3
PREREQUISITE: MB 401 or MB 403 or MB 430.
COREQUISITE: Graduate standing or petition approval from the Vice Provost of Graduate Education.
- An inquiry-based study of recent advances in understanding the etiology, pathogenesis, chemotherapy and prevention of infectious disease which includes analysis of current literature, case histories, and online sources of information. This course is intended for practicing teachers and those in the MSSE program.

MB 540 APPLIED MICROBIOLOGY
S alternate years, to be offered starting 2011
5 cr. IND 3
PREREQUISITE: MB 536 and MB 541 or equivalent course.
COREQUISITE: BS in biology or equivalent; Graduate standing or petition approval from the Vice Provost of Graduate Education.
- Coverage includes biotechnology, industrial microbiology, antimicrobial chemotherapy, public health, epidemiology, climate change, food, water, wastewater, extreme environments, space travel, biodegradation, bioremediation and bioaugmentation. This course is intended for middle/high school/lower level college teachers, and others in education roles, e.g., nature facilities.

MB 541 MICROBIAL GENETICS
Su alternate years, to be offered odd years 3 cr.
LEC 3
- Prokaryotes provide much of the understanding of fundamental genetics for all organisms, especially through in vivo and in vitro genetic tools. Transcription, translation, mutation and recombination are considered, so that science teachers understand of fundamental of genetics. This course is intended for practicing teachers and those in the MSSE program.

MB 542 MICROBIAL ECOLOGY
S alternate years, to be offered 2010 3 cr. LEC 3
PREREQUISITE: BS in biology or equivalent course.
COREQUISITE: BS in biology or equivalent; Graduate standing or petition approval from the Vice Provost of Graduate Education.
- Ecology of microorganisms in relation to nutrition, growth, control, metabolism, biogeochemical cycling, natural environments and microbial interactions will be covered. This course is intended for middle/high school/lower level college teachers, and others in education roles, e.g., nature facilities.

MB 544 ADVANCED BIOINFORMATIC
S 4 cr. LEC 3 Lab 1
PREREQUISITE: BIOL 355.
- This requirement can be waived at instructor’s discretion.
- This course will cover advanced topics in Bioinformatics, including genome assemblies and functional annotations of proteins. This training will enable students to make confident predictions from biological sequences and to develop testable hypotheses that will guide their experimental work.

MB 552 ADVANCED SOIL & ENVIRONMENTAL MICROBIOLOGY
S alternate years, to be offered every year
3 cr. IND 3
PREREQUISITE: LRES 452 or consent of instructor.
- Advanced laboratory course. Microorganisms are targeted for isolation and characterization, emphasizing those not normally encountered in general microbiology laboratory. Biochemical cycling, contaminant biodegradation, extremophiles, and plant-microbe interactions are typical topics is investigated. Students employ classic and novel cultivation approaches, identifying microbes based morphologically, physiologically and phylogenetically. Cross-listed with LRES 552.

MB 570 INDEPENDENT STUDY
On Demand 1-3 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

MB 575 PROFESSIONAL PAPER
F, S, Su 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing and committee approval.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

MB 576 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum credits unlimited
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

MB 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MB 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

MB 590 MASTER’S THESIS
F, S, Su 1-10 cr. IND Maximum 20 crs.
PREREQUISITE: Master’s standing.

MB 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND Maximum 50 crs.
PREREQUISITE: Doctoral standing.

MBEH Microbiology Environmental Health
Department of Microbiology
(406) 994-2903

MBEH 210RN PRINCIPLES OF ENVIRONMENTAL HEALTH SCIENCE
F 4 cr. LEC 3 LAB 1
- Environmental programs and activities concerned with identification and control of physical-chemical-biological factors that impact human health; water pollution and treatment, food protection, air pollution, hazardous waste disposal, vectorborne disease control, community sanitation, hazard control in institutional and occupational environments. The course emphasizes how human health is linked to the health of the environment.

MBEH 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

MBEH 475 FIELD PROJECT
F, S, Su 1 - 4 cr. IND Maximum 4 cr.
PREREQUISITE: Consent of instructor and department head.
- Research and field experience in some aspect of environmental health science.
MBEH 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: junior standing, consent of instructor, and approval of department head.
- An individual assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MBEH 499R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY INSTRUCTION
F, S 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MBEH 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MBEH 499R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY
F, S 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

MBSP Molecular Biosciences Program
Division of Graduate Education
(406) 994-6652

MBSP 500 MOLECULAR BIO SCIENCES PROGRAM SEMINAR
F, S 1 cr. SEM 1
- This course will fulfill the seminar requirement of the first year Molecular Biosciences Program (MBSP) doctoral fellows. The fellows (students) will attend three seminars sponsored by the MBSP focused on molecular biosciences research. Students will also attend twelve additional departmental or research center-based seminars from the participating MBSP centers and departments. Each student will write a summary of the fifteen attended seminars and turn it into the instructor by the last day.

MBSP 561 MOLECULAR BIO SCIENCES PROGRAM LAB ROTATION I
F, S 1 cr. LAB 1
- Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation provides students with a six-week period of active research experimentation time. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research project. Extensive bench research time will be required to obtain meaningful results.

MBSP 562 MOLECULAR BIO SCIENCES PROGRAM LAB ROTATION II
F, S 1 cr. LAB 1
- Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation provides students with a six-week period of active research experimentation time. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research project. Extensive bench research time will be required to obtain meaningful results.

MBSP 563 MOLECULAR BIO SCIENCES PROGRAM LAB ROTATION III
F, S 1 cr. LAB 1
- Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research project. Extensive bench research time will be required to obtain meaningful results.

MBSP 564 MOLECULAR BIO SCIENCES PROGRAM LAB ROTATION IV
F, S 1 cr. LAB 1
- Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research project. Extensive bench research time will be required to obtain meaningful results.

MBSP 575 MOLECULAR BIO SCIENCES RESEARCH PROJECT
F, S 1 cr. LAB 1
- This course will fulfill the research requirement of the first year Molecular Biosciences Program (MBSP) doctoral fellows. The fellow (students) will work on a research project under the direction of their advisor.

MBSP 579 MOLECULAR BIO SCIENCES PROGRAM LAB ROTATION
F 1 cr. LAB 1
- Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research project. Extensive bench research time will be required to obtain meaningful results.

MBSP 613 SCIENTIFIC PROPOSAL WRITING
Su 5 cr. LEC 3
PREREQUISITE: Enrollment is limited to Molecular Biosciences Program Doctoral Graduate Fellows.
- Research scientists and engineers in today’s highly competitive world need to develop and acquire research proposal writing skills and knowledge as part of their training for a successful career. The goal of this course is to provide doctoral students with strategies, practical skills and experience in seeking funding for their research as well as writing and evaluating scientific proposals. The student will leave this course with a research proposal that is ready to submit for funding.

ME Mechanical Engineering
Department of Mechanical & Industrial Engineering
(406) 994-2203

ME 101 INTRODUCTION TO MECHANICAL ENGINEERING
F 1 cr. LEC 1
- The mechanical engineering profession, logical process of problem solving and design, professionalism, ethics.

ME 115 ENGINEERING DESIGN GRAPHICS
F, S 1 cr. LEC 1
- Introductory course developing freehand sketching for engineering design graphics. Skills will be developed for sketching and interpreting dimensioned multi-view drawings, pictorials, sections, and assemblies.

ME 116 ENGINEERING DESIGN GRAPHICS LABORATORY
F, S 1 cr. LAB 1
COREQUISITE: ME 115 or consent of instructor.
- Hands-on laboratory experience in two dimensional computer-aided design (CAD) for engineering design graphics.

ME 117 MECHANICAL ENGINEERING DESIGN GRAPHICS
F, S 1 cr. LEC 1
PREREQUISITE: ME and MET majors only, or consent of instructor.
- Introductory course developing freehand sketching and computer aided modeling techniques for mechanical engineering design graphics. Skills will be developed for sketching and interpreting dimensioned multi-view drawings, tolerancing, specifications, pictorials, and assemblies for mechanical designs.

ME 118 MECHANICAL ENGINEERING DESIGN GRAPHICS LABORATORY
F, S 1 cr. LAB 1
PREREQUISITE: ME and MET majors only, or consent of instructor.
- Hands-on laboratory experience in three-dimensional and parametric constraint-based modeling for mechanical engineering design.
ME 202 ENGINEERING COMPUTER APPLICATIONS
F, S 1 cr. LAB 1
PREREQUISITE: ME and MET majors only.
COREQUISITE: M 172 for ME majors; M 166 for MET majors.
- Computer methodology, use of various computer software packages in mechanical engineering applications.

ME 250 MECHANICAL ENGINEERING MATERIALS
On Demand 3 cr. LEC 3
PREREQUISITE: CHMY 121 or CHMY 141.
COREQUISITE: M 165 for MET majors only; M 171 for ME majors.
- Properties of metallic, ceramic, and polymeric materials as related to their structures. Material selection for engineering applications.

ME 251 ME MATERIALS SCIENCE LABORATORY
F, S 1 cr. LAB 1
PREREQUISITE: ME majors only.
COREQUISITE: ME 102 and CHBE 213.
- This course is intended to supplement current materials lecture course offerings. Provides students with hands-on lab experience to identify and quantify physical, electrical, and mechanical properties of metallic and non-metallic materials via experimental measurements. Experimental procedures and reporting are emphasized.

ME 255 MANUFACTURING PROCESSES
F, S 3 cr. LEC 3
PREREQUISITE: ME 250 or CHBE 213.
- Basic methods of processing materials to change shapes, dimensions, and finishes; special attention to associated forces, temperature, and property changes.

ME 257 MANUFACTURING PROCESSES LABORATORY
F, S 1 cr. LAB 1
COREQUISITE: ME 255.
- Course will supplement lecture materials covered in ME 257. Provides students with hands-on experience for performing and analyzing a broad spectrum of manufacturing processes including metal casting, injection molding, powder metallurgy, metal forming, metal removal, inspection and measurement and welding.

ME 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND 1-3 Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

ME 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ME 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ME 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ME 315 ENGINEERING ANALYSIS
F, S 4 cr. LEC 4
PREREQUISITE: ME 102, M 273, M 274.
COREQUISITE: EM 253.
- Course focuses on enhancing the appreciation of mathematics in ME and advancing the knowledge of mathematical methods in engineering analysis. Topics include introduction to mathematical modeling of engineering systems, linear algebra techniques, numerical methods, method of Laplace transformation, Fourier analysis, with classic and modern engineering applications.

ME 320 THERMODYNAMICS I
F, S 3 cr. LEC 3
PREREQUISITE: M 273, EM 251.
- Basic thermodynamic concepts, first and second laws, open and closed systems, properties of ideal and real substances, work, heat, irreversibility, and availability.

ME 321 THERMODYNAMICS II
F, S 3 cr. LEC 3
PREREQUISITE: ME 320.
- Vapor, gas power, and refrigeration cycles; mixtures and combustion.

ME 324 ENGINEERING THERMODYNAMICS
S 3 cr. LEC 3
PREREQUISITE: PHYS 205 or PHYS 211.
COREQUISITE: M 166 or M 172.
- General treatment of the basic laws of thermodynamics and engineering applications with introduction to heat transfer for curricula not requiring ME 320, ME 321 series.

ME 326 FUNDAMENTALS OF HEAT TRANSFER
F, S 4 cr. LEC 4
PREREQUISITE: EM 335, ME 320.
COREQUISITE: Concurrent enrollment in or prior completion of ME 315.
- Mechanisms of energy transport due to a temperature difference in materials. Conduction, convection, and radiation formulations. Introduction to heat transfer equipment.

ME 341 INTRODUCTION TO MACHINE DESIGN
F, S 4 cr. LEC 5 RCT 1
PREREQUISITE: WRIT 101W, COM 110 or CLS 101, ME 102, ME 251, EM 253, M 274, and ME 118 or consent of instructor.
COREQUISITE: Concurrent enrollment in or prior completion of ME 257, ME 315 and I&ME 350.
- Static yield theories, introduction to fracture mechanics, analysis of fatigue, thick-wall pressure vessels, strain energy, Castigliano’s theorem, application to engineering design analysis problems.

ME 342 MECHANICAL COMPONENT DESIGN
F, S 4 cr. LEC 4
PREREQUISITE: ME 341, EM 252.
- Analysis of components used in mechanisms and machines. Topics include kinematics and dynamics of machines; bolts, welds, springs, bearings, gears, belts, chains, motors, and hydraulic elements.

ME 345 MECHANICAL STRUCTURES
On Demand 3 cr. LEC 3
PREREQUISITE: EM 252, EM 253, M 274, ME 102, ME 117 or equivalent, ME 315, ME 341.
- Numerical analysis of skeletal structures by the stiffness method including strain energy and Castigliano’s theorem. Introduction to finite element method.

ME 350 ENGINEERING MATERIALS
S 3 cr. LEC 5
PREREQUISITE: CHBE 213 and ME 251.
- Application of materials selection to the engineering design process. Development of microstructure-processing-properties relationships on the mechanical and functional behavior of materials.

ME 355 COMPUTER-AIDED MANUFACTURING
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: ME 110 or ME 111, ME 255; CS 120 or some familiarity with computers and programming.
- Computer-aided, operation, and application of computer-controlled manufacturing and assembly for product/process design including multiaxis CNC, robotics, and integrated manufacturing systems.

ME 360 MEASUREMENT AND INSTRUMENTATION
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 250, WRIT 101W, COM 110 or CLS 101; ME 320 and EM 253 for ME majors.
COREQUISITE: Concurrent enrollment in or completion of I&M 350 or consent of instructor; ME 524 for MET majors.
- Theory and application of engineering measurement concepts, focusing on dynamic mechanical/electrical systems with an emphasis on computerized data acquisition. Lecture and laboratory content includes function and operation of transducers, calibration, statistical analysis, sampling, signal conditioning, as well as dynamic response.

ME 403 MECHANICAL ENGINEERING DESIGN I
On Demand 3 cr. LEC 2 RCT 1
PREREQUISITE: ME 320, EM 335.
COREQUISITE: Concurrent enrollment in or prior completion of ME 342.
- Mechanical Engineering design project experience emphasizing use of a formal design process, presentations, and documentation. Includes coverage of industry machining and welding practices.

ME 404R MECHANICAL ENGINEERING DESIGN II
F, S 2 cr. LEC 1 RCT 1
PREREQUISITE: ENGR 330, ME 326, and ME 342.
COREQUISITE: Concurrent enrollment in or prior completion of ME 360, ME 321, ME 445.
- First semester of senior capstone design experience in Mechanical Engineering. Students, under the guidance of a faculty supervisor, solve real-world design problems.

ME 405R MECHANICAL ENGINEERING DESIGN III
F, S 2 cr. LAB 1 IND 1
PREREQUISITE: ME 404.
- Second semester of the senior capstone design experience in Mechanical Engineering. Students, under the guidance of a faculty supervisor, implement their ME 404 design projects.
ME 411 ADVANCED ENGINEERING GRAPHICS AND COMPONENT SPECIFICATION
On Demand 3 cr. LEC 1 LAB 2
PREREQUISITE: ME 118; instructor’s consent for non-ME/MET majors; junior standing.
– Develop the ability to use solid and parametric modeling to design and document machine parts. Geometric dimensioning and tolerancing, auxiliary views, analysis of models, advanced modeling techniques and customization are covered through hands-on experiences.

ME 422 INTRODUCTION TO MICROELECTROMECHANICAL SYSTEMS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: Senior standing; EE 250 and EM 255; or consent of instructor.
– Introduction to sensors and actuators and their working principles. MEMS (microelectromechanical systems) fabrication procedures. MEMS Materials and their mechanical properties. Mechanical Behavior of Microsystems. MEMS Packaging and thermal/mechanical stresses in MEMS packages. Reliability Issues in MEMS.

ME 426 DYNAMICS OF FLUIDS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 255, EM 335.
– A study of fluid dynamics, including incompressible and compressible inviscid fluids, and viscous flow theory and application.

ME 430 THERMAL SYSTEMS
F S 3 cr. LEC 3
PREREQUISITE: ME 321, ME 326, ME 341.
– Study of thermodynamics, heat transfer, and fluid mechanics analysis for applications to thermal systems.

ME 435 FLUID POWER TECHNOLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 250, EM 331 or EM 335, ME 360; or consent of instructor.
– An introduction to the fundamentals and application of fluid power in industry today. Coverage includes: flow and pressure relationships, fluid properties, heat, filtration, selection of components, electro-hydraulic and electro-pneumatic systems, controls, design of hydraulic and pneumatic circuits, and troubleshooting. Cross-listed with MET 430.

ME 445 MECHANICAL VIBRATIONS
F S 3 cr. LEC 3
PREREQUISITE: EM 252, EM 253, ME 315.
– Vibration problems of single and multiple degree of freedom systems. Introduction to vibration of continuous bodies. Analysis of free and forced vibration problems. Effects of damping.

ME 448 DESIGN FOR MANUFACTURING AND TOOLING
S 3 cr. LEC 2 LAB 1
PREREQUISITE: ME 255, MET 256 or ME 257, MET 314; or instructor approval.
COREQUISITE: I&ME 350.
– Overview of production systems and lean manufacturing fundamentals and principles. Introduction to design for assembly and design for manufacturing principles. Fundamentals of tool design, including tooling materials, workholding principles, jig and fixture design, assembly tool design, design of tools for inspection and gaging, and tool fabrication techniques. Practical lab experiences will enhance the course material. Cross-listed with MET 449.

ME 450 METALLIC MATERIALS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 250 or equivalent.
– Advanced consideration of the structure and behavior of metals.

ME 451 WELDING, MACHINING, AND FABRICATION PRACTICES
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: ME 255, CHBE 213 or ME 250; junior standing and instructor consent for non-ME/I&ME majors.
– Survey of welding and machine tool practices, including existing fabrication methods and their limitations.

ME 454 REFRIGERATION AND HVAC
F 3 cr. LEC 3
PREREQUISITE: ME 321 or ME 324.
– Refrigeration and heating, ventilating and air-conditioning (HVAC) for comfort and industrial applications. Psychrometrics, physiological factors in cooling; HVAC heat calculations; modern vapor compression, absorption, low temperature refrigeration cycles; air distribution and fan duct analysis, design/selection of HVAC equipment and control systems. Crosslisted with MET 454.

ME 458 AIRCRAFT STRUCTURES
On Demand 4 cr. LEC 3 RCT 1
PREREQUISITE: ME 341 or instructor approval.
– An introduction to the current practices in the design and analysis of aircraft metallic and composite structures. Overview of aircraft design, analysis, testing, and certification with examples. Static and dynamic load condition analysis.

ME 459 MECH. ENGINEERING CONSULTATION
F S alternate years, to be offered odd years 3 cr.
PREREQUISITE: Sophomore standing in ME/MET curriculum and consent of supervising faculty.
– Students enrolled in this class will provide technical support for selected ME/MET courses.

ME 460 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
– Directed research and study on an individual basis.

ME 467 MECHANICAL ENGINEERING CONSULTATION
On Demand 1-3 cr. IND Maximum 9 cr.
PREREQUISITE: Sophomore standing in ME/MET curriculum and consent of supervising faculty.
– An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ME 470 SEMINAR
On Demand 1-3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ME 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S, Su 1 - 2 cr.
COREQUISITE: ME 490.
– Classroom instruction associated with directed undergraduate research/creative activity projects.

ME 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F S, Su 1-6 cr.
COREQUISITE: ME 490.
– Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

ME 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
– Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting the discussion material.

ME 510 ADVANCED ENGINEERING ANALYSIS I
F 3 cr. LEC 3
PREREQUISITE: ME 315 or consent of instructor.
– Mathematical modeling of engineering systems, physical interpretation of ordinary and partial differential equations and methods of solution. This course is crosslisted with CHBE 522.
COURSE DESCRIPTIONS: ME 511 - MEDS 440

ME 511 ADVANCED ENGINEERING ANALYSIS II
S 3 cr. LEC 3
PREREQUISITE: ME 315 or consent of instructor.
- Analytical and numerical methods in engineering

ME 520 ADVANCED THERMODYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 321.
- First and second laws of thermodynamics, uniform flows and general open systems, real gases, mixtures, reacting processes, phase and chemical equilibrium.

ME 521 STATISTICAL THERMODYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 520.
- Kinetic theory of gases, distribution functions, thermodynamic properties in terms of partition functions, reactions, phase transition.

ME 525 CONDUCTION HEAT TRANSFER
F 3 cr. LEC 3
PREREQUISITE: ME 526.
- Advanced topics in conduction heat transfer with emphasis on analytical techniques including separation of variables, Duhamel's theorem, two-phase problems, and numerical techniques.

ME 526 CONVECTION HEAT TRANSFER
On Demand 3 cr. LEC 3
PREREQUISITE: ME 525.
- Advanced topics in convection heat transfer including both internal flows and external flows, introduction to the theory of laminar boundary layer stability, determination of turbulent transition, and analytical models of turbulent flows.

ME 527 RADIATION HEAT TRANSFER
On Demand 3 cr. LEC 3
PREREQUISITE: ME 526.
- Advanced topics in radiation heat transfer including detailed specification of radiative surface properties, development of energy equations for diffuse gray enclosures and nondiffuse nongray enclosures, development of energy equations for combined modes of heat transfer, introduction to Monte Carlo method.

ME 530 ADVANCED FLUID MECHANICS I
On Demand 3 cr. LEC 3
PREREQUISITE: EM 335 or CHBE 322.
COREQUISITE: EM 525 or consent of instructor.
- Review of conservation equations, laminar and turbulent internal flows, potential flows, and Stokes flow.

ME 531 ADVANCED FLUID MECHANICS II
On Demand 3 cr. LEC 3
PREREQUISITE: EM 335 or CHBE 322.
COREQUISITE: EM 525.
- Laminar boundary layer and free shear flows, internal and external compressible flows.

ME 532 TURBULENCE
On Demand 3 cr. LEC 3
PREREQUISITE: ME 531.
- Modern turbulence theory, turbulence modeling.

ME 533 TRANSPORT PHENOMENA
On Demand LEC 3
PREREQUISITE: ME 531.
- Comprehensive treatment of mass, momentum, and energy transport. This course is crosslisted with ChE 530.

ME 534 VISCOUS FLUID DYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: EM 335.
- Cross-listed. See CHBE 535 for description.

ME 535 APPLIED FLUIDS & THERMODYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 521.
- Theory, analysis and performance characteristics of propulsion and advanced energy conversion systems.

ME 536 COMPUTATIONAL FLUID MECHANICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 551.
- Numerical solutions of fluid flows, discretization methods, solution algorithms, aspects of turbulent flows.

ME 551 PHYSICAL ACOUSTICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 510 or equivalent, ME 530 or EM 525.

ME 540 ADVANCED MECHANICAL VIBRATIONS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 445.
- Advanced topics in mechanical vibrations. Multidegree of freedom systems, continuous systems, generalized coordinates. Introduction to non-linear vibrations.

ME 541 THEORY OF MAGNETIC RESONANCE IMAGING I
F 3 cr. LEC 3
PREREQUISITE: Graduate standing, or consent of instructor.
- Advanced topics in NMR phenomena including relaxation, diffusion, chemical shift, and magnetic susceptibility, as well as experimental aspects including phase cycling, magnetic field gradients, rf coil, tuning and matching and pulse sequence development will be covered.

ME 550 FAILURE OF MATERIALS
Odd years, S 3 cr. LEC 3
PREREQUISITE: One of the following: CHBE 463, EM 415, ME 450.
- Cross-listed. See CHBE 550 for description.

ME 551 ADVANCED COMPOSITE MATERIALS
Even years, S 3 cr. LEC 3
PREREQUISITE: CHBE 463.
- Cross-listed. See CHBE 551 for description.

ME 555 SMART STRUCTURES
On Demand 3 cr. LEC 3
PREREQUISITE: ME 315 and ME 342 and ME 445, or equivalent.
- Analysis and design of intelligent structures for aerospace, mechanical, and civil applications. Topics include piezoelectricity, shape memory effects, magnetostrictive, and biomimicking.

ME 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ME 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. This course can be used toward fulfilling the requirements for the Master of Science in Mechanical Engineering for non-thesis option students.

ME 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or on a trial basis to determine acceptability and demand before requesting a regular course number.

ME 589 GRADUATE CONSULTATION
F, S, Su 1 - 3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ME 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND May be repeated.
PREREQUISITE: Master’s standing.

ME 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

MEDS
Medical Science
Department of Medical Science/WWAMI
(406) 994-4411

MEDS 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or on a trial basis to determine acceptability and demand before requesting a regular course number.

MEDS 440 INTRODUCTION TO DENTISTRY
S 1 cr. LEC 1 cr.
PREREQUISITE: CHMY 141 and CHMY 143; BIOL 213 and BIOL 214; at least junior standing, GPA >3.0 and consent of instructor.
- This course is ideal for students who want to confirm an interest in a career in dentistry. An overview of tooth anatomy, development and vocabulary will position students to better understand the various specialties presented at the clinics of community dentists.

MEDS 440 40 hr CLINICAL OBSERVATION
F, S 2 cr. LAB 2 cr.
PREREQUISITE: CHMY 141 and CHMY 143; BIOL 213 and BIOL 214; at least junior standing, GPA >3.0 and consent of instructor.
- This shadowing experience will provide students with the opportunity to observe providers in a clinical setting and position them to meet, in part, the requirements for application to health professional school.
MEDS 462 US HEALTHCARE SYSTEMS
F, S 3 cr. LEC 3
PREREQUISITE: Junior or higher standing.
A detailed overview of the US healthcare systems, providing students with an understanding of the history and current status regarding the US healthcare systems, industry, economics and healthcare policy. Factors playing a role in the escalating cost of healthcare will be identified, as will the performance indicators of health outcomes, with comparisons between the US and other countries.

MEDS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MEDS 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: WWAMI medical student or consent of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Yearly conference dealing with topics related to Montana’s colorful medical history.

MEDS 502 SPANISH FOR HEALTHCARE PROFESSIONALS
S 1 cr. LEC 1
PREREQUISITE: WWAMI medical student or consent of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Learn basic and intermediate Spanish in a medical setting; the vocabulary needed to perform a review of systems and physical exams; and how to feel less uncomfortable with a patient who only speaks Spanish.

MEDS 510 MICROSCOPIC ANATOMY (HISTOLOGY)
F 3 cr. LEC 2 LAB 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Microscopic study of the structure and function of human cells, tissues and organs as a basis for understanding the alterations in structure and function seen in human disease.

MEDS 511 ANATOMY & EMBRYOLOGY
F 4 cr. LEC 2 LAB 2
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Dissection study of the anatomy of the human thorax, abdomen, pelvis and perineum. The course integrates a detailed study of adult anatomical features, innervations, blood supplies, and lymphatics with basic embryonic development, both normal and abnormal.

MEDS 512 MECHANISMS IN CELL PHYSIOLOGY
F 4 cr. LEC 4
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Physiological mechanisms in excitable tissues, transporting epithelium and other organ systems; excitation and conduction, junctional, transport signal transduction, sensory reception and epithelial transport. Integration of physiological mechanisms within and between organ systems.

MEDS 513 INTRODUCTION TO CLINICAL MEDICINE I
F 2 cr. LEC 1 LAB 1
PREREQUISITE: WWAMI medical student.
Communication skills and interview techniques to form the basis for the doctor-patient relationship and for the skill of communicating with patients.

MEDS 514 BIOCHEMISTRY AND MOLECULAR BIOLOGY
F 5 cr. LEC 4 RCT 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Coordinated course covering classical molecular and cellular biochemistry and molecular genetics. Metabolic interrelationships as they occur in the individual are stressed and related to disturbances in disease states.

MEDS 516 CLINICAL PRECEPTORSHIP
F 1 cr. LAB
PREREQUISITE: WWAMI medical student.
Opportunity to gain personal experience with primary care medical practice by observation of selected physicians in the Bozeman area.

MEDS 521 INFECTIOUS DISEASES AND MICROBIOLOGY
S 6 cr. LEC 4 RCT 1 LAB 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Pathogenesis, susceptibility and resistance to infection. Microbiology, epidemiology, clinical manifestations and control of representative bacterial, fungal, parasitic and viral infections. Principles of chemotherapy, sterilization, principles of asepsis, nosocomial and iatrogenic infections and their prevention.

MEDS 522 INTRODUCTION TO CLINICAL MEDICINE II
S 2 cr. LEC 1 LAB 1
PREREQUISITE: WWAMI medical student.
Continuation of communication skills. The medical history is introduced and instruction in data collection begins. Screening physical examination, further experience and instruction in the medical history, the problem-oriented medical record.

MEDS 523 IMMUNOLOGY & HUMAN DISEASE
S 2 cr. LEC 1 LAB 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Mechanisms of humoral and cell mediated immunity. Immunological mechanisms of cell and tissue injury. Immune mechanisms in human resistance to disease and in immunological diseases.

MEDS 531 HEAD & NECK ANATOMY
S 4 cr. LEC 2 LAB 2
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Gross anatomy of head and neck. Relation of head and neck anatomy to disease of the nasal passages, throat, eyes and oral cavity. Relation to physical examination (including skull, pharynx, and larynx).

MEDS 532 NERVOUS SYSTEM
S 5 cr. LEC 4 LAB 2
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Integrated course covering classical molecular and cellular biochemistry and molecular genetics. Metabolic interrelationships as they occur in the individual are stressed and related to disturbances in disease states.

MEDS 533 SYSTEMS OF HUMAN BEHAVIOR I
F 3 cr. LEC 3
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Overview of conceptual systems and models of behavior, normality and abnormality, environment and social learning, conditioning, learning in the autonomic nervous system, catecholamines and behavior, illness behavior, feelings, emotion and cognition, physician-patient interaction and disease and techniques of behavior change.

MEDS 540 CLINICAL PRACTICUM
F, S, Su 1 cr. LAB 1
PREREQUISITE: Graduate level standing and acceptance into Post-Bacc Pre-Med program.
A practical course for students going into the medical field to work in then hospital departments while observing and learning about the services provided by different health care professionals at various stages of patient care.

MEDS 551 MEDICAL MUSCULOSKELETAL ANATOMY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Dissection study of the anatomy of the extremities and back including correlations with clinical material such as diseases, disorders, trauma, imaging methods, and physical examinations.

MEDS 560 RURAL HEALTH CARE DELIVERY
F 1 cr. LEC 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
Provide historical and current information about the health care industry, health care delivery systems and economics of health care and health care policy; with emphasis on rural health care. The purpose is to encourage WWAMI students to consider practicing in rural communities and/or providing health care to underserved populations. The infrastructure of the Montana health Care Delivery system will be presented in detail.

MEDS 562 US HEALTHCARE SYSTEMS
F 3 cr. LEC 3
A detailed overview of the US healthcare systems, providing students with an understanding of the history and current status regarding the US healthcare systems, industry, economics and healthcare policy. Factors playing a role in the escalating cost of healthcare will be identified, as will the performance indicators of health outcomes, with comparisons between the US and other countries.
MEDS 570 INDIVIDUAL PROBLEMS
On Demand 1 - 3 cr. IND Minimum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of the Director of the WWAMI Medical Program and Dean of Graduate Studies.
- Directed research and study on an individual basis.

MEDS 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MEDS 591 MEDICAL INFORMATION & DECISION MAKING
F 1 cr. LEC 1
PREREQUISITE: WWAMI medical student or consent of Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
- This course is designed to provide an introduction to medical information. Evidence-Based Medicine and use of medical information in patient care. This will include an introduction to methods for identifying and retrieving high quality, relevant evidence electronically, using the Internet and other resources. The course will also present methods to evaluate the quality of primary research studies, or preventive interventions. The course will also describe the challenges of applying medical information to decision making. The course will utilize lectures, discussion sessions and computer lab sessions.

MET Mechanical Engineering Technology
Department of Mechanical & Industrial Engineering
(406) 994-2203

MET 101 INTRODUCTION TO MECHANICAL ENGINEERING TECHNOLOGY
F 1 cr. LEC 1
- A seminar course surveying the mechanical engineering technology profession. Topics include an overview of career opportunities, problem solving processes, an introduction to the basic engineering design process, professionalism, professional registration, and ethics.

MET 119 TECHNICAL GRAPHICS COMMUNICATION
S 2 cr. LAB 2
PREREQUISITE: MET majors or consent of instructor.
- Communication through engineering graphics. The course topics include drawing utilizing sketching, 2D CAD and 3D solid modeling software, drawing standards, fits, and tolerances.

MET 201 MECHANICAL ENGINEERING TECHNOLOGY COMPUTER APPLICATIONS
On Demand 1 cr. LAB 1
COREQUISITE: M 176 – Computer methodology, and use of various computer software packages in mechanical engineering technology applications.

MET 211 GRAPHICS FOR DESIGN
S 3 cr. REC 2 LAB 1
PREREQUISITE: MET 119
- Course emphasizes the design process as it pertains to manufacturability, and the role of graphics to communicate design intent to production. Using 3D software, design method, G.D&T, and data management techniques, students will create drawings that communicate their designs.

MET 251 MATERIALS SCIENCE LAB
F 1 cr. LAB 1
PREREQUISITE: MET majors only.
COREQUISITE: CHBE 213 or equivalent, MET 201.
- Specific hands-on experience with material properties experiments that parallel the lecture portion of CHBE 213. Students will analyze mechanical and physical properties of various materials. Students will use various testing apparatus and will conduct both destructive and non-destructive evaluations (NDE).

MET 256 MANUFACTURING PROCESS LABORATORY
S 1 cr. LAB 1
PREREQUISITE: MET majors only; non-majors require instructor approval.
COREQUISITE: ME 255.
- Hands-on applications of the fundamentals of basic manufacturing processes.

MET 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

MET 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MET 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MET 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed research and study on an individual basis.

MET 314 MACHINING TECHNOLOGY AND INDUSTRIAL SAFETY
F 3 cr. LEC 1 LAB 2
PREREQUISITE: MET 211 or equivalent, or TE 230 for non-majors, or instructor approval.
COREQUISITE: MET 256.
- Introduction to modern machining technology and the key principles of industrial safety, material properties related to machining practices, design, and specifications. Semiprecision and precision layout are covered. An introduction to computer numerically controlled (CNC) technology and operations is included. Specific hands-on experiences included in laboratory.

MET 315 WELDING TECHNOLOGY
S 3 cr. LEC 1 LAB 2
PREREQUISITE: MET 119 or equivalent, or TE 230 for non-majors, or instructor approval.
COREQUISITE: MET 256.
- Course emphasizes the use of computer aided engineering tools in the design process: understanding proper use and interpretation, gaining experience in how to use them through exercises and projects, modeling for analysis, rapid prototyping, and computer aided manufacturing techniques.

MET 325 HEAT TRANSFER FOR ENGINEERING TECHNOLOGY
S 3 cr. LEC 3
PREREQUISITE: ME 324 or equivalent.
COREQUISITE: EM 351 or equivalent.
- Study of the basic mechanisms of heat transfer and its applications. Introduction to equipment that utilize these mechanisms.

MET 340 MECHANISMS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: M 166 or equivalent.
COREQUISITE: EM 215, MET 291.
- Introduction to mechanisms and machine elements used in the design and synthesis of mechanical devices.

MET 345 MACHINE DESIGN
S 4 cr. LEC 3 LAB 1
PREREQUISITE: MET 340 or equivalent.
- Application of mechanisms fundamentals, strength of materials, material selection, and tolerances and fits to the design of machines and machine systems. Specific hands-on experiences included in laboratory.

MET 401 MECHANICAL ENGINEERING TECHNOLOGY SENIOR SEMINAR
F 1 cr. SEM 1
COREQUISITE: MET 456.
- A seminar course focusing on career path development. Students will meet with current industry professionals to discuss specific careers, as well as meet with freshman students to share undergraduate experiences.

MET 417 ADVANCED WELDING AND MACHINE TOOL APPLICATIONS
On Demand 3 cr. LEC 1 LAB 2
PREREQUISITE: MET 314 and MET 315.
- Advanced applications of welding and machine tool technology. Computer numerical control, multi-axis machining setup, gas tungsten arc welding, and gas metal arc welding.
COURSE DESCRIPTIONS: MET 420 - MGMT 314

MET 420 CNC & CAM TECHNOLOGY
S 3 cr. LEC 1 LAB 2
PREREQUISITE: MET 314 or instructor approval.
- Application and optimization of computer numerical control (CNC) and computer-aided manufacturing (CAM) technology fundamentals as related to turning, milling, and plasma cutting operations. Development of toolpaths and machine code (G&I) from associated CAD models is emphasized. Specific handson experiences included in laboratory.

MET 430 FLUID POWER TECHNOLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 250, EM 331 or EM 335, ME 306; or consent of instructor.
- An introduction to the fundamentals and application of fluid power in industry today. Coverage includes: flow and pressure relationships, fluid properties, heat, filtration, selection of components, electrohydraulic and electro-pneumatic systems, controls, design of hydraulic and pneumatic circuits, and troubleshooting. Crosslisted with ME 455.

MET 449 DESIGN FOR MANUFACTURING AND TOOLING
S 3 cr. LEC 2 LAB 1
PREREQUISITE: ME 255, MET 256 or ME 257, MET 314; or instructor approval.
COREQUISITE: I&ME 350.
- Overview of production systems and lean manufacturing fundamentals and principles. Introduction to design for assembly and design for manufacturing principles. Fundamentals of tool design, including tooling materials, workholding principles, jig design, fixture design, assembly tool design, design of tools for inspection and gaging, and tool fabrication techniques. Practical lab experiences will enhance the course material. Crosslisted with ME 448.

MET 454 REFRIGERATION AND HVAC
F 3 cr. LEC 3
PREREQUISITE: ME 321 or ME 324.
- Refrigeration and heating, ventilating and air-conditioning (HVAC) for comfort and industrial applications. Psychrometrics, physiological factors in cooling, HVAC load calculations; modern vapor compression, absorption, low temperature refrigeration cycles; air distribution and fan-duct analysis, design/selection of HVAC equipment and control systems. Crosslisted with ME 454.

MET 455 HEATING, VENTILATION, AND AIR CONDITIONING LAB
On Demand 1 CR. LAB 1
PREREQUISITE: ME 360, MET majors only; nonmajors require instructor approval.
COREQUISITE: ME 454.
- Laboratory experiences enforcing topics covered in ME 454.

MET 456 MECHANICAL ENGINEERING TECHNOLOGY CAPSTONE EXPERIENCE I
F 3 cr. RCT 2 LAB 1.
PREREQUISITE: MET 303, MET 314, MET 315, MET 345, for MET majors only.
COREQUISITE: ME 360, ENGR 310, MET 401, I&ME 325.
- First course in senior capstone sequence. Students, under the guidance of faculty supervisors, design, plan, and schedule a product for fabrication/manufacture. Lectures will address fundamental principles of planning, estimating, budgeting, scheduling, and controlling engineering projects, plus review of CAD software.

MET 457R MECHANICAL ENGINEERING TECHNOLOGY CAPSTONE EXPERIENCE II
S 3 cr. RCT 1 LAB 2.
PREREQUISITE: MET 456, for MET majors only.
- Second course in senior capstone sequence. Manufacturing, scheduling, and construction of the project initiated.

MET 465 BUILDING SYSTEMS
F 3 cr. LEC 3
PREREQUISITE: PHYS 206 and junior standing.
- A survey of the systems and equipment for water supply, sanitation, fire protection, electrical service, heating and air conditioning of buildings.

MET 466 THERMAL PROCESSES LAB
S 1 CR. LAB 1
COREQUISITE: ME/MET 454, ME 325.
- Laboratory experiences covering topics in heat transfer, thermodynamics, and HVAC areas in support of MET 325, ME 324, and ME/MET 454.

MET 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

MET 476 INTERNSHIP
On Demand 1 - 12 cr. IND
PREREQUISITE: junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MET 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MET 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 CR. RCT May be repeated. Max 4 cr.
COREQUISITE: MET 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MET 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

MGMT Management
College of Business
(406) 994-4423

MGMT 103 SUPERVISION AND LEADERSHIP
On Demand 3 CR. LEC 2 RCT 1
- Management principles as they apply to first-line supervision and to the function of leadership and motivation in any organization. This course may not substitute for any required business course.

MGMT 204 INTRODUCTION TO BUSINESS
F, S 3 cr. LEC 3
- Explores the application of business principles and functions including forms of business ownership, management and leadership, marketing, finance, accounting, economics, and social responsibility. Intended for students transferring into the College of Business and non-majors interested in business.

MGMT 231S BUSINESS RESEARCH METHODS
F, S 5 cr. LEC 5
PREREQUISITE: STAT 216, and BUS 211 as pre- or corequisite.
- Introduction to the methods of knowledge and knowing regarding business activities and business organizations. Focused on disciplined inquiry using statistics and quantitative analysis; providing the intellectual foundation for further exploration of the business discipline.

MGMT 245D CULTURAL DIMENSIONS OF INTERNATIONAL BUSINESS
On Demand 3 CR. RCT 3
- The course will help students recognize the importance cultural differences play in conducting international business transactions. They will analyze the nature and impact of some common problems resulting from not understanding how to deal appropriately with cultural differences.

MGMT 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of Associate Dean.
- Directed research and study on an individual basis. Not to be used as a substitute for a required course.

MGMT 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-6 cr. RCT May be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MGMT 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

MGMT 314 BUSINESS WEB SITE DESIGN
F 3 cr. LEC 3
- Students acquire skills necessary to create and implement effective business web sites. Best practices in web site design, HTML, CSS, host site selection and introductory programming are covered. Project-based course includes creating web sites for businesses or non-profit organizations.
MGMT 315 NETWORKS AND TELECOMMUNICATIONS
S 3 cr. LEC 3
PREREQUISITE: BUS 311. For business majors: Formal admission to the College of Business.
- Students acquire skills necessary to understand the role that telecommunications play in organizations, how networks facilitate competitive advantage, and how to integrate technology into a corporate culture. Students create business cases for value-adding networks and telecommunications systems.

MGMT 356 MANAGERIAL ANALYSIS AND ACTION I
S 3 cr. LEC 3
PREREQUISITE: BUS 301 or permission of the instructor. For business majors: Formal admission to the College of Business.
- Students develop skills necessary to understand the challenges faced by today's managers. This course will deal with such operations/first-line supervision issues as human resources, team building, leadership, ethics, technology, and law.

MGMT 400 SEMINAR
On Demand 1-3 cr. SEM 1-3 Maximum 6 cr.
PREREQUISITE: Junior Standing, BUS 301. For business majors: Formal admission to the College of Business.
- Topics offered at the upper-division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MGMT 415 TOPICS IN BUSINESS ORGANIZATIONS
S 3 cr. LEC 3
PREREQUISITE: BUS 301 or permission of the instructor. For business majors: Formal admission to the College of Business.
- Theories, issues, and current topics related to the emergence and effectiveness of leaders, with focus on leadership behaviors and processes in business organizations. Emphasis placed on examination of how individual and organizational leadership capacity is developed.

MGMT 403 HUMAN RESOURCES MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: BUS 301. For business majors: Formal admission to the College of Business.
- The functions and tools used in procurement, development, compensation, integration, and maintenance of human resources and their impact on the effective attainment of organizational goals.

MGMT 406 NEGOTIATION AND DISPUTE RESOLUTION
F 3 cr. RCT 3
PREREQUISITE: BUS 301 or consent of instructor. For business majors: Formal admission to the College of Business.
- Introduction to negotiation theories and skills to help students practice and improve this essential area of business and personal competence. Taught primarily through discussion and in-class exercises that allow students to gain experience and confidence as negotiators.

MGMT 411 COMPUTER APPLICATIONS
On Demand 3 cr. LEC 3
PREREQUISITE: ACCT 325 or BUS 311. For business majors: Formal admission to the College of Business.
- Business applications for computers. Accounting inventory, planning, and financial analysis are among the topics covered. End-user programming and prototyping will be emphasized.

MGMT 412 DESIGN OF E-COMMERCE SITES
S 3 cr. LEC 3
PREREQUISITE: BUS 311. For business majors: Formal admission to the College of Business.
- Study of methods and tools a system analyst uses in development of e-commerce websites including best practices and performance metrics. Design done on networked microcomputers. Final solutions presented orally, in writing, and on the web.

MGMT 413 CONTEMPORARY SUPPORT SYSTEMS
F 3 cr. LEC 3
PREREQUISITE: BUS 311. For business majors: Formal admission to the College of Business.
- Integrates theory, application and development of information systems to support managerial decision making in semi-structured and unstructured situations. Considers spreadsheet, expert system, and/or web-based software applications to support decision making. Uses cases and project-based assignments.

MGMT 414 DATA-DRIVEN BUSINESS WEB SERVICES
S 3 cr. LEC 3
PREREQUISITE: MGMT 314. For business majors: Formal admission to the College of Business.
- This course prepares students to design and create data-driven, web-based applications commonly found in electronic-commerce applications by combining database design and use with interactive web site creation.

MGMT 415 MANAGEMENT OF INFORMATION TECHNOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: MGMT 411, MGMT 412, and BUS 301. For business majors: Formal admission to the College of Business.
- Course integrates content from the courses in the Management of Information Technology minor. The course will unite the technical knowledge and skills acquired by students with behavioral knowledge and skills necessary to effectively manage business applications of information technology.

MGMT 433 MANAGING QUALITY AND PRODUCTIVITY
On Demand 3 cr. LEC 3
PREREQUISITE: BUS 351. For business majors: Formal admission to the College of Business.
- An in-depth study of the theoretical foundations of quality management along with applications of the quantitative and qualitative tools used in improving organizational quality and productivity. Coverage will include the principles promoted by major quality experts and a review of the requirements for corporate quality certification.

MGMT 460 BUSINESS TUTORIAL
F 3 cr. LEC 1 SEM 2
PREREQUISITE: By application. For business majors: Formal admission to the College of Business.
- Provides selected upper-division students an opportunity to develop leadership and mentoring skills through involvement with the BUS 10HUS First Year Seminar course. Student Associates work closely with faculty to enhance the academic, cultural, and social experiences of students in the seminar course.

MGMT 461 SMALL BUSINESS MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: ACCT 202, BUS 301, BUS 341, BUS 351, and Senior standing. For business majors: Formal admission to the College of Business.
- Focus on the process of starting and managing a small business, with an emphasis on businesses owned and operated by one individual or family. Topics covered will include typical funding sources and all phases of small business management from startup to exit.

MGMT 462 ENTREPRENEURSHIP
F 3 cr. RCT 3
PREREQUISITE: ACCT 202, BUS 301, BUS 341, BUS 351 and Senior standing. For business majors: Formal admission to the College of Business.
- Evaluation of small business entrepreneurial opportunities, startup problems, tax aspects, legal forms, forecasts, feasibility studies, venture financing, and promotion. Students develop own business plans.

MGMT 463 THE ENTREPRENEURIAL EXPERIENCE
F 3 cr. LEC 3
PREREQUISITE: ACCT 202, BUS 301, BUS 341, BUS 351 and Senior standing. For business majors: Formal admission to the College of Business.
- Non-Business majors may register with permission of instructor.
- This course is designed to give students real-world experience in projects that will assist area entrepreneurs. Students will work with these new ventures to solve their management, marketing, finance and other business problems. The content of the problems will depend on the situation of the client businesses.

MGMT 464 INTERNATIONAL MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: MKTG 212, BUS 301 and senior standing. For business majors: Formal admission to the College of Business.
- Description of the challenges which the global context poses to business managers. Examination of the elements of international environments and illustration of their effects on management practices and how management deals with such forces.

MGMT 465 INTERNATIONAL PRACTICUM
On Demand 1-12 cr.
PREREQUISITE: By application. For business majors: Formal admission to the College of Business.
- Intensive study of culture, customs, politics, history, and business practices of another country. Program culminates with extended visit to location for lectures, and other relevant activities.
MGMT 466 MANAGERIAL ANALYSIS AND ACTION II
F 3 cr. LEC 3
PREREQUISITE: BUS 311, BUS 331, BUS 351, and MGMT 366. For business majors: Formal admission to the College of Business.
- Part of an integrated, two-course sequence which will build knowledge and skills appropriate for the challenges faced by managers. This course will deal with issues faced by middle managers at the functional level of the organization.

MGMT 468 BUSINESS, ETHICS AND SOCIETY
On Demand 3 cr. LEC 3
PREREQUISITE: Senior standing or permission of the instructor. For business majors: Formal admission to the College of Business.
- The relationship between business and society in the social, ethical and natural environment. A focus on issues of business responsibility and ethics with emphasis on practical business problems of leadership and accountability.

MGMT 469 COMMUNITY AND SOCIAL ENTREPRENEURSHIP
S 3 cr. RCT 3
PREREQUISITE: Senior standing or permission of the instructor. For business majors: Formal admission to the College of Business.
- Engages students in the application of entrepreneurial thinking and business strategies to address community and societal issues. Students develop and strengthen their understanding of business principles, leadership skills and management capacities as related to effective nonprofit management.

MGMT 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of Associate Dean. For business majors: Formal admission to the College of Business.
- Directed research and study on an individual basis. Not to be used as a substitute for a required course.

MGMT 472 LEGAL AND SOCIAL FRAMEWORK OF BUSINESS REGULATION
On Demand 3 cr. LEC 3.
PREREQUISITE: BUS 361 or consent of instructor. For business majors: Formal admission to the College of Business.
- Study of legal and social basis for government regulation of business. Topics include environmental regulation, employment and labor law, securities regulation, antitrust, and international trade. Students research and make class presentation on regulatory issues.

MGMT 473 MODERN MANAGEMENT OF WESTERN RESOURCES
On Demand 3 cr. LEC 3.
PREREQUISITE: BUS 361 or consent of instructor. For business majors: Formal admission to the College of Business.
- Study of the decision making process of managers of large tracts of Western land. Real world cases will be used to explore the variables impacting their decision such as: production versus subdivisions, conservation easements, inheritance taxes and wildlife based business plans.

MGMT 475R MANAGEMENT PRACTICUM
F, S 3 cr. RCT 3
PREREQUISITE: Senior standing or permission of instructor. For business majors: Formal admission to the College of Business.
- Teams do major project such as substantive community service project, research paper, small business experience case, business plan, or strategic analysis. Practical experience with project and/or team management where performance is measured by delivered product. No credit for previous experience.

MGMT 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, Formal Admission to the College of Business, and consent of the instructor.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MGMT 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering. For business majors: Formal admission to the College of Business.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MGMT 489R UNDERGRADUATE RESEARCH/CREATIVITY INSTRUCTION
On Demand 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MGMT 490. For business majors: Formal admission to the College of Business.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MGMT 490R UNDERGRADUATE RESEARCH/CREATIVITY
On Demand 1 - 12 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

MGMT 565 THE STRATEGIC MANAGEMENT OF TECHNOLOGICAL INNOVATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing in Business, Engineering or Agriculture or consent of instructor.
- To prepare students to strategically manage the innovation of technology by bringing together students from several disciplines and have them work together to integrate strategy and technology. The students will be given cases and other problems throughout the semester that require them to use and integrate these concepts.

MGMT 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr
PREREQUISITE: Graduation standing consent of instructor, approval of Associate Dean and Dean of Graduate Studies.
- Directed research and study on an individual basis.

MGMT 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper-division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MKTG Marketing
College of Business
(406) 994-4423

MKTG 211 SALES
On Demand 3 cr. LEC 3
- Principles of sales for non-business majors.
Focus is on selling in retail and service environments. This course may not substitute for any required business course.

MKTG 242D INTRODUCTION TO INTERNATIONAL BUSINESS
F, S 3 cr. LEC 3
- Introduces topics of globalization: differences in political economies, culture, legal systems, and ethical standards; international trade laws; issues in foreign direct investment trade alliances; global economic, financial, marketing, and human resource challenges; and organizational and strategic issues for international business.

MKTG 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
- Principles of sales for non-business majors.
Focus is on selling in retail and service environments. This course may not substitute for any required business course.

MKTG 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MKTG 299R UNDERGRADUATE RESEARCH/CREATIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MKTG 299R UNDERGRADUATE RESEARCH/CREATIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.
COURSE DESCRIPTIONS: MKTG 342R - ML 490R

MKTG 342R MARKET RESEARCH
F S 3 cr. LEC 3
PREREQUISITE: STAT 217 or MGMT 231; and BUS 341. For business majors: Formal admission to the College of Business.
- The application of scientific research methods to marketing problems. The emphasis is on survey design and data analysis for market segmentation studies.

MKTG 343 CONSUMER BEHAVIOR
F S 3 cr. LEC 3
PREREQUISITE: BUS 341. For business majors: Formal admission to the College of Business.
- Application of behavioral sciences to understanding human behavior in the market place. Emphasis on culture and subculture, social class, reference group, family, attitudes, perception, motivation, personality, and learning theory on consumer and marketing management decisions.

MKTG 400 SEMINAR
On Demand 1 cr. SEM 1
PREREQUISITE: Junior standing and as determined for each offering. For business majors: Formal admission to the College of Business.
- Topics offered at the upper-division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MKTG 441 INTERNATIONAL MARKETING
S 3 cr. LEC 3
PREREQUISITE: BUS 341. For business majors: Formal admission to the College of Business.
- International economic, financial, cultural, political, and legal environment; marketing research, market segmentation and positioning issues analyzed primarily from a global perspective. Global strategies and organizational designs described and analyzed as related to foreign market entry, sourcing, product development, pricing, promotion, logistics, and distribution, and export/import management.

MKTG 445 PROMOTION
F 3 cr. LEC 3
PREREQUISITE: Senior standing, BUS 341. For business majors: Formal admission to the College of Business.
- Explores the use of advertising, sales promotion, Internet, electronic media, and personal selling as methods for promoting goods and services. Taught from the perspective of the marketing manager, with emphasis on the theory, strategy, and tactics of promotion.

MKTG 446 RETAIL MANAGEMENT
F 3 cr. LEC 3
PREREQUISITE: Bus 341. For business majors: Formal admission to the College of Business.
- The application of marketing theory to retail management problems. Topics include structure of the retail industry and nature of competition; merchandising planning, budgeting and control; and pricing and location theory.

MKTG 447 PROFESSIONAL SELLING
F 3 cr. LEC 3
PREREQUISITE: BUS 341. For business majors: Formal admission to the College of Business.
- Personal selling techniques applied to outside sales. Sales organization including structure, training, motivation, and compensation. Evaluation of sales goals and individual performance.

MKTG 448 MARKETING FOR ENTREPRENEURS
F 3 cr. LEC 3
PREREQUISITE: BUS 341. For business majors: Formal admission to the College of Business.
- This course examines the unique marketing challenges faced by startup organizations. New firms are often resource constrained. As a result, penetrating markets dominated by larger competitors with new and innovative products and services requires different marketing tactics. Markets are undefined and establishing primary demand for a new product category may be required.

MKTG 449 MARKETING MANAGEMENT
F S 3 cr. LEC 3
PREREQUISITE: Senior standing, MKTG 342 and approval of instructor. For business majors: Formal admission to the College of Business.
- Student teams will apply their expertise in marketing to practical business problems encountered by firms in the community and surrounding area. The problems have their basis in any of the marketing mix elements such as identifying market potential, developing a promotional campaign, or development of a new product.

MKTG 450 PROMOTION
F S 3 cr. LEC 3
PREREQUISITE: BUS 341. For business majors: Formal admission to the College of Business.
- The content of previous marketing courses is applied using the case method to solve marketing problems. Emphasis is on marketing strategy and implementation.

MKTG 470 INDEPENDENT STUDY
On Demand 1 - 6 cr. IND Maximum 12 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of Associate Dean. For business majors: Formal admission to the College of Business.
- Directed research and study on an individual basis. Not to be used as a substitute for a required course.

MKTG 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: For business majors: Formal admission to the College of Business and consent of instructor.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MKTG 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering. For business majors: Formal admission to the College of Business.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MKTG 489 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
On Demand 1 - 2 cr. RCT 3
PREREQUISITE: MKTG 490.
- Directed undergraduate research creativity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

ML Modern Languages
Department of Modern Languages & Literatures
(406) 994-4448

ML 100H INTRODUCTION TO ISSUES IN INTERNATIONAL STUDIES
S 3 cr. RCT 3 cr.
- Introduces students to a range of issues in the field of international studies through an interdisciplinary approach to world regions. Through lectures, discussion, and project-based learning, students gain knowledge of key cultural, historical, and economic concepts in an international context. Students develop an understanding of national, regional, and area studies models for learning about global issues.

ML 290R UNDERGRADUATE RESEARCH
F S 1 - 6 cr. IND
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ML 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ML 344 INSTRUCTIONAL PERSPECTIVES
F, S Su On Demand 1 cr. RCT 1 Maximum 3 cr.
PREREQUISITE: FRCI 323 or FRCI 324; GRMN 330 or GRMN 331; SPNS 323 or SPNS 324.
- Students learn how various pedagogical approaches are realized through class discussion, observation, and practice under the direction of the faculty mentor.

ML 490R UNDERGRADUATE RESEARCH
F, S Su 1 - 8 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.
ML 491 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
= Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ML 492 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
= Directed research and study on an individual basis.

ML 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
= Directed research and study on an individual basis.

ML 580 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
= Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ML 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
= Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subdivided.

MSG
Military Science - Army ROTC
Department of Military Science
(406) 994-4044

MSG 101 INTRODUCTION TO MILITARY LIFESTYLES
F 2 cr. LEC 1 LAB 1
= An introduction to issues and competencies that are central to a commissioned officer’s responsibilities. These initial lessons establish a framework for understanding officership, leadership and Army values. The class also addresses “life skills” including fitness and time management. Laboratory component is required.

MSG 103 PROBLEM SOLVING AND LEADERSHIP MANAGEMENT SKILLS
S 2 cr. LEC 1 LAB 1
PREREQUISITE: Recommended MSG 101.
= Building on problem solving, communications and leadership. “Life skills” include problem solving, goal setting, interpersonal communication skills and assertiveness skills. Futher information about life in the Army. Laboratory component is required.

MSG 106 ARMY PHYSICAL FITNESS
F S 1 cr. LAB 1
= MSG 106 is designed to provide students a framework of fitness skills, planning and testing for a lifetime of health. The course consists of three Physical Training sessions per/week that include running, swimming, upper body and core development, sports, and team building exercises. This course may be repeated for credit.

MSG 200 LEADERSHIP MANAGEMENT AND LIFE SKILLS
F 2 cr. LEC 1 LAB 1
= Leadership training in understanding how to build teams, influence, communicate, decision making, creative problem solving, planning and organizing. Laboratory component is required which includes physical fitness training, and other outdoor skills.

MSG 201 ADVANCED LEADERSHIP CONCEPTS AND COMMUNICATION SKILLS
S 2 cr. LEC 1 LAB 1
= An advanced look at leadership principles and the application and practice of those principles. Laboratory component is required and includes the operation of military radios and telephones, and a continued emphasis on physical fitness training.

MSG 205 AMERICAN MILITARY HISTORY
F S 3 cr. LEC 2 LAB 1
= The study of the evolution of the American Military, with concentration on the evolution of the American military within the context of national historical development, specifically with regard to industrialization, national security, and the United States’ evolving international role and policies. Study of significant events throughout our history that includes a field trip to a historical battlefield.

MSG 204 LEADERS TRAINING COURSE
Su 3 cr. LAB 3
PREREQUISITE: Consent of Professor of Military Science – Practical application of basic knowledge required of an army officer. Subject matter parallels 100 and 200 level courses. Satisifies prerequisites for advanced course in lieu of the basic course.

MSG 270 INDEPENDENT STUDY
On demand 1-5 cr. Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
= Directed research and study on an individual basis.

MSG 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
= Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MSG 301 SMALL UNIT TACTICS AND METHODS OF INSTRUCTION
F 3 cr. LEC 2 LAB 1
PREREQUISITE: MSG 101, MSG 105, MSG 201, MSG 200, or MSG 204.
= The study, practice and evaluation of adaptive leadership skills. Small unit tactical operations are used to develop self awareness and critical thinking. Preparation for Leader Development and Assessment Course. A lab component including a field training exercise is required.

MSG 302 PREPARATION FOR LEADER DEVELOPMENT AND ASSESSMENT COURSE
S 3 cr. LEC 2 LAB 1
PREREQUISITE: MSG 301.
= Situational leadership challenges are used to build awareness and skills in leading small units. Skills in decision making, persuading and motivating team members are explored, evaluated and developed. Preparation for Leader Development and Assessment Course. A lab component including a field training exercise is required.

MSG 303 MILITARY SCIENCE LEADER DEVELOPMENT AND COURSE
Su 5 cr. LAB 3
PREREQUISITE: MSG 302. Enrollment restricted to successful completion of MSG 301 and MSG 302 and the Professor of Military Science's approval. (2) Practical exercise in tactical, technical, and administrative duties common to all branches of the Army. Development of leadership and the ability to function effectively in small unit operations.

MSG 401 SENIOR SEMINAR I
F 3 cr. LEC 2 LAB 1
PREREQUISITE: MSG 401, approval of instructor.
= Study of military justice system and international military law. Study of Army organization and administrative organizations. Exploration of the dynamics of leading in complex situations. Preparation for transition from college student to commissioned officer in the Army. A lab component is required.

MSG 402 SENIOR SEMINAR II
S 3 cr. LEC 2 LAB 1
PREREQUISITE: MSG 401, approval of instructor.
= Study of military justice system and international military law. Study of Army organization and administrative organizations. Exploration of the dynamics of leading in complex situations. Preparation for transition from college student to commissioned officer in the Army. A lab component is required.

MSG 479 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
= Directed research and study on an individual basis.

MSG 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
= Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MSG 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MSG 490.
= Classroom instruction associated with directed undergraduate research/creative activity projects.

MSG 499R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. END May be repeated. Max 12 cr.
= Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.
MSSE
Master Of Science Education
Division of Graduate Education
(406) 994-5679

MSSE 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Bachelor degree, consent of instructor, and admission to MSSE program.
- Directed research and study on an individual topic.

MSSE 380 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MTA
Media & Theatre Arts
The School of Film and Photography
(406) 994-2484

MTA 101A FILM IN AMERICA
F 3 cr. LEC 1 LAB 2
- Survey of the development of the motion pictures as an art, a craft and a business in the United States during the 20th century.

MTA 102 AESTHETICS OF FILM PRODUCTION
F,S 3 cr. RCT 3
- An understanding of motion pictures, video art and television production through study of principles of concept and production. Will include assignments to view and critique selected examples and the completion of short exercises.

MTA 103A UNDERSTANDING PHOTOGRAPHY
F,Su 3 cr. LEC 2 LAB 1
- An introductory application of basic photographic theory and visual principles, including camera operation, use of B&W darkroom, and photographic assignments. Photography majors must take this class fall semester to fit into the sequential nature of the Photography program.

MTA 104H THEATRE AND MASS MEDIA
S 3 cr. LEC 3
- An exploration of major plays from the history of drama via contemporary film and television equivalents.

MTA 105 INTERMEDIATE PHOTOGRAPHY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: B or better in MTA 103 and registration as a Photography major.
- Theory and continued application of image control in B&W photography, through the use of a variety of 35mm films and the introduction of basic zone system principles and digital technologies. Advanced traditional B&W printing techniques in preparation for portfolio review.

MTA 110A ACTING FOR NON-MAJORS
F 3 cr. LEC 3
- An introduction to the creative process engaged by a performer on a stage. Taught in a workshop format in which the individual student engages in exercises designed to convey stories and emotions through the understanding of human behavior as expressed on a stage.

MTA 112A EXPLORING DIGITAL PHOTOGRAPHY
On Demand 3 cr. LEC 3
- Introduces technical and aesthetic ways of creating digital photographic images. Emphasis is on the production of photographic images, from acquiring them with digital cameras to manipulating them using computer software for manipulating digital images. Instructor and peer critique of student work is an integral part of the course.

MTA 215D INTERNATIONAL FILM & TELEVISION
F 3 cr. LEC 1 RCT 1 LAB 1
- A close analysis and interpretation of the social function and cultural value of film and television in other countries by comparative approaches, with emphasis on the period since World War II.

MTA 222 LIGHTING TECHNIQUE AND DESIGN
F 3 cr. LEC 1 RCT 2
PREREQUISITE: Sophomore standing in FILM.
- An introduction to the aesthetics and technical principles of lighting for film and theatre with attention to familiarity with basic instruments and a lighting board. The opportunity for an exercise in lighting design will be provided.

MTA 232 ACTING I
F 3 cr. LEC 1 RCT 2
PREREQUISITE: Sophomore standing in FILM.
- An introduction to the basic skills of acting through acting exercises and individual projects, including a unit for acting for the camera.

MTA 233 BASIC PRODUCTION OPERATIONS AND TECHNIQUES
F,S 3 cr. LEC 1 RCT 2
PREREQUISITE: MTA 102 or MTA 103.
- Practical experience associated with production and research project in motion pictures, television/video, photography, and theatre. May include rehearsal or performance activity. Credit will be offered to students doing basic work on faculty members’ productions or on student productions under direct faculty supervision. Credit will be offered to students giving basic technical support to: a) faculty teaching courses, b) faculty engaged in creative activities, or c) advanced students’ productions (while supervised by an SPF faculty member).

MTA 241 WRITING
S 3 cr. RCT 3
PREREQUISITE: Sophomore standing in FILM.
- Experience in techniques and concepts of writing for motion picture and video production.

MTA 251 EDITING
F 3 cr. LEC 1 RCT 2
PREREQUISITE: Sophomore standing in FILM.
- History and techniques of motion picture and video editing. The course will combine lectures with hands-on exercises in editing.

MTA 253 DIRECTING
S 3 cr. RCT 2 LAB 1
PREREQUISITE: MTA sophomore standing in FILM.
- An examination of the theory and practice of directing and working with actors. Students complete projects for the stage and for filming during the semester.

MTA 254 SOUND
S 3 cr. LEC 1 RCT 2
PREREQUISITE: Sophomore standing in FILM.
- Theoretical and practical approaches to the motion picture soundtrack. Topics and exercises will include field recording, post-production, sound design, and the musical score.

MTA 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F,S 3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MTA 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F,S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.
MTA 303 EARLY HISTORY OF PHOTOGRAPHY
S alternate years, to be offered every year
5 cr. LEC 3
PREREQUISITE: MTA 103, WRIT 101W.
– The visual and technical evolution of photography within the cultural context. Personalities, ideas, and style of individual photographers are explored. Prehistory to 1913.

MTA 304 RECENT HISTORY OF PHOTOGRAPHY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: MTA 103, WRIT 101W.
– Continued exploration of the visual and technical evolution of photography from 1913 to the present, including study of criticism and the relationship to contemporary culture and art.

MTA 313 ADVANCED SCRIPTWRITING
F 3 cr. RCT 3
PREREQUISITE: Junior standing in FILM or permission of instructor.
– Advanced scriptwriting and the techniques of writing for motion picture production. This class requires that students author a 100 page Hollywood script. Assessment of student work is done by the faculty member as well as via peer work shopping, presentations and discussions.

MTA 318 WORLD CINEMA
On Demand 3 cr. LEC 1 RCT 2
PREREQUISITE: Junior standing in FILM Option curriculum (i.e., all freshman and sophomore MTA requirements are prerequisites).
– An advanced introduction to the theories which enable an understanding of the national cinemas practiced in light of, outside of, the influence of Hollywood. Focus on particular national cinemas varies by semester, but may include examinations of major European cinemas, Asian cinema, and/or the cinemas of the developing world.

MTA 319 ALTERNATIVE PROCESSES
S 4 cr. RCT 2 STU 2
– Image creation through the use of historical contact printing processes. A variety of alternative processes will be addressed such as gum printing, cyanotype, and platinum/palladium. Extensive aesthetic exploration will be supported through a blend of the old processes and current digital negative making techniques.

MTA 333 ADVANCED PRODUCTION OPERATIONS AND TECHNIQUES
F, S, Su 1-3 cr. IND Maximum 12 cr total for both MTA 253 & MTA 333 combined.
PREREQUISITE: MTA 102 or MTA 103.
– Practical experience associated with production and research projects in motion pictures, television/video, photography, and theatre. May include rehearsal or performance activity. Credit will be offered to students doing advanced work on faculty members’ productions or on student productions under direct faculty supervision. (May be taken by sophomores with written permission of an advisor and the Department Head.)

MTA 341 PORTRAITURE
On Demand 4 cr. LEC 2 Lab 2
– Advanced portrait techniques, theory, and practice in studio and on location. Emphasis on creative exploration and application of a variety of styles in portraiture, such as informal, editorial, environmental, etc.

MTA 342 ADVANCED LIGHTING PRACTICES
On Demand 4 cr. RCT 2 STU 2
– Advanced photographic theory and practice in studio and on location. Emphasis given to creative aspects of artificial lighting and staged subject matter in all camera formats.

MTA 343 NON-FICTION PHOTOGRAPHY
S 4 cr. LEC 2 RCT 2
– The applied study of photography as a narrative medium, emphasizing the practices and uses of non-fiction, editorial and essays using digital and analog processes.

MTA 344 EXPERIMENTAL PHOTOGRAPHY
F 4 cr. LEC 2 LAB 2
– The applied study of experimental photographic techniques. These techniques will be explored in image capture as well as traditional darkroom working methods.

MTA 347 INTERDISCIPLINARY PROJECTS I
On Demand 3 cr. RCT 3
PREREQUISITE: MTA Majors: MTA 254 and consent of instructor. Cross listed with MUS 347.
– For upper-level Film and Music Technology students. Exploration of cross-disciplinary techniques in multimedia art. Individual and collaborative projects with visuals and sound. Overview of the history of audio art, video art and experimental film.

MTA 348 INTERDISCIPLINARY PROJECTS II
S 3 cr. RCT 3
PREREQUISITE: MTA majors: MTA 222 and MTA 254 and permission of instructor.
– Studies theoretical practice of sound and lighting design for live performances. Students gain hands-on experience for designing and executing light and sound.

MTA 360 ADVANCED COLOR PHOTOGRAPHY
On Demand 4 cr. LEC 2 LAB 2
– Further applied study of color visual theory and the control of materials for color photographic expression. Emphasis on application of alternative forms - including animation, multimedia, interactivity, and the internet - to individual aesthetic practices.

MTA 361 PHOTOGRAPHY: PROFESSIONAL PRACTICES
On Demand 4 cr. LEC 2 RCT 2
PREREQUISITE: MTA 260 and MTA 264 and Junior standing in the Photography Option.
– Introduction to professional practices in photography. Emphasis on the fundamentals of business and marketing to prepare for entering the photographic profession.

MTA 370 PROFESSIONAL PRACTICES
F, S, Su on demand, 2-4 cr. RCT 2-4. May be repeated. Maximum 12 cr.
PREREQUISITE: Junior standing in FILM.
– Projects pursued under faculty supervision, emphasizing an area of specialization in Theatre, Film or Video relating to professional practices. Details of individual sections and the supervising faculty will be posted by the department prior to pre-registration.

MTA 371 JUNIOR PRODUCTION PROCESS: NONFICTION
F, S 4 cr. RCT 4
PREREQUISITE: Junior standing in FILM.
– Projects pursued under faculty supervision, emphasizing fiction production using traditional and non-traditional approaches from preproduction through post-production. Details of individual sections and the supervising faculty will be posted by the department prior to pre-registration.

MTA 372 JUNIOR PRODUCTION PROCESS: FICTION
F, S 4 cr. RCT 4
PREREQUISITE: Junior standing in FILM.
– Projects pursued under faculty supervision, emphasizing fiction productions using traditional and non-traditional approaches from preproduction through post-production. Details of individual sections and the supervising faculty will be posted by the department prior to pre-registration.

MTA 374 JUNIOR PRODUCTION: THEATRE
F 4 cr. RCT 4
PREREQUISITE: Junior standing in FILM.
– Projects pursued under faculty supervision, emphasizing the theatrical production processes. Specific emphasis may include acting, directing, management, technical theatre and/or theatrical design.

MTA 400 PRODUCTION SEMINAR
F, S, Su 1 - 4 cr. SEM Maximum 12 cr.
PREREQUISITE: Junior standing or permission of instructor and as determined for each offering.
– Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

MTA 401 STUDIES SEMINAR
F, S 1 - 12 cr. SEM May be repeated.
PREREQUISITE: Junior standing or permission of instructor.
COREQUISITE: Sophomore level.
– Studies topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

MTA 444 PROFESSIONAL PERSPECTIVES - L.A. FIELD TRIP
Su 5 cr. SEM
COREQUISITE: Consent of the instructor.
– This course prepares the students for an intensive encounter with accomplished professionals in the motion picture, video, and television industries.

MTA 469 FILM AND DOCUMENTARY THEORY
F 5 cr. LEC
PREREQUISITE: Upper-division standing.
– An intensive survey of major trends in film and media theory, as applied to feature-length fiction, documentary, and experimental cinema. Topics include: feminism, postcolonialism, cultural studies, psychoanalysis, star intertextuality, and cognitive methods.

MTA 470 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
– Directed research and study on an individual basis.
MTA 472 MOTION PICTURE/TV/VIDEOTHEATRE SENIOR PRODUCTION
F S 2 cr. RCT 2 May be repeated Maximum 10 credits
PREREQUISITE: Senior standing in MPVT and faculty supervision in small workshop groups.
COREQUISITE: MTA 474.
- Senior capstone course. A final series of television programming, video production projects, a stage production, or the production of a complete motion picture.

MTA 473 PHOTOGRAPHY
F S 2 cr. RCT 2 May be repeated Maximum 4 credits
PREREQUISITE: Senior standing in the Photography option.
COREQUISITE: MTA 475.
- Senior capstone course. Independent production of a significant body of work in photography; extensive production combined with group critique and faculty consultation.

MTA 474 INDEPENDENT MOTION PICTURE/TV/VIDEOTHEATRE SENIOR PRODUCTION
F S 3 cr. IND 3
COREQUISITE: MTA 472.
- Independent production supporting MTA 472.

MTA 475 INDEPENDENT PHOTOGRAPHY SENIOR PRODUCTION
F S 3 cr. IND 3 May be repeated Maximum 6 credits.
COREQUISITE: MTA 473.
- Independent production work supporting MTA 473.

MTA 476 CAREER INTERNSHIP
F S Su 2-12 cr. IND
PREREQUISITE: Consent of instructor.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MTA 480 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in a curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MTA 490 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F S Su 1-3 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MTA 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MTA 490 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F S Su 1-6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Senior standing in MPVT.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research

MTA 504 FILM AND DOCUMENTARY THEORY
F 3 cr. LEC 3
- An advanced introduction to the methods developed for studying the fiction, documentary and experimental film over the past 100 years.

MTA 505 CRITICISM AND THEORY I
F 3 cr. LEC 3
- A close analysis and interpretation of the social function and cultural value of science and natural history films, with a particular emphasis for broadcast nationally and internationally.

MTA 506 CRITICAL APPROACHES TO SCIENCE FILMMAKING
S 3 cr. LEC 3
- An advanced introduction to the critical methodologies necessary for intelligently interrogating the representations of science and technology in print and media.

MTA 507 FORM AND THEORY OF THE IMAGE
F 1 cr. LEC 1
PREREQUISITE: Admission to MFA Program.
- This course will introduce first-year graduate students to the unique skill, talents, and research interests of the individual members of the MTA faculty in both the Motion Picture/Video/Theatre Option and the Photography Option. It will be an intensive introduction to the range of research areas and techniques involved in faculty work. The goal is to provide the students with an overview of both the field of science and natural history filmmaking and an introduction to the varying skills required. These sessions should provide guidance and possible mentorship for the students’ own work in the program.

MTA 511 PRODUCTION TECHNIQUE II
F 3 cr. LAB 3
- Basic field production techniques in film, video, sound, editing. Train on digital video, 16 mm cinematography, sound recording and digital nonlinear editing.

MTA 512 PRODUCTION METHODS & STUDIES I
F 2 cr. LEC 2
COREQUISITE: MTA 510, 511.
- An introduction to working professionals and faculty that examines successful filmmaking methodologies. May include presentations, forums or seminars designed to explore specific actual production scenarios on a variety of documentary subjects including producing, directing, cinematography, sound, editing, grant writing, distribution and funding.

MTA 513 PRODUCTION TECHNIQUE III
S 3 cr. LEC 3
- All phases of the production process for the producer of documentary films examined from practical and creative points of view; includes strategies for producing a proposal that bridges the distance between idea and underwater with realistic schedules and accurate budgets.

MTA 515 SCIENCE & NATURAL HISTORY FILM
S 3 cr. LEC 3
PREREQUISITE: MTA 510, 511, 507 and MTA 510.
- This course will teach the aesthetics and craft in effective picture and sound editing. This will be an intensive introduction to the range of research areas and techniques involved in faculty work. The goal is to provide the students with an overview of both the field of science and natural history filmmaking and an introduction to the varying skills required. These sessions should provide guidance and possible mentorship for the students’ own work in the program.

MTA 516 PRODUCTION TECHNIQUE IV
S 3 cr. LEC 3
PREREQUISITE: MTA 510, 511.
- Advanced field and studio production exercises in equipment use and applications, including high definition digital imaging, 16mm cinematography, location and studio sound recording and advanced editing and digital effects.

MTA 517 PRODUCTION MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: MTA 510, 511, 512.
- A master class where working professionals and faculty present and examine successful advanced filmmaking aesthetics and applied methodologies. May include presentations, forums, workshops or seminars designed to explore specific professional film applications on a variety of documentary subjects including producing, directing, cinematography, sound, editing, grant writing, distribution and festivals.

MTA 518 WRITING FOR DOCUMENTARY & NON-FICTION FILM
S 3 cr. RCT 3
PREREQUISITE: MTA 504 and MTA 505 and MTA 507 and MTA 510.
COREQUISITE: MTA 515.
- Creative non-fiction introduces central concept of narrative common to the science and history film text. The course examines and questions the models of non-fiction writing and challenges the biases surrounding this genre.

MTA 519 POST PRODUCTION WORKFLOW
S 3 cr. LEC 3 LAB 2
PREREQUISITE: MTA 504 and MTA 505 and MTA 507 and MTA 510.
COREQUISITE: MTA 515.
- This class will teach the aesthetics and craft in effective picture and sound editing. Final Cut Pro editing platform will be used, and architecture and archiving techniques will be stressed. The styles and techniques of well thought-out editing will be examined and practiced.

MTA 520 PRINCIPLES OF PRODUCTION MANAGEMENT
S 3 cr. LEC 3
- All phases of the production process for the producer of documentary films examined from practical and creative points of view; includes strategies for producing a proposal that bridges the distance between idea and underwater with realistic schedules and accurate budgets.

MTA 521 CONTEMPORARY TRENDS IN NONFICTION
F 4 cr. LEC 1 RCT 3
PREREQUISITE: MTA 504, MTA 505, MTA 507, MTA 510, MTA 515, MTA 517, MTA 518, MTA 519 - All.
- This course will explore both the history and technological developments in nonfiction film since 1990.

MTA 522 SOUND TECHNIQUE
On Demand 3 cr. LEC 3
PREREQUISITE: Restricted to students accepted into the MFA program.
COREQUISITE: MTA 510, MTA 511.
- This course will provide students with the skills to record, edit, and create broadcast quality audio for documentary films and videos. Students will learn audio editing and processing using Pro Tools, the film industry standard for post production sound.

MTA 523 SECOND YEAR FILM PREP
F 2 cr. SEM 3
PREREQUISITE: MTA 504, MTA 505, MTA 507, MTA 510, MTA 515, MTA 517, MTA 518, MTA 519.
- This course will prepare second year SNHF MFA students to create their required second year film.
MTA 525 SECOND YEAR FILM PRODUCTION
S 3 cr. SEM 3
PREREQUISITE: MTA 515.
- The objective of this course is to provide faculty support and supervision of self-authored second year MFA candidates’ film projects. Each student will develop and produce their own original short documentary to further develop storytelling acumen and expand their production skill sets and techniques.

MTA 526 ALTERNATIVE NONFICTION
S 3 cr. SEM 3
PREREQUISITE: MTA 504 and MTA 505 and MTA 506 and MTA 507 and MTA 510, MTA 515 and MTA 517 and MTA 518 and MTA 519 and MTA 521.
COREQUISITE: MTA 521 (may be a co-requisite; not required).
- The purpose of this course is to further the study and production of contemporary documentary films and videos. Graduate students will study a range of contemporary documentary and experimental documentary filmmakers, viewing and analyzing these films. Each student will then develop and produce their own original short documentary works that utilizes some aspect(s) of the contemporary works studied.

MTA 530 ADVANCED CINEMATOGRAPHY WORKSHOP
Su, F 1 cr. LAB 1
PREREQUISITES: MTA 510,511,512,515,516,517 or permission of instructor.
- Instruction and practical application of the use of high-definition camera in order to qualify for use in the MFA program in science and natural history filmmaking.

MTA 531 BUSINESS AND LEGAL ASPECTS OF DOCUMENTARY FILMMAKING
Su, F 1 cr. LEC 1
PREREQUISITES: MTA 504, MTA 505, MTA 507, MTA 510, MTA 515, MTA 518, MTA 519 or permission of instructor.
- This course will examine business and legal issues relating to the production of documentary films.

MTA 552 UNDERWATER CINEMATOGRAPHY
Su, F 1 cr. LAB 1
PREREQUISITES: MTA 515 and MTA 516 and permission of instructor.
- This course will focus on the skills and training necessary to begin filming in the underwater environment.

MTA 554 ADVANCED CINEMATOGRAPHY
Su, F 1 cr. LAB 1
PREREQUISITES: MTA 515 and MTA 516 and permission of instructor.
- Advanced techniques on the DSR 570 and HD Cameras and Lighting.

MTA 558 PRODUCTION PRACTICUM: POST-PRODUCTION
S 3 cr. IND 3
PREREQUISITE: MTA 550 and 552.
- A committee directed course in which the students begin the post-production phase and concludes with the completion of their second year project.

MTA 559 PRODUCTION PRACTICUM: PRE-PRODUCTION
F 2 cr. IND 2
PREREQUISITE: MTA 551.
- The rotation proposal workshop makes students formalize their second year projects. This course initiates dialogues and proposals with broadcasters and hosting agencies.

MTA 575 POST PRODUCTION MEETS INFORMATION DESIGN
F 3 cr. RCT 3
PREREQUISITE: Completion of MFA First Year curriculum.
- This course will teach advanced post-production and information design skills to Graduate MFA students. The course is tailored specifically to the needs of students training to be science and natural history filmmakers.

MTA 576 INTERNSHIP
F, S, Su 1-6 cr. IND 1-6
PREREQUISITE: Master’s standing/Restricted Entry.
- This course allows the student to spend a semester working in a professional environment under the guidance of a mentor.

MTA 578 SPECIAL TOPICS
On Demand - 3 cr. Maximum 12 cr.
PREREQUISITE: MTA 504, MTA 505, MTA 510, MTA 515, MTA 517, MTA 518, MTA 519 - All.
- Courses not required in any curriculum for which there is a particular one time need, or on a trial basis to determine acceptability and demand before requesting a regular course number. This class provides students with advanced production opportunities.

MTA 580 GRADUATE CONSULTATION
F, S, Su 3 cr. IND 3
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

MTA 589 MASTER’S THESIS
F, S, Su 1-15 cr. IND 1-15
PREREQUISITE: Master’s standing/Restricted Entry.
- Course replaces MTA 591, MTA 592 and MTA 593.
- Maximum of 8 credits per semester.

MOR Museum of the Rockies
Museum of the Rockies
(406) 994-2251

MOR 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MOR 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.
MOR 301 INTRODUCTION TO MUSEUM PRACTICES
F 3 cr. LEC 3
PREREQUISITE: Junior standing or permission of instructor.
- Team-taught by Museum of the Rockies staff, the course will introduce students to the museum profession with emphasis on collections and exhibitions. Topics covered include museum missions, object-based learning, collecting theory, curatorial research, managing collections, and developing exhibitions.

MOR 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

MOR 498 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MOR 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MOR 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in creating and presenting discussion material.

MUEP 504 STUDIES IN HISTORY AND ANALYSIS
Su alternate years, to be offered every 3 cr. LEC 3
PREREQUISITE: MUSA 296, MUSA 301, MUSI 302.
- Review and study of the history of music, with an emphasis on specific works. Review and practice of analytical and theoretical procedures and concepts in a variety of musical genres and styles.

MUEP 515 CONTEMPORARY DIRECTIONS IN MUSIC
On demand 2 cr. LEC 2
PREREQUISITE: MUSA 302.
- In-depth investigation of musical styles prevalent in western music between 1975-present.

MUEP 519 WORLD MUSIC
On demand 2 cr. LEC 2
PREREQUISITE: MUSA 302.
- Approaches to and use of music in world cultures. The influence of world music on Western music.

MUEP 520 MONTANA CHAMBER MUSIC WORKSHOP
Su 2 cr. LAB 2
PREREQUISITE: MUSA 295, MUSA 295 and consent of instructor.
- Students investigate the wealth of chamber music literature that includes their own instrument in various instrumental combinations, through coached playing assignments and in performance forums.

MUEP 530 MUSIC, SOCIETY AND EDUCATION
Su alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDEL 410, EDSD 410
- Philosophical, historical, psychological and social foundations of music education. Music in public education, music curricula, aesthetics, and music learning theory.

MUEP 532 MUSIC EDUCATION: RESEARCH AND PRACTICE
Su alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDEL 410, EDSD 410
- Examination and close study of research in music education and its implications for practice.

MUEP 535 TEACHING MUSIC LITERACY
On demand 2 cr. LEC 2
PREREQUISITE: EDEL 410.
- Analysis of the foundations of music literacy, contemporary trends in music reading and writing instruction and research related to these issues.

MUEP 540 ADVANCED CONDUCTING
F, Su 1 - 3 cr. RCT 3 May be repeated for credit.
PREREQUISITE: MUSA 335 or MUSA 336.
- Conducting techniques, score study and rehearsal procedures for direction of instrumental and choral groups in the public schools. Online readings, research, and discussions with on-campus and off-site conducting of ensembles.

MUEP 542 GRADUATE VOCAL PEDAGOGY
F alternate years, to be offered even years 3 cr. SEM 3
PREREQUISITE: MUSA 442.
COREQUISITE: Must be an active music educator.
- Online/Seminar delivery centers around classroom application of vocal methodologies in the studio and classroom. Course content will include the study of vocal physiology and acoustics.

MUEP 545 GEN MUSIC PRACTICUM
Su alternate years, 3 cr. RCT 3
- Current issues and developments, teaching-learning systems, materials, media, strategies, and research relevant to K-8 general music education. Practical application of course content to one’s own teaching situation through online readings, research, discussions, and presentations.

MUEP 560 APPLIED MUSIC
F, Su 1 cr. STU 1 May be repeated; Maximum 3 cr.
PREREQUISITE: MUSA 495 and consent of instructor.
- Advanced studies of techniques of performance and interpretation to develop musical ability, expression, accuracy and stylistic awareness in student’s performance area.

MUEP 565 GRADUATE RECITAL
F, Su 1 cr. IND 1
PREREQUISITE: MUEP 560.
- Formal recital to include works from different eras.

MUEP 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

MUEP 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

MUEP 576 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum credits unlimited
PREREQUISITE: Graduate standing, consent of instructor and Department Head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

MUEP 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MUEP 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Courses offered on a one-time basis to fulfill professional development needs in service educators. A specific focus is given to each course which is appropriately subtitled.

MUSE, MUSI, MUST Music Department of Music
(406) 994-3562

MUSI 100 CONCERT ATTENDANCE
F, S 0 cr. IND 0 cr. May be repeated
- Required of Music Major students every semester that they are in residence on campus. Each student must attend 8 concerts or recitals and sign in or submit proof of attendance. Pass/Fail course.

MUSI 101A ENJOYMENT OF MUSIC
S 3 cr. LEC 5 cr.
- Introduces students to the rich legacy of Western Art Music, defined as noted musical traditions in Europe and later in the USA from liturgical chant to the present. Explores the historical context that led to the development of important genres and influenced the lives of composers. Facilitates active listening and curious inquiry into the language of music.
MUSI 103RA FUNDAMENTALS OF MUSICAL CREATION
F, S 3 cr. LEC 1 RCT 1 LAB 1
- Open to all students. Study of the elements of music and their combination in musical creation. Activities include the acquisition of keyboard skills, exploration of traditional harmonic theory and exercises in music reading, analysis, and composition.

MUSI 105 MUSIC THEORY I
F 3 cr. LEC 3
PREREQUISITE: Music fundamentals pre-test. COREQUISITE: MUSI 140.
- Music fundamentals, diatonic harmony and elementary counterpoint. Successful completion of Music Fundamentals Pre-test (administered during the first class meeting and covering scales, rhythm/meter, clefs, and key signatures) required for enrollment in this course.

MUSI 106 MUSIC THEORY II
S 3 cr. LEC 3
PREREQUISITE: MUSI 105.
- Continuation of study of materials used in the previous semester: diatonic harmony and analysis in the common practice style, musical notation and language, function and interaction of the elements of music.

MUSI 112 CHOIR I: UNIVERSITY CHORUS
F, S 1 cr. LAB 1 May be repeated, Maximum 8 cr.
- Intermediate, mixed-voice choir performing a variety of concert music.

MUSI 114 BAND I: UNIVERSITY BAND
F, S 1 cr. LAB 1 May be repeated, maximum 8 cr.
- Study and performance of traditional and contemporary repertoire for wind and percussion in a large ensemble format. Open to all students with high school instrumental music experience.

MUST 115 INTRODUCTION TO DIGITAL MUSIC
F, S 3 cr. LEC 3
- First course in the Music Technology Sequence. Concepts and terms, creative projects using software and hardware, historical background, an introduction to the music industry, and tools for building self-directed careers within the changing field of music technology.

MUSE 123 TECHNIQUES: VOICE
F 1 cr. LAB 1
PREREQUISITE: Music Major or consent of instructor.
- Introductory vocal training and diction for instrumentalists and beginning singers. Students develop voice production and performance skills for solo and small group singing through a lab setting.

MUSE 125 MIDI SEQUENCING & NOTATION
S 3 cr. LEC 3
PREREQUISITE: MUSE 115, and permission of instructor.
- Continuation of the MIDI component of Introduction to Digital Music. Composition and music notation, synthesizer programming, constructing an integrated music technology studio, and advanced applications for film and theatre.

MUSE 130 TECHNIQUES: FLUTE & CLARINET
F 1 cr. LAB 1
- Teaching techniques, materials and basic playing approaches for flute and clarinet. For music education students.

MUSE 131A HISTORY OF JAZZ
S 3 cr. LEC 3
- Important literature from American jazz, with an emphasis on a detailed study of styles that have developed new directions in music and shaped America’s culture.

MUSE 131A TECHNIQUES:
SAX, OBOE & BASSOON
S 1 cr. LAB 1
- Teaching techniques, materials, and basic playing approaches for saxophone, oboe, and bassoon. For music education students.

MUSE 131 JAZZ ENSEMBLE I: MSU
F, S 1 cr. LAB 1 May be repeated, Maximum 8 cr.
PREREQUISITE: Successful audition.
- Ensemble experience performing musical styles that include swing, jazz, commercial, and popular music. Open to all students with high school instrumental music experience.

MUSE 132 TECHNIQUES: BRASS
S 1 cr. LAB 1
- Teaching techniques, materials, and basic playing approaches for brass instruments. For music education students.

MUSE 134 TECHNIQUES: PERCUSSION
S 1 cr. LAB 1
- Teaching techniques, materials, and basic playing approaches for percussion. For music education students.

MUSE 135 TECHNIQUES: STRINGS
F 1 cr. LAB 1
- Teaching techniques, materials, and basic playing approaches for strings. For music education students.

MUSE 135 KEYBOARD SKILLS I
F 1 cr. LAB 1
PREREQUISITE: Placement audition and music major.
- Study of keyboard theory and technique, creative activities, sight reading, and piano repertoire. For music majors.

MUSE 136 KEYBOARD SKILLS II
S 1 cr. LAB 1
PREREQUISITE: MUSE 135 or placement audition and music major.
- Continual study of keyboard theory and technique, creative activities, sight reading, and piano repertoire. For music majors.

MUSE 140 LABORATORY INSTRUMENTAL ENSEMBLE
F 1 cr. LAB 1 May be repeated, Maximum 8 cr.
- Repertoire suitable for beginning and advanced secondary school ensembles (band and/or orchestra) will be reviewed. Students are asked to play their secondary instrument.

MUSE 141 LABORATORY CHORAL ENSEMBLE
S 1 cr. LAB 1 May be repeated, Maximum 8 cr.
- Repertoire suitable for beginning and advanced secondary school vocal ensembles will be reviewed. The ensemble will present a recital at the end of the semester under the direction of student conductors.

MUSE 140 AURAL PERCEPTION I
F 1 cr. LAB 1
PREREQUISITE: Music reading pre-test. COREQUISITE: MUSE 105.
- Studies in ear training and sight-singing to develop aural perception of tonal and temporal relationships. Primarily for students with planned concentration in music. Assumes knowledge of musical notation.

MUSE 141 AURAL PERCEPTION II
S 1 cr. LAB 1
PREREQUISITE: MUSE 140.
- Continuation of studies in ear training and sight-singing to develop aural perception of tonal and temporal relationships. Primarily for students with planned concentration in music.

MUSE 155 MARCHING BAND:
SPIRIT OF THE WEST
F 1-2 cr. LAB May be repeated.
- Non-auditioned ensemble offering experience in marching techniques and outdoor performances.

MUSE 160 BEGINNING GUITAR
F, S 1 cr. LAB 1
PREREQUISITE: Placement audition.
- Basic instruction in techniques of chord and classical guitar, music reading, and performance.

MUSE 161 BEGINNING GUITAR II
S 1 cr. LAB 1
PREREQUISITE: MUSE 160 or placement audition.
- Continuation of MUSE 160.

MUSE 195 APPLIED MUSIC I
F, S, Su 1 cr. STU 1 May be repeated, Maximum 3 cr.
PREREQUISITE: Placement audition.
- Techniques of performance and interpretation to develop musical ability, expression, accuracy, and stylistic awareness in student's performance area.

MUSE 205 AMERICAN POPULAR MUSIC:
REFLECTIONS OF POLITICS & SOCIETY
F, S 3 cr. LEC 3
- A study of the way in which American popular music is a product of the social, political, and historical context in which it developed, and in turn how this context was shaped by this music.

MUSE 205 MUSIC THEORY III
F 3 cr. LEC 3
PREREQUISITE: MUSE 106.
- Study and use of chromatic harmony and counterpoint in the common practice period. Analysis of small forms.

MUSE 206 MUSIC THEORY IV
S 3 cr. LEC 3
PREREQUISITE: MUSE 205.
- Analysis and use of homophonic forms and 20th Century techniques.

MUSE 211A MASTERWORKS IN MUSIC
F, S 3 cr. LEC 3
- Presentation of examples of great music literature to develop informed, perceptive listening and musical understanding.
MUSI 219IA HONORS MUSIC & SOCIETY
S 3 cr. LEC 3
- An investigation into the relationship between composers and the cultural, political, and social influences that impacted their creative work. Various composers and significant musical works representing diverse style periods, cultures, and historical backgrounds will be discussed in depth. Students will be required to present a final paper discussing the work of a specific composer of their choice, incorporating the above criteria. Restricted entry. Priority to University Honors students.

MUSE 220 INTRO TO COMP APP MUS ED
F 2 cr. LEC 1 LAB 1
PREREQUISITE: MTEC Major status.
- An introduction to computer applications in music, including music notation, marching band and basic music notation, music education majors.

MUST 220 RECORDING I
F 3 cr. LEC 2 LAB 1
PREREQUISITE: MTEC Major status.
- Introduction to, and exploration of, technologies for recording, recording, edit, format, manufacture, reinforce and reproduce audio. Combination of lecture and hands-on learning.

MUSI 225 JAZZ THEORY & IMPROVISATION I
F alternate years, to be offered odd years 2 cr. LEC 1 LAB 1
PREREQUISITE: MUSI 105 and MUSI 295 or successful audition.
- Improvisational basics for experienced instrumentalists and vocalists, improvement of aural perception, techniques of teaching improvisation and utilizing it at various levels of technical proficiency, enhancing other approaches to music education.

MUST 227 ELECTRIC MONSTER LAPTOP ENSEMBLE
S 2 cr. LAB 2.
PREREQUISITE: Permission of instructor required.
- Performance and study of music making in an ensemble of mainly laptop computers. Computer music programming skills as well as music performance experience desirable.

MUSI 226 JAZZ THEORY & IMPROVISATION II
S alternate years, to be offered even years 2 cr. LEC 1 LAB 1
PREREQUISITE: MUSI 225.
- Application of the techniques learned in Improvisation I, continuation of improvisational and creative experiences.

MUSI 230 INTERMEDIATE KEYBOARD SKILLS: REPertoire
F 1 cr. LAB 1
PREREQUISITE: MUSI 156 OR placement audition and music major.
- Continuation of the study of keyboard theory and technique, sight reading, and piano repertoire. For non-keyboard music majors.

MUSI 231 INTERMEDIATE KEYBOARD SKILLS: ACCOMPANYING
F 1 cr. LAB 1
PREREQUISITE: MUSI 156 or placement audition and music major.
- Continuation of the study of keyboard theory and technique, ensemble playing, sight reading, and piano accompanying. For non-keyboard music majors.

MUSI 232 INTERMEDIATE KEYBOARD SKILLS: OPEN SCORE READING
S 1 cr. LAB 1
PREREQUISITE: MUSI 156 or placement audition and music major.
- Continuation of the study of keyboard theory and technique, sight reading, and keyboard realization of choral and instrumental ensemble scores. For music majors.

MUSI 233 INTERMEDIATE KEYBOARD SKILLS: JAZZ
S 1 cr. LAB 1
PREREQUISITE: MUSI 156 or placement audition and music major.
- Continuation of the study of keyboard theory and technique, creative activities, sight reading, improvisation and performance of jazz. For music majors.

MUSI 240 AURAL PERCEPTION III
F 1 cr. LAB 1
PREREQUISITE: MUSI 141.
- Continuation of development of aural and vocal skills that deal with tonal and temporal relationships.

MUSI 241 AURAL PERCEPTION IV
S 1 cr. LAB 1
PREREQUISITE: MUSI 240.
- Continuation of development of aural and vocal skills that deal with tonal and temporal relationships.

MUSI 260 INTERMEDIATE GUITAR
F 1 cr. LAB 1
PREREQUISITE: MUSI 161.
- Continuation instruction in techniques of chord and classical guitar, music reading, and performance.

MUSI 281 DICTION: LATIN, ENGLISH ITALIAN
S 2 cr. LEC 2
PREREQUISITE: MUSI 195 in voice or previous singing experience.

MUSE 290R UNDERGRADUATE RESEARCH
F, S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

MUSI 295 APPLIED MUSIC II
F, S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

MUSI 299R UNDERGRADUATE RESEARCH
F, S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

MUSI 301 MUSIC HISTORY I
S 3 cr. LEC 5
PREREQUISITE: MUSI 106.
- Music as it relates to other arts and humanities from an historical and stylistic perspective. From Antiquity through the Baroque era.

MUSI 302 MUSIC HISTORY II
F 3 cr. LEC 5
PREREQUISITE: MUSI 106.
- Music as it relates to other arts and humanities from an historical and stylistic perspective. The Classical and Romantic eras.
MUSI 303 MUSIC HISTORY
OF THE 20TH CENTURY
S 3 cr. LEC 3
PREREQUISITE: MUSI 106 and MUSI 301 or
MUSI 302.

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MUST 305 ORCHESTRA FOR NEW MEDIA
S 2 cr. LEC 1 LAB 1
PREREQUISITE: MTEC majors: MUST 125 and
permission of instructor; other majors: permission
of instructor only.

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MUSI 303 MUSIC HISTORY
OF THE 20TH CENTURY
MUSI 302.

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MUSI 307A WORLD MUSIC
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing.

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MUSI 308 ORCHESTRA II:
MUSI SYMPHONY ORCHESTRA
F, S 1 cr. LAB 1
PREREQUISITE: Successful audition.

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MUSI 310 OPERA THEATRE II
F, S 1 cr. LAB 1
PREREQUISITE: Successful audition.

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MUSI 312 CHOIR III: CHORALE
F, S 1 cr. LAB 1 May be repeated, maximum 8 cr.
PREREQUISITE: Successful audition.

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MUSI 314 BAND III: WIND SYMPHONY
F, S 1 cr. LAB 1 Maximum 8 cr.
PREREQUISITE: Enrollment by audition.

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MUSI 320 RECORDING II
F 3 cr. LAB 3
PREREQUISITE: MUSI 220, formal admission to the
MTEC Major, and permission of instructor.

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MUSI 322 PERCUSSION ENSEMBLE
F, S 1 cr. LAB 1 May be repeated, maximum 8 cr.
PREREQUISITE: Successful audition.

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MUSI 331 JAZZ ENSEMBLE II:
ONE O'CLOCK JAZZ BAND
F, S 1 cr. LAB 1 May be repeated, maximum 8 cr.
PREREQUISITE: Successful audition.

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MUSI 333 INSTRUMENTAL
CONDUCTING & REHEARSAL TECHNIQUES
F 2 cr. LEC 1 RCT 1
PREREQUISITE: MUSI 241, MUSI 206.

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MUSI 336 CHORAL CONDUCTING &
REHEARSAL TECHNIQUES
S 2 cr. LEC 1 RCT 1
PREREQUISITE: MUSI 335.

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MUSE 339 CONDUCTING PRACTICUM
F, S 1 cr. LAB 1
COREQUISITES: MUSI 335 (fall) or MUSI 336
(spring).

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MUSE 340 MARCHING BAND TECHNIQUES
On Demand 2 cr. LEC 2
PREREQUISITE: MUSI 206.

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MUSE 341 SOUND DESIGN AND SYNTHESIS
F 3 cr. LEC 3
PREREQUISITE: MUSI 155.

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MUSE 342 ORCHESTRA MANAGEMENT
F, S 3 cr. LEC 3
PREREQUISITE: MUSI Majors: MUSI 115 and con
sideration.

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MUSE 343 PROJECTS I: FILM I
F 3 cr. RCT 3
PREREQUISITE: MUS Majors: MUSI 115 and con
sideration of Parkening Master Class.

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MUSI 350 REAL-TIME COMPUTER MUSIC
S 3 cr. LEC 3
PREREQUISITE: MTEC Major status and
permission of instructor.

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MUSI 351 ACCOMPANYING
F alternate years, to be offered odd years 2 cr. RCT 2
PREREQUISITE: MUSI 205.

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MUSI 352 CHAMBER ENSEMBLES III:
MUSI 303 - MUSI 395
F, S 1 cr. LAB 1 May be repeated; maximum 8 cr.
COREQUISITE: MUSI 195, MUSI 295, MUSI 395,
MUSI 495, or MUSD 560; or successful audition.

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MUST 380 INTERDISCIPLINARY
PROJECTS I: FILM I
F 3 cr. RCT 3
PREREQUISITE: MUS Majors: MUS I 115 and con
sideration of Parkening Master Class.

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MUSI 382 DICTION: GERMAN AND FRENCH
F alternate years, to be offered odd years 2 cr. LEC 2
PREREQUISITE: MUSI 281.

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MUSI 383 ASSESSMENT IN MUSIC EDUCATION
F, S, Su 2 cr. RCT 2
PREREQUISITE: EDCI 208 or EDIC 299.

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MUSI 384 FILM SCORING
F 3 cr. LEC 1 LAB 2
PREREQUISITE: MUSI 125 and MUSI 305 or con
sideration of Parkening Master Class.

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MUSE 395 TEACHING
PRACTICUM: GENERAL MUSIC
F 1 cr. Lab 1.
COREQUISITE: MUSI 397.

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MUSI 395 APPLIED MUSIC III
F, S, Su 1 cr. May be repeated, maximum 3 cr.
PREREQUISITE: MUSI 295 and successful audition.

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MUSI 396 APPLIED MUSIC III
F, S, Su 1 1/2 cr. SU 1 May be repeated, Maximum
3 cr.
PREREQUISITE: MUSI 295 and successful audition.

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MUSE 397 AUTOCAD
PREREQUISITE: MUSI 295 and successful audition.

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MUST 398 INTERDISCIPLINARY
PROJECTS II
S 3 cr. RCT 3 May be repeated for credit when top
ics vary.
PREREQUISITE: MUS Majors: Music Technology major status and permission of instructor only.

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MUSE 399 INTERDISCIPLINARY
PROJECTS III
S 3 cr. RCT 3 May be repeated for credit when top
ics vary.
PREREQUISITE: MUS Majors: Music Technology major status and permission of instructor only.
MUSE 439 CHORAL FIELD EXPERIENCE
F 1 cr. LAB 1
COREQUISITE: MUSE 497
- A field experience in secondary (grades 5-12) choral music situations prior to student teaching. Observations, interviews, and brief teaching experiences with music ensembles at the secondary level.

MUSI 440 ORCHESTRATION
S 2 cr. LEC 1 LAB 1
PREREQUISITE: MUSE 206.
- Training in scoring principles for instrumental ensembles with emphasis on arranging and adapting music for public school programs.

MUSE 442 VOCAL STUDIO
PEDAGOGY & LITERATURE
S 2 cr. LEC 1
PREREQUISITE: Course prerequisites as determined for each offering.
- Vocal pedagogy, teaching techniques, and literature.

MUSE 445 STUDIO TEACHING EXPERIENCE
F S 2 cr. IND 1
PREREQUISITE: Senior standing and one of the following: MUS 156 or MUSI 295 and MUSI 231.
- Supervised teaching in student's performance area.

MUSI 450 RECITAL
F S 1 cr. LAB 1
PREREQUISITE: MUSI 105 or MUSI 307 and consent of instructor.
- Advanced performance in solo, chamber music, or choral music.

MUSI 451 PEDAGOGY & LITERATURE
F S 2 cr. IND 1
PREREQUISITE: MUSI 231, MUSE 208, and good standing in Teacher Education Program.
- Study of the techniques of writing two- and three-voice counterpoint. 16th, 18th, and 20th-Century styles.

MUSI 485 ACOUSTIC COMPOSITION
F S 1 cr. LAB 1
COREQUISITE: MUSE 395 or MUSI 495.
- Directed research and study on an individual basis.

MUSI 486 GUITAR MASTER CLASS
F S 1 cr. IND 1
PREREQUISITE: MUSI 295.
- Selection of appropriate program of works suited to student's abilities, preparation for performance.

MUSI 493 INDEPENDENT STUDY
F S 2 cr. LEC 1
PREREQUISITE: MUSI 395.
- Directed research and study on an individual basis.

MUSI 494 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Topics not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MUSI 495 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MUSI 496 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 6 cr.
PREREQUISITE: Senior standing and consent of instructor and approval of department head.
- Directed research and study on an individual basis.

MUSI 497 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 6 cr.
PREREQUISITE: Senior standing and consent of instructor and approval of department head.
- Directed research and study on an individual basis.

MUSI 498 SEMINAR/WORKSHOP
F S Su On Demand 1 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MUSI 499 SEMINAR/WORKSHOP
F S Su On Demand 1 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.
MUSI 495 APPLIED MUSIC IV
F, S 1-2 cr. STU 1 May be repeated; maximum 5 cr.
PREREQUISITE: MUSI 395 and successful audition.
- Continued study of techniques of performance and interpretation to develop musical ability, expressivity, accuracy, and stylistic awareness in student’s performance area.

MUSE 497 MI METHODS; INSTRUMENTAL METHODS & LITERATURE 5-12
S 3 cr. LEC 3
PREREQUISITE: MUSI 335, MUSI 206, MUSI 232.
COREQUISITE: MUSE 437.
- Rehearsal techniques, materials, literature, strategies for classroom management and the administration of the instrumental program for the middle school band and orchestra teacher.

MUSE 497 MC METHODS: CHORAL METHODS & LITERATURE 5-12
F 3 cr. LEC 3
PREREQUISITE: MUSI 336, MUSI 206, MUSI 232.
COREQUISITE: MUSE 439.
- Rehearsal techniques, materials, literature, strategies for classroom management and the administration of the choral program for the middle school and high school choral instructor.

MUST 498 INTERNSHIP
On Demand 2 - 6 cr. END Maximum 12 cr.
PREREQUISITE: Consent of instructor.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MUST 499R SENIOR RECITAL/CAPSTONE EXPERIENCE
F 3 cr. LEC 2, SEM 1
PREREQUISITE: Senior standing in MTEC program (MTEC and Composition/Orchestration coursework must be completed or in progress).
- Creation and public performance of a large-scale work incorporating original sound design (film score, multimedia work, EP-length album, or theatrical soundtrack) plus research paper synthesizing knowledge and inquiry in the Music Technology major.

N 115 NURSING AS A PROFESSION
F, S 2 cr. LEC 2
- The purpose of this course is to initiate and foster the professional socialization process. Content and activities expose students to issues surrounding the profession of nursing, multiple roles of nursing in society and health care, and concepts related to the dimensions of nursing practice: nurse, client, health and environment.

N 200 SEMINAR
On Demand 1 - 4 cr. SEM Maximum 12 credits
PREREQUISITE: As determined for each offering.
- Topics offered at the lower division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

N 220 FOUNDATIONS OF ETHICAL NURSING PRACTICE
F, S 2 cr. LEC 1 RCT/DIS 1
- Drawing on contemporary issues in ethics this foundational course explores influential moral values, philosophical principles and theories as formal grounding for ethical decision making and action in health care. A broad historical, cultural and societal perspective is emphasized to provide the background for understanding the everyday ethical problems that health professionals encounter in their practices. A psychological and social framework of analysis is used to foster sensitivity, skills of analysis and ethical behavior in situations of moral conflict.

N 223 FOUNDATIONS FOR PLANNING AND PROVIDING CLINICAL NURSING CARE
F, S 4 cr. LEC 2 LAB 2
PREREQUISITES: BIOL 207, BIOL 208, HDFC 150, and MB 201.
COREQUISITES: N 259 or consent of instructor.
- Application of nursing concepts, principles and related skills for care of the individual needing assistance. The clinical decision-making process is utilized in the provision of nursing care in clinical settings.

N 224 PATHOPHYSIOLOGY
F, S 3 cr. LEC 3
PREREQUISITES: BIOL 207, BIOL 208, CHMY 121 and CHMY 123.
- This course provides an introduction to the abnormal functioning of human cells, tissues, and organ systems, and the physiological adaptations that occur. Commonly encountered age-related variations are addressed. The influences of environment, genetics, nutrition, and culture are emphasized. Current research that explains the changes that accompany a particular syndrome or disease is considered.

N 239 HEALTH ASSESSMENT ACROSS THE LIFE SPAN
F, S 4 cr. LEC 2 LAB 2
PREREQUISITES: BIOL 207 and BIOL 208.
- This course is designed to teach the student a health oriented approach to nursing assessment of clients across the life span in a variety of community based settings. The primary focus of the course is on normal health assessment findings, with recognition of abnormal variations. This course emphasizes development of the skills needed to perform a comprehensive health assessment of clients in diverse settings. A data collection through comprehensive history taking and physical assessment is emphasized. Utilizations of assessment findings in clinical decision making is discussed throughout the course.

N 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

N 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: As determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

N 280R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
On Demand 1-3 cr. RCT may be repeated
COREQUISITE: N 280R
- Classroom instruction associated with directed undergraduate research/creative activity projects.

N 280R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
On Demand 1-6 cr. Maximum 12 cr.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

N 337 NURSING PHARMACOTHERAPEUTICS
F, S 3 cr. LEC 2 LAB 1
PREREQUISITES: CHMY 121, CHMY 123, HDFN 221, N 224, N 225 and N 229.
- The focus of this course is to examine pharmacotherapeutics in nursing practice. Clinical application of pharmacological and pathophysiological principles are integrated. Physical, psychological, social and cultural factors; age related variations; and alternative therapies are highlighted.

N 342 PSYCHOSOCIAL NURSING CONCEPTS
F, S 3 cr. LEC 2 LAB 1
PREREQUISITES: PSYX 100, SOCI 101, N 115, N 220, N 223, N 224 and N 239.
- This course explores selected psychosocial concepts and theories basic to nursing practice with clients in a variety of settings. Topics include family theory, palliative care, crisis theory, anxiety, loss, grief & other human responses; and related psychosocial nursing strategies.
N 348 NURSING CARE OF CHILDBEARING FAMILY
F, S 5 cr. LEC 2 LAB 3
PREREQUISITES: N 342, N 354 and N 337.
- The focus of this course is the nursing care of childbearing women, neonates and their families in a variety of settings. Normal pregnancy and childbirth are addressed, as well as the identification and management of high risk childbearing situations. Selected health care of women content is included.

N 349 NURSING CARE OF CHILDREN AND FAMILIES
F, S 5 cr. LEC 2 LAB 3
PREREQUISITES: N 224, N 337, N 342, and N 354.
- The focus of this course is the nursing care of children within the family context in a variety of settings. This course builds upon and integrates knowledge gained from nursing, sciences and the humanities.

N 354 ACUTE AND CHRONIC ILLNESS
F, S 5 cr. LEC 2 LAB 3
PREREQUISITES: N 223, N 224 and N 239.
COREQUISITE: N 337.
- The focus of this course is application of theoretical and empirical knowledge to nursing care for clients across the adult life span, with acute and chronic illness in a variety of settings. Health promotion, disease prevention, and symptom management are emphasized. This course builds upon and integrates knowledge gained from nursing, sciences and the humanities.

N 377 INTRODUCTION TO COMMUNITY BASED NURSING
F, S 5 cr. LEC 2 LAB 3
- The focus of this course is to introduce the student to community based nursing practice for individuals, families, populations and communities. There is emphasis on health promotion, disease prevention and health determinants in a variety of settings.

N 387 RESEARCH IN HEALTH CARE
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: STAT 216 or Consent of Instructor.
- Students are introduced to the research process and evidence-based practice. They develop knowledge, skills, and values necessary to be informed consumers of health related research. Students engage in research processes, examine research reports, and describe practice applications.

N 400 SEMINAR
On Demand 1-4 cr. SEM Maximum 12 credits
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

N 416 SUMMER INTERNSHIP
Su 5 cr. LAB 3
PREREQUISITE: Satisfactory completion of all 1st semester junior level clinical nursing courses. Placement subject to availability.
- This elective course is designed to increase competence and confidence in previously learned clinical skills. The student works with a registered nurse (RN) in a cooperating clinical agency for a period of intensified clinical experience.

N 418 ISSUES IN HEALTH POLICY AND HEALTH CARE ECONOMICS
F, S 2 cr. LEC 1 SEM 1
- Focus is on economics, public policy and political factors which affect the delivery of health and nursing care at the local, state, national and international levels. Students are encouraged to participate in efforts to influence health policy.

N 435 SPIRITUALITY IN HEALTH CARE
F, S 2 cr. RCT/DIS 2
PREREQUISITES: PSYX 100 and N 115 or consent of instructor.
- This elective course explores aspects of spirituality and the use of spiritually-based therapies in health care from various faith traditions. Spiritual assessment and spiritually-based strategies to promote health and wellness are emphasized. Although a multi-disciplinary approach to spiritual care is presented, a nursing perspective is highlighted.

N 457 PSYCHIATRIC NURSING
F, S 3 cr. LEC 2 LAB 3
PREREQUISITES: N 342 and N 377 and N 348 or N 349 or N 354.
- The focus of this course is nursing care of clients with acute and chronic psychiatric disorders, including psychopathology associated with major mental illness. Community based experiences provide opportunity for continued development of therapeutic skills. Social, cultural, spiritual and environmental issues influencing mental health are explored.

N 444 CARE MANAGEMENT
F, S 3 cr. LEC 2 RCT/DIS 1
PREREQUISITES: N 354 and N 387R.
- This course focuses on care management with application of ethical and legal concepts. The care management process is explored. Care management is examined as a method of managing health care.

N 454 URGENT AND PALLIATIVE CARE
F, S 6 cr. LEC 3 LAB 3
PREREQUISITE: N 354.
- The focus of this course is application of theoretical and empirical knowledge to nursing care for complex clients across the adult life span requiring urgent and palliative care in a variety of settings. Clinical decision making, triage and symptom management are emphasized. This course builds upon and integrates knowledge gained from nursing, sciences and the humanities.

N 469 CULTURAL APPLICATIONS IN NURSING: THE [SPECIFIC CULTURE] EXPERIENCE
F, S 2 cr. LEC 1 LAB 1
PREREQUISITE: Enrolled in the undergraduate nursing program.
- This elective course is designed as an intense but time-limited immersion into another culture and is focused on health benefits, health care, and nursing applications. The experience is preceded by analysis of cultural principles applicable to nursing and conducted by analysis of actual clinical participation with [specific culture] nurses and clients.

N 470 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITES: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

N 477 POPULATION BASED NURSING CARE IN THE COMMUNITY
F, S 6 cr. LEC 3 LAB 3
PREREQUISITES: N 347 and N 454.
- The focus of this course is the health and well-being of the community. Global and national health problems are examined from a public health perspective. Community assessment and epidemiologic methods are used to identify populations at risk and potential areas for intervention.

N 489 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

N 485 NURSING LEADERSHIP AND MANAGEMENT
F, S 6 cr. LEC 3 LAB 3
PREREQUISITES: N 437, N 444 and N 454.
- Senior capstone course. The focus of this course is to provide an integration of theory and skill development in leadership, management and organizational concepts for the design, coordination, and management of health care using the community based philosophy.

N 489R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY INSTRUCTION
On Demand 1-2 cr. RCT May be repeated.
Max 4 cr.
PREREQUISITE: Junior standing.
COREQUISITE: N 490R.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

N 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
On Demand 1-6 cr. IND May be repeated.
Max 12 cr.
PREREQUISITE: Junior standing.
COREQUISITE: N 489R.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

N 500 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

N 561 TEACHING CONCEPTS FOR NURSING EDUCATORS
F 2 cr. LEC 2
PREREQUISITE: Graduate Standing.
- Designed for students interested in nursing education (academic or practice environment). Emphasizes teaching strategies and delivery of nursing education for diverse learners in a variety of settings. Roles and responsibilities are explored. Includes history and evolution of teaching and learning.
N 501 EFFECTIVE CLINICAL TEACHING
S 2 cr. LEC 2
PREREQUISITE: Graduate Standing.
- Focuses on educator roles and responsibilities in teaching clinical nursing (academic or practice environments). Designed for students interested in developing clinical teaching skills. Major themes include development of learning activities, evaluation of student performance, concepts of student supervision, and agency cooperation.

N 503 CURRICULUM DEVELOPMENT
Su, alternate years, to be offered Su even years 5 cr. LEC 5
PREREQUISITE: Graduate Standing.
- Theories and models of curriculum development are explored and designed for nurses teaching in either academic or practice environments. Variables associated with design and planning of educational interventions are explored. Students synthesize appropriate theoretical concepts to develop a model curriculum.

N 504 ASSESSMENT AND EVALUATION OF EDUCATION
Su, alternate years, to be offered Su odd years 3 cr.
LEC 3
PREREQUISITE: Graduate Standing.
- Students engage in discussions around design, assessment, and evaluation of instruction by nurses. Topics include writing instructional objectives and constructing activities to assess student learning outcomes. Students complete a project to gain skills in evaluating learning related to a specific unit of study.

N 505 EVIDENCE BASED PRACTICE
F 4 cr. LEC 4
PREREQUISITE: N 387 (or equivalent) and STAT 216 (or equivalent).
- This course focuses on the various methods and processes used to translate knowledge into evidence based practice. Students explore processes for acquiring, evaluating and using knowledge for clinical practice in both rural and urban areas.

N 506 MANAGEMENT OF CARE ENVIRONMENTS
S 4 cr. LEC 3 LAB 1
PREREQUISITE: N 565
- Introduces the role of Clinical Nurse Leader, examines internal and external forces which affect care delivery in a variety of settings within health-care systems and organizations. Opportunity to learn strategies for team coordination, quality management, and risk reduction. Healthcare informatics is included.

N 507 MANAGEMENT OF CLINICAL OUTCOMES
S 4 cr. LEC 5 LAB 1
PREREQUISITE: N 505, N 506, N 517, N 550, and N 560 or consent of instructor.
COREQUISITE: N 506.
- Focus on dynamic leadership, clinical decision-making models, and management of clinical outcomes for groups of clients across the wellness-illness continuum. Students apply evidence-based practice and knowledge management strategies to ensure optimum care in rural and urban environments.

N 508 CLINICAL LEADERSHIP PRACTICUM
F, S, Su 8 cr. LAB 8
PREREQUISITE: N 505, N 506, and N 567.
- This course is an immersion clinical practicum. Students practice Clinical Nurse Leader competencies in their selected health care environment(s) to design, manage, and evaluate care to improve health outcomes for a selected population.

N 517 FOUNDATIONS OF PHARMACOTHERAPEUTICS
F 1 cr. LEC 1
PRE or COREQUISITE: N 560, graduate standing, or consent of instructor.
- Introduces the student to the essentials of pharmacotherapy for advanced practice nurses. Provides a basis for understanding the pharmacokinetics and actions of selected classes of drugs commonly used in primary care practice. Legal and ethical considerations of prescriptive practice are addressed.

N 518 PHARMACOTHERAPEUTICS FOR INFANTS, CHILDREN, AND ADULTS OF CHILDBEARING AGE
S 1 cr. LEC 1.
PREREQUISITE: N 517 or consent of instructor.
- Addresses pharmacological intervention in managing common health problems of midlife adults and their families. Students will apply knowledge of medication management of commonly encountered pediatric and women’s health care concerns.

N 519 PHARMACOTHERAPEUTICS FOR MIDDLE AGE ADULTS
Su 1 cr. LEC 1
PREREQUISITE: N 517 or consent of instructor.
- Addresses pharmacological intervention in managing common health problems of midlife adults and their families. Students will apply knowledge of pharmacological management of commonly encountered health problems of middle aged adults.

N 520 PHARMACOTHERAPEUTICS FOR OLDER ADULTS
F 1 cr. LEC 1
PREREQUISITE: N 517 or consent of instructor.
- Addresses pharmacological interventions in managing common health problems of elders and their families. Students will apply knowledge of pharmacological management of commonly encountered health problems for the aging population. Regulatory issues regarding prescriptive practice for APRNs are addressed.

N 521 THEORY AND RESEARCH IN NURSING
F 5 cr. LEC 5.
PREREQUISITE: N 387 (or equivalent) and STAT 216 (or equivalent).
- Provides an overview of the interrelationships among theory, research and practice. Students explore patterns and processes for acquiring knowledge and the utilization of knowledge in clinical practice.

N 522 ADVANCED PRACTICE NURSING: ROLES AND ISSUES
S 2 cr. LEC 1 RCT 1.
PREREQUISITE: Graduate standing or consent of instructor.
- Introduction to theoretical foundations and competencies of advanced practice nursing and employment settings in which advanced practice nursing may occur. Emphasis on history and development of advanced practice nursing, roles, role transition, spheres of influence, core competencies, and target outcomes.

N 525 FAMILY MENTAL HEALTH NURSING I
S 6 cr. LEC 3 LAB 3.
- Students will explore the role and scope of advanced psychiatric nursing, legal/ethical issues, and nurse practitioner/patient relationship. Emphasis on advanced mental health nursing assessment, diagnosis, and managing mental health problems and psychiatric disorders for individuals and families within culturally diverse environments.

N 526 FAMILY MENTAL HEALTH NURSING II
Su 6 cr. LEC 3 LAB 3.
PREREQUISITE: N 525.
- Students explore conceptual and theoretical foundations for psychotherapy, selected therapeutic modalities for individuals, group psychotherapy, selected therapeutic modalities for individuals, group psychotherapy, and integration of multicultural skills for health promotion and management of mental health problems and psychiatric disorders. Work with individuals and groups across the lifespan within culturally diverse environments.

N 531 RURAL HEALTH NURSING
S 3 cr. LEC 2 LAB 1
PREREQUISITE: N 521 or consent of instructor.
- This course focuses on the health concerns, issues, and trends facing individuals and populations in rural areas. Rural environments will be assessed and data from a variety of sources will be analyzed through systematic approaches. Students will have the opportunity to build and expand upon rural nursing theory.

N 530 ADVANCED HEALTH ASSESSMENT
F 3 cr. LEC 2 LAB 1
- This course consists of study modules and videos based on various components of health assessment with emphasis on rural populations. Students will be required to demonstrate assessment competency to faculty.

N 552 ADMINISTRATION AND ORGANIZATION OF HEALTH CARE SYSTEMS
F 2 cr. LEC 2
- This course focuses on nursing leadership in community-focused health care systems. Emphasis is on organizational structure, culture, change and behavior. Traditional elements of leadership are blended with emerging nursing theory to strategically energize current and developing health care systems.

N 553 FINANCING AND BUDGETING OF HEALTH CARE SYSTEMS
S 2 cr. LEC 2
- This course focuses on the application of fiscal management principles of health care systems. Emphasis is on health care economics, fiscal management and budgeting concepts.

N 555 CONCEPTS OF FAMILY CARE
S 2 cr. LEC 2
PREREQUISITE: N 521 or consent of instructor.
- Analysis and synthesis of family theories from nursing and other disciplines to form a family-focused foundation for application in advanced practice nursing. Related concepts and theories are analyzed as a basis for understanding the principles of family assessment. Emphasis is placed on family health promotion, nursing of families within a rural context and the influence of culture on family health.

N 560 ADVANCED PHYSIOLOGY AND PATHOPHYSIOLOGY
F 4 cr. LEC 4
- Focuses on a comprehensive study of the physiological functioning and common pathophysiological alterations in human organs and systems.
N 561 PRIMARY CARE I FOR CHILDBEARING AND CHILDREARING FAMILIES
S 6 cr. LEC 3 LAB 3
COREQUISITE: N 531 and N 553.
- Focuses on comprehensive assessment, intervention and preventive care for childbearing and childrearing families in primary health care for the advanced practice nurse. Includes content on physiological, pathophysiological, psychological, developmental, sociocultural and spiritual care.

N 562 PRIMARY CARE II FOR MIDLIFE FAMILIES
Su 6 cr. LEC 3 LAB 3
PREREQUISITE: N 561.
- This course includes content on the physiological, pathophysiological, psychological, development, sociocultural and spiritual primary health care needs of midlife families. Addresses assessment, intervention and preventive care.

N 563 PRIMARY CARE III FOR AGING FAMILIES
F 6 cr. LEC 3 LAB 3
PREREQUISITE: N 562.
- Assessment, treatment and preventive care for aging families in primary health care settings. Physiological, pathophysiological, psychological, developmental, sociocultural and spiritual responses to acute and chronic conditions will be explored along with the advocacy role of the nurse practitioner.

N 565 PRINCIPLES OF POPULATION-BASED HEALTH
F 3 cr. LEC 2 LAB 1
PREREQUISITE: N 477 or equivalent, N 578 or equivalent and STAT 216 or equivalent.
- Emphasizes public health concepts and skills essential to community-oriented leadership and practice in rural communities; concepts of risk, epidemiology, biostatistics, health planning, community empowerment, and resource development. The values on health promotion and disease prevention are explored.

N 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

N 571 PRIMARY CARE IV: CLINICAL PRECEPTORSHIP
S 6 cr. LAB 6
PREREQUISITE: Final semester of course work.
- This practicum allows students to further refine family nurse practitioner skills in practice settings such as family health, pediatrics, women’s health or gerontology or a broad based general practice based on availability.

N 574 TEACHING PRACTICUM
F, S, Su LAB 1 - 4 cr.
PREREQUISITE: N 540 or consent of instructor.
- Teaching/learning principles are integrated into nursing education in academic or practice environments. Students practice, observe, and evaluate teaching/learning processes. The instructor and student negotiate laboratory activities.

N 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

N 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

N 581 CLINICAL NURSE SPECIALIST PRACTICE I
S alternate years, starting even years
6 cr. LEC 3 LAB 3
PREREQUISITE: N 550, N 560, and N 521 or consent of instructor.
COREQUISITE: N 522 or consent of instructor.
- Focus on clinical management of adults with complex health care problems of selected body systems. Seminars and supervised practica allow students to develop CNS competencies. Emphasis is placed on the patient/client sphere of CNS influence.

N 582 CLINICAL NURSE SPECIALIST PRACTICE II
F alternate years, starting even years
6 cr. LEC 3 LAB 3
PREREQUISITE: N 550, N 560, and N 521 or consent of instructor.
COREQUISITE: N 552 or consent of instructor.
- Focus on clinical management of adults with complex health care problems of selected body systems. Seminars and supervised practica provide opportunity for students to develop CNS competencies. Emphasis is placed on the nurses/nursing practice sphere of CNS influence.

N 583 CLINICAL NURSE SPECIALIST PRACTICE III
S alternate years, starting odd years
6 cr. SEM 1 LAB 5
PREREQUISITE: N 581, N 582 PRE or COREQUISITE: N 553
- Capstone course. Students implement the CNS role with adults with complex health problems. Emphasis on professional philosophy, scope of practice, collaborating within a multidisciplinary health care team, and working within health care systems to improve client outcomes.

N 589 GRADUATE CONSULTATION
F, S, Su 5 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

N 590 MASTER’S THESIS
F, S, Su 10 cr. IND May be repeated.
PREREQUISITE: Master’s standing.

NAS
Native American Studies
Department of Native American Studies
(406) 994-3881

NASC 001 SELECTED ISSUES IN PERSONAL DEVELOPMENT
F 2 cr. RCT 2
- For students making an adjustment to university life. Topics include study skills, goal setting, decision making, time management, and personal issues that face college students.

NAS 100D INTRODUCTION TO NATIVE AMERICAN STUDIES
F, S 3 cr. LEC 3
- A survey of traditional and contemporary American Indian cultures, the historical development of the unique relationship between the federal government and Indian nations, and current issues among Indian peoples.

NAS 200D AMERICAN INDIANS IN MONTANA
S 3 cr. LEC 3
- Movements of Indians into Montana. Social structures including kinship, political affiliations; military, warrior societies, and religion. Establishment of Montana’s reservations; treaties and agreements with the federal government; vested rights of Indians; sovereignty and self-government; contemporary tribal governments; contemporary Indian societies; socioeconomic problems.

NAS 220 AMERICAN INDIAN ART
F 3 cr. LEC 3
- The aesthetic, cultural, and symbolic meanings of traditional and contemporary American Indian art: Plains, Southwestern, Northwest Coast, and Inuit art and artists.

NAS 240S NAS THEORIES & METHODS
S 3 cr. SEM 3
PREREQUISITE: NAS 100, INTRODUCTION TO NAS.
- This course critically examines the political and academic foundations of Native American Studies. It analyzes the theoretical and methodological underpinnings, emphasizing indigenous paradigms and practices. Students are expected to think analytically, participate in discussion, and do original research.

NAS 242D AMERICAN INDIANS IN CONTEMPORARY SOCIETY
F 3 cr. LEC 3
- Selected contemporary economic, social, political, educational, and cultural issues facing American Indians today, with special emphasis on tribal groups in Montana.

NAS 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Max 6
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

NAS 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
NAS 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, Su 1 - 2 cr. RCT
COREQUISITE: NAS 290.
- Classroom instruction associated with directed undergraduate research and creative activity projects.

NAS 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 8 cr. RCT
PREREQUISITE: Consent of department head.
- Directed undergraduate research/creative activity. Course will address responsible conduct of research.

NAS 315 NATIVE AMERICAN INDIANS AND THE CINEMA
F alternate years, to be offered odd years 3 cr. LEC 3
- Analysis of images and representations of American Indians in feature, independent, and telefilms based in a cultural studies approach to film and film production. Considerable attention is given to Indigenous aesthetics

NAS 320 AMERICAN INDIAN RELIGIONS
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing
- An in-depth analysis of specific contemporary and historic, tribal, and pan-Indian beliefs. Basic elements of Native American religions are defined from the perspective of the practitioner’s understanding of their contributions to distinct cosmologies. The legal protection of Native American religions frames the analysis.

NAS 325 NATIVE PEOPLES OF THE AMERICAS
8 alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing
- Histories and cultures of representative Native peoples of North, Central, and South America; impact of European discovery, conquest and colonization; political, social, and economic developments from pre-Columbian to present times including contemporary issues facing the indigenous peoples of the Americas.

NAS 340 AMERICAN INDIAN LITERATURE
F, S 3 CR. LEC 3
PREREQUISITE: Junior standing
- Traditional and contemporary Native American literature including oral narratives, folktales, poetry, short stories, essays, and the novel. Methods of literary analysis will be explored to assist students in determining the meaning and function of the various genres.

NAS 345 NATIVE FOOD SYSTEMS
8 alternate years, to be offered even years 5 cr. LEC 1 SEM 2
PREREQUISITE: NAS 100 or NAS 201 and upper division standing.
- This course engages indigenous practices and beliefs, focusing particularly on the food systems of the Native Americans, and using comparative data from across time and place. Of specific interest are dynamic connections between Native foods and the health of people and place, both traditionally and in societies affected by colonization and rapid cultural change.

NAS 425 PAN-INDIANISM IN AMERICAN SOCIETY
S alternate years, to be offered even years 3 cr. LEC 2 RCT 1
PREREQUISITE: NAS 242.
- The course is a broad study of Pan-Indianism as a cultural mechanism that both empowers and victimizes American Indian identity. Lectures and discussions will cover the sources and scope of the social, economic, spiritual and political aspects of Pan-Indianism, drawing from history, literature, political science and anthropology.

NAS 426 FEDERAL INDIAN LAW & POLICY
S 3 cr. LEC 3
PREREQUISITE: NAS 100, and junior standing.
- Survey of institutions, laws, cultures, and political forces which shaped federal Indian policy from colonial times to the present. Examination of primary documents, treaties, case law, and agencies which are the foundations of federal relationships with Indian Tribes. (Formerly NAS 330).

NAS 430 AMERICAN INDIAN EDUCATION
S alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: Junior standing, WRIT 101W, NAS 201.
- Historical development and contemporary directions in American Indian education, values and assumptions inherent in programs devised at the state and federal levels and their results, the cultural basis of Indian education, and selected materials appropriate to the various educational levels.

NAS 445 INDEPENDENT OFFERED
On Demand 1 - 3 cr. IND
- Directed research and study on an individual basis.

NAS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

NAS 476 INSTRUCTION
On Demand 2-12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

NAS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisite as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NAS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: NAS 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

NAS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

NAS 500 SEMINAR
On Demand 1-4 cr. SEM
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

NAS 520 FEMINIST AND GENDER ISSUES IN NATIVE AMERICAN STUDIES
On Demand 3 cr. LEC 3
PREREQUISITE: NAS 100 or equivalent and NAS 420 or equivalent.
- This course is designed to explore gender issues in Native American Studies. It will critically explore the problems and points of conflict between Native American women’s gender concerns and Euroamerican feminist theories.

NAS 521 TRIBAL GOVERNMENT: YESTERDAY AND TODAY
On Demand 3 cr. LEC 3
PREREQUISITE: NAS 100 or equivalent and NAS 420 or equivalent.
- The course examines the complexities of American Indian governments’ organization, their histories, and the unique relationship between the Federal government and American Indian tribes. The course highlights several models of both traditional and contemporary tribal governance systems.

NAS 523 AMERICAN INDIANS AND MINORITIES IN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: NAS 100 OR NAS 242.
- The course will develop and build the students’ understanding of the historical and current situation of American Indians and other minorities in the U.S. higher education. It will also focus on the unique place of tribal colleges in the U.S. higher education.

NAS 524 CONTEMPORARY ISSUES IN AMERICAN INDIAN STUDIES
F to be offered even years 3 cr. LEC 3
PREREQUISITE: NAS 320 or NAS 340 or equivalent.
- The course is intended to develop and refine the students’ knowledge of the historical background of American Indian issues and how history now affects the contemporary issues facing American Indians.

NAS 525 AMERICAN INDIANS AND EUROPEAN RELATIONS
F, S, Su 1 - 8 cr. IND
PREREQUISITE: NAS 320 or NAS 340 or equivalent.
- This course begins by examining Indigenous philosophies of sacred ecologies, contrasting these views with those held by European ways of understanding the natural world. It traces the impact of patriarchy on Indigenous peoples of the United States, and the colonial milieu of the United States and engages students in the methods of cultural anthropology.

NAS 526 NATIVE AMERICAN LIT. IN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: NAS 100 or NAS 242.
- The course begins by examining Indigenous philosophies of sacred ecologies, contrasting these views with those held by European ways of understanding the natural world. It traces the impact of patriarchy on Indigenous peoples of the United States, and the colonial milieu of the United States and engages students in the methods of cultural anthropology.

NAS 527 AMERICAN INDIAN LIT. IN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: NAS 100 or NAS 242.
- The course begins by examining Indigenous philosophies of sacred ecologies, contrasting these views with those held by European ways of understanding the natural world. It traces the impact of patriarchy on Indigenous peoples of the United States, and the colonial milieu of the United States and engages students in the methods of cultural anthropology.

NAS 528 NATIVE AMERICAN LIT. IN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: NAS 100 or NAS 242.
- The course begins by examining Indigenous philosophies of sacred ecologies, contrasting these views with those held by European ways of understanding the natural world. It traces the impact of patriarchy on Indigenous peoples of the United States, and the colonial milieu of the United States and engages students in the methods of cultural anthropology.
NAS 530 FEDERAL LAW AND INDIAN POLICY
F S cr. LEC 3
PREREQUISITE: NAS 100 or NAS 330 or equivalent.
- Advanced analysis of theories, doctrines, case law, and legislation with a focus on key legal and policy concerns for contemporary Native American including treaties, criminal jurisdiction, land, environmental regulation, water rights, fishing and hunting, child welfare, gaming, taxation, repatriation, and religious freedom.

NAS 540 THEORETICAL POSITIONS IN NATIVE AMERICAN STUDIES
F 3 cr. LEC 3
PREREQUISITE: NAS 100 or NAS 330 or equivalent.
- An introduction to the central conceptualizations of the academic discipline of Native American Studies and several of the theoretical paradigms operative within it. Students will gain an understanding of the contributions of Native American Studies to theoretical understandings within, across, and beyond dominant academic disciplines.

NAS 541 A CRITICAL APPROACH TO NAS METHODOLOGIES
S 3 cr. LEC 3
PREREQUISITE: NAS 540 or equivalent.
- A critical survey of the interdisciplinary approaches used in NAS grounded in a sociopolitical context with emphasis on ethical questions raised by research of Native Americans. Students receive individual attention toward formulating an effective methodology for their master’s project.

NAS 550 NATIVE AMERICA: DISPELLING THE MYTHS
F 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- This course is designed around a series of commonly held assumptions or “myths”. When unexamined, these assumptions undermine our ability to communicate across cultures, and ultimately form the basis for some of the worst forms of racism and stereotyping. We wrestle with these preconceptions while learning the most basic elements of American Indian—which is to say American history.

NAS 551 AMERICAN INDIAN ART SURVEY
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Exploration of the functions and purposes of the unique arts of North American indigenous peoples by culture area, in both the past and the present, within the overlapping contexts of culture area policies, cosmology, religion and spirituality, and gender.

NAS 560 NATIVE AMERICAN LITERARY TRADITIONS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: NAS 340.
- A survey of prose writing, mainly long fiction, by and about contemporary Native Americans.

NAS 570 INDEPENDENT STUDY
On Demand 1-3 cr. END
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

NAS 575 PROFESSIONAL PAPER
F, S, Su 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

NAS 576 INTERNSHIP
F, S, Su 1-6 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

NAS 580 SPECIAL TOPICS
On Demand 1-4 cr. RCT Maximum 6 cr.
PREREQUISITE: Upper division courses and others determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NAS 589 GRADUATE CONSULTATION
F, S, Su 5 cr. TUT 3
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by graduate students who have completed all of their course work and their theses, if on a thesis plan, but who need additional faculty or staff time and assistance.

NAS 590 MASTER’S THESIS
F, S, Su 1-10 cr. May be repeated.
PREREQUISITE: Master’s standing.

PHIL Philosophy
Department of History & Philosophy
(406) 994-4395

PHIL 105H PROBLEMS OF GOOD & EVIL
F, S 3 cr. LEC 3
- An examination from a multi-cultural perspective of traditional conceptions of good and evil and their implications for relativism.

PHIL 120HI REASON AND REALITY
F, S 3 cr. LEC 3
- Exploration of the nature of reality and human knowledge. A critical look at the presuppositions of our common sense world view.

PHIL 208D PHILOSOPHY AND CULTURE
S 3 cr. LEC 3
PREREQUISITE: Sophomore standing or consent of instructor.
- Addresses questions of how philosophy and culture interact, as well as exploring the differences and commonalities between philosophical traditions. Themes include social justice, identities, society, and culture.

PHIL 215 SOCIAL AND POLITICAL PHILOSOPHY
On Demand 3 cr. LEC 3
- Philosophical problems about the nature of the state and society and their relationship to the individual.

PHIL 220 PHILOSOPHIES OF ASIA
S 3 cr. LEC 5
- A critical examination of some classical school of Asian philosophy such as Confucianism, Hinduism, or Buddhism.

PHIL 255CS SCIENCE, PSEUDO-SCIENCE AND SUBJECTIVITY
On Demand 3 cr. LEC 3
- Introduces both deductive and inductive aspects of scientific reasoning as a foundation for addressing broader questions such as, “Is there demarcation between science and non-science?”; “Is science subjective?”; “Is scientific knowledge cumulative?”; and many more.

PHIL 255CS OTHER ANIMALS
On Demand 3 cr. LEC 3
- Explores how animals have been understood over time from scientific, philosophical, and cultural perspectives, in the East as well as in the West. The understanding of both morphology and behavior will be examined in terms of classical Darwinian and Japanese approaches. The various methodologies employed, their underlying assumptions and possible limits, will be discussed, as well as the larger moral issues that they raise.

PHIL 251 INTRODUCTION TO LOGIC
F, S 3 cr. LEC 3
- Modern forms of valid inference with applications.

PHIL 259RH MORALITY AND SOCIETY
On Demand 3 cr. LEC 3
PREREQUISITE: Consent of instructor.
- The philosophcal study of contemporary moral issues such as capital punishment, euthanasia, racism, and terrorism. The term will culminate in a substantial piece of original research on a moral issue chosen by the individual student.

PHIL 280 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHIL 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

PHIL 290R UNDERGRADUATE RESEARCH/CREATIVITY INSTRUCTION
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

PHIL 355RH HISTORY OF WESTERN PHILOSOPHY: ANCIENT & MEDIEVAL
F 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Great systems of philosophic thought and their origins during ancient and medieval times.

PHIL 356 HISTORY OF WESTERN PHILOSOPHY: MODERN
S 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Foundations of contemporary thought, Descartes to Kant.
COURSE DESCRIPTIONS: PHIL 311 - PHIL 490R

PHIL 311 AESTHETICS AND THE ARTS
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Philosophical examination of the nature and function of the arts and the aesthetic experience.

PHIL 313 PHILOSOPHY AND FILM
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or permission of instructor.
- Philosphic study of the moving image. Examines topics such as ontology of the image, theory of cinematic narrative, problem of realism versus illusion in film, its aesthetic, moral, and cultural value; and what constitutes appropriate interpretative activity in judging film.

PHIL 320 PHILOSOPHY OF RELIGION
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Analysis of concepts of God, revealed truth, and immortality; the nature of religious emotion and experience, and of religious language; relation of faith to reason; traditional proofs of God's existence; the problem of evil; religious diversity; spirituality.

PHIL 325R STATE, COMMUNITY AND INDIVIDUAL
On Demand 3 cr. LEC 3
PREREQUISITE: One course in Philosophy or consent of instructor.
- The philosophical study of the state and society. Topics include the nature and limits of political legitimacy and the nature of just economic systems.

PHIL 332 ETHICS
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of general moral theory with applications to moral problems of current interest such as abortion, the legal enforcement of morality, the death penalty, and nuclear war.

PHIL 334 MORAL THEORY
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of 20th Century moral theory. The focus is on such issues as whether morality is objective or subjective as well as methods of moral reasoning.

PHIL 338 BIO-MEDICAL ETHICS
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of moral problems in medicine such as abortion, euthanasia, human experimentation, and the distribution of scarce medical resources.

PHIL 340 ENVIRONMENTAL ETHICS
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- This course reviews the major readings, both classical and contemporary, on environmental ethics, and isolates the major issues. It provides the appropriate theoretical background. It applies these readings and this background to the investigation and resolution of several environmental policy questions.

PHIL 342 APPROACHES TO EPISTEMOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- The course gives an introduction to some epistemological problems like the problem of skepticism, the problem concerning the nature of justification, the problem of induction, and the problem associated with the nature and existence of God. It offers three approaches: traditional, naturalized, and Bayesian approaches to some of the problems mentioned above.

PHIL 352 METAPHYSICS
S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- The most basic questions human beings raise in reflecting on their world, themselves and their place in the world. Sample questions concern the possibility of freedom, the relation of mind and brain, and the nature of being.

PHIL 360 EXISTENTIALISM AND AFTER
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Existentialism and related developments including phenomenology and post modernism.

PHIL 362 PHILOSOPHY AND RACE
F alternate years, to be offered even years, 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Examines the development of the concept of race in philosophy since the 17th century. Traces the effects race has had on concepts such as the person, self-respect, rationality, knowledge, state of nature, science, social justice, and ordinary life.

PHIL 363 PHILOSOPHY AND FEMINISM
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Philosophical analysis of concepts and assumptions central to feminist theories. Topics may include the nature of gender and oppression, masculinity, the relationship between sexism and other forms of oppression, the ideal society, and feminist challenges to traditional philosophical theories.

PHIL 364 CONTEMPORARY PHILOSOPHY
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- This course introduces students to recent trends in analytical philosophy. Among the topics the course addresses are philosophy of mind that involves problems concerning the mind/body relationship, the nature of consciousness, artificial intelligence, and others.

PHIL 365 PHILOSOPHY OF MIND & CONSCIOUSNESS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- In this course we will examine different philosophical theories regarding the workings of the mind and the nature of consciousness. Are you the same thing as your mind? What is thought? Is conscious experience explainable by the physical sciences?

PHIL 368 LANGUAGE AND THE WORLD
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- A discussion of linguistic meaning, the concept of truth, and the relation between thought and language as viewed by contemporary philosophers.

PHIL 378 PHILOSOPHY OF SCIENCE
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of the concepts of explanation, confirmation, and theory and their application to classic works in the history of the natural and social sciences.

PHIL 388 PHILOSOPHY OF TECHNOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of certain concepts used to describe and explain technology and their application to questions concerning the limitations of a technological way of life.

PHIL 390 REASON AND REVOLUTION
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of the scope and limits of reason and their role in revolution as exemplified in Hegel, Marx, and other nineteenth century philosophers.

PHIL 400 SEMINAR
F, S 3 cr. SEM Maximum 9 cr.
PREREQUISITE: Junior standing.
- Senior capstone course. Each semester is given over to the detailed study of a major figure or problem in philosophy. Since the figures and problems studied vary from semester to semester, the course may be repeated for credit. Two semesters of Phil 400 are required for all philosophy majors.

PHIL 470 INDEPENDENT STUDY
On Demand 1 - 6 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

PHIL 489 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHIL 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: PHIL 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

PHIL 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S Su 1 - 6 cr. Ind May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.
PHIL 500 SEMINAR
On Demand 3 cr. SEM Maximum 4 cr
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHIL 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head, and Division of Education.
- Directed research and study on an individual basis.

PHYS

Physics
Department of Physics
(406) 994-3614

PHYS 101N MYSTERIES OF THE SKY
F, S, Su 3 cr. LEC 3
- An introduction to contemporary astronomy that explores the nature, methods, and limitations of scientific inquiry within the context of our struggle to understand the structure and evolution of the Universe. Topics include the history of astronomy, motions of the night sky, the solar system, stellar evolution, galaxies, and cosmology.

PHYS 102N MYSTERIES OF THE UNIVERSE
Su 4 cr. LECT 3 RCT 1
- An introduction to contemporary astronomy that explores the nature, methods, and limitations of scientific inquiry within the context of our struggle to understand the structure and evolution of the Universe. Topics include the history of astronomy, motions of the night sky, the solar system, stellar evolution, galaxies, and cosmology. In addition to lectures, students spend one full class each week working in teams on a series of lab-like exercises designed to reinforce the learning of key concepts. Students may only count one of PHYS 101 and PHYS 102 toward meeting graduation requirements.

PHYS 103N THE PHYSICS OF HOW THINGS WORK
F 3 cr. LEC 3
PREREQUISITE: High School Algebra.
- A practical approach to a broad array of fundamental topics in physics for non-science majors taught by analyzing things that are used and observed in everyday life. Classroom demonstrations will provide the opportunity for in-class analysis, discussions, and hands-on activities. Physics principles will be used to scrutinize issues such as energy and recycling from economic and environmental perspectives. The latest technology in transportation, electronics, and energy production will be analyzed. The connection between basic research in physics and modern technology will be examined. Students will not receive credit if they have passed PHYS 205, PHYS 211, or PHYS 221.

PHYS 200 RESEARCH PROGRAMS IN PHYSICS
F 1 cr. LEC 1
- An introduction to some of the exciting ideas, developments, problems, and experiments of modern day physics.

PHYS 201N PHYSICS BY INQUIRY
F, S 3 cr. LAB 3
- An indepth exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of properties of matter, observational astronomy, and DC electric circuits. For pre-service elementary teachers.

PHYS 205 COLLEGE PHYSICS I
F, S, Su 4 cr. LEC 5 LAB 1
PREREQUISITE: High school trigonometry or M 151.
- First semester of sequence. Topics include kinematics and dynamics of linear and rotational motion; work and energy; impulse and momentum; and fluids. Students will not receive credit if they have passed PHYS 211 or PHYS 221.

PHYS 206 COLLEGE PHYSICS II
F, S, Su 4 cr. LEC 5 LAB 1
PREREQUISITE: PHYS 205 or PHYS 211.
- Second semester of sequence. Topics include simple harmonic motion; electric forces and fields; dc electric circuits; magnetic forces and fields; and magnetic induction and motors. Students will not receive credit if they have passed PHYS 212 or PHYS 222.

PHYS 211 GENERAL AND MODERN PHYSICS I
F, S 4 cr. LEC 3 LAB 1
COREQUISITE: M 171 or M 181
- First semester of a three-semester sequence primarily for engineering and physical science students. Covers topics in mechanics (such as motion, Newton’s laws, conservation laws, work, energy, systems of particles, and rotational motion) and in mechanical waves (such as oscillations, wave motion, sound, and superposition).

PHYS 212 GENERAL AND MODERN PHYSICS II
F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: PHYS 211 or PHYS 221; M 171 or M 181
COREQUISITE: M 172 or M 182
- Covers topics in electricity and magnetism (such as Coulomb’s law, Gauss’ law, electric fields, electric potential, dc circuits, magnetic fields, Faraday’s law, ac circuits, and Maxwell’s equations) and optics (such as light, geometrical optics, and physical optics).

PHYS 213 GENERAL AND MODERN PHYSICS III
F 4 cr. LEC 3 LAB 1 (“Will be offered in Spring 2011 and Fall 2011 and Fall terms thereafter”)
PREREQUISITE: PHYS 212 or PHYS 222; M 172 or M 182
- Covers topics in thermodynamics (such as temperature, heat, laws of thermodynamics, and the kinetic theory of gases) and modern physics (such as relativity; models of the atom; quantum mechanics; and atomic, molecular, solid state, nuclear, and particle physics).

PHYS 221 HONORS GENERAL AND MODERN PHYSICS I
F 4 cr. LEC 3 LAB 1
COREQUISITE: M 171 or M 181.
- The honors section of PHYS 211. The concepts are discussed in more depth and the range of applications is greater.

PHYS 222 HONORS GENERAL AND MODERN PHYSICS II
F 4 cr. LEC 5 LAB 1 (also offered Fall 2010)
PREREQUISITE: PHYS 211 or PHYS 221; M 171 or M 181.
COREQUISITE: M 172 or M 182.
- The honors section of PHYS 212. The concepts are discussed in more depth and the range of applications is greater.

PHYS 231 INTRODUCTION TO THEORETICAL PHYSICS
S 3 cr. LEC 5
PREREQUISITE: PHYS 273 or M 283; PHYS 212 or PHYS 222.
- Mathematical methods essential to the practice of theoretical physics, such as matrices, vector calculus, differential equations, complex variables, and Fourier series, with applications to examples from mechanics and electromagnetism.

PHYS 253 PHYSICS OF PHOTOGRAPHY
F 2 cr. LEC 2
PREREQUISITE: High school algebra.
- Improvement of photographic skills through an understanding of the basic principles of photography. The nature of light and color and the physical principles involved in the operation of a camera will be presented. Unusual effects and recent developments will be discussed. Numerous demonstrations, photographs, and slides will be used to illustrate the principles.

PHYS 261 LABORATORY ELECTRONICS I
F 2 cr. LEC 1 LAB 1
COREQUISITES: PHYS 212 or PHYS 222.
- Laboratory electronic measurements and analysis, and design of basic linear circuits.

PHYS 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed study on an individual basis.

PHYS 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHYS 290 UNDERGRADUATE RESEARCH
F, S, Su 1 - 6 cr. RCT
PREREQUISITE: Consent of instructor and approval of department head.
- Directed undergraduate research. Course will address responsible conduct of research.

PHYS 301 CLASSICAL MECHANICS
F 4 cr. LEC 4
COREQUISITE: PHYS 212 or PHYS 222; PHYS 231.
- Principles of Newtonian, Lagrangian, and Hamiltonian mechanics including single particle motion, systems of particles, rigid body motion, moving coordinate systems, and small oscillations.
PHYS 311 SOLAR SYSTEM ASTRONOMY
F, Su on demand 4 cr. LEC 3 LAB 1
PREREQUISITE: PHYS 205, PHYS 211, or PHYS 221.
COREQUISITE: PHYS 206, PHYS 212, or PHYS 222.
— Covers the origin and evolution of our solar system, including detailed examinations of the sun, earth, moon, other planets, and satellites. Exciting new discoveries and emerging research results will be integrated into the course. The laboratory operates in a "project mode" and includes experiments with models that can be done indoors as well as with the use of telescopes.

PHYS 312 INTRODUCTION TO ASTRONOMY
S alternate years, to be offered odd years 4 cr. LEC 3 LAB 1
PREREQUISITE: PHYS 205, PHYS 211, or PHYS 221, or the equivalent.
COREQUISITE: PHYS 206, PHYS 212, or PHYS 222, or the equivalent.
— After reviewing basic classical astronomy on the properties, structure and evolution of stars and galaxies, the course will introduce some hot topics in frontiers of astronomy, such as pulsars, quasars, black holes, and fate of the universe.

PHYS 317 ELECTRICITY AND MAGNETISM I
F 3 cr. LEC 3 (Will be offered Spring terms only starting Spring 2013 with PHYS 322 as prerequisite. Not offered Fall 2012.)
PREREQUISITE: PHYS 251 or M 348.
— Electrostatic fields, dielectric materials, magnetic fields, magnetic materials, and Maxwell’s equations.

PHYS 318 ELECTRICITY AND MAGNETISM II
S 3 cr. LEC 3 (Will be offered Fall terms only starting Fall 2015. Not offered Spring 2015)
PREREQUISITE: PHYS 317.
— Propagation of electromagnetic waves, radiation, and general wave phenomena.

PHYS 322 INTERMEDIATE PHYSICS
F 3 cr. LEC 3 (Not offered until Fall 2012)
PREREQUISITE: PHYS 213, PHYS 251, and M284 or M274.
— Waves in classical physics and quantum mechanics: complex representation, amplitude mechanics, and interference; Special relativity; postulates, Lorentz transformations, applications in nuclear and particle physics; Quantum mechanics: interpretation of key experiments, Schrodinger equation, particles in potentials, spin, the atom; Introduction to nuclear and particle physics.

PHYS 331 COMPUTATIONAL PHYSICS
F 1 cr. LEC 1
PREREQUISITE: PHYS 251.
— Introduction to the use of computational methods in physics. Emphasis will be placed on common methods of casting problems into forms amenable to numerical solution and for displaying numerical results.

PHYS 353R NM THE ART AND SCIENCE OF HOLOGRAPHY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: junior standing; M 151 or equivalent M Placement Test.
— Beginner’s course on creating holograms. Pictorial and geometric interpretations of lasers, interference, coherence, film, and holography enable students with limited science and math backgrounds to create their own holographic masterpieces. Lab techniques and documenting the creative process are emphasized.

PHYS 361 LABORATORY ELECTRONICS II
S 2 cr. LEC 1 LAB 1
PREREQUISITE: PHYS 261.
— Analysis and design of basic digital circuits and advanced laboratory electronic measurements.

PHYS 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr
PREREQUISITE: junior standing and as determined for each offering.
— Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHYS 401 PHYSICS BY INQUIRY I
Su 3 cr. LAB 3.
PREREQUISITE: Teacher Certification.
— An in-depth and hands-on exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of dc electrics, one and two dimensional kinematics, and dynamics. For middle school and high school science teachers.

PHYS 402 PHYSICS BY INQUIRY II
Su 5 cr. LAB 3.
PREREQUISITE: PHYS 401.
— An in-depth and hands-on exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of light, color, geometrical optics, heat, and temperature. For middle school and high school teachers.

PHYS 403 SPECIAL RELATIVITY ONLINE
S alternate years, to be offered odd years 3 cr. RCT 3
PREREQUISITE: PHYS 212, M 172 or M 182, Bachelor’s degree, and one year teaching experience.
— This online course addresses the question: In what way does nature behave differently at high relative speeds than at low speeds? Designed for practicing high school physics teachers. Assignments and discussions use electronic computer conferencing and interactive visual software.

PHYS 404 PHYSICS BY INQUIRY III
Su 5 cr. LAB 3
PREREQUISITE: Science Teacher Certification.
COREQUISITE: PHYS 401.
— PHYS 404 is a continuation of the PHYS 403 experience, but it may also be taken concurrently with PHYS 401. The course will begin with a careful investigation of geometrical optics, leading to an understanding of pinhole cameras, lenses, and prisms. This will be followed by an exploration of magnetic interactions and magnetic materials.

PHYS 406 CAPSTONE PRESENTATIONS
S 1 or SEM 1
PREREQUISITE: Completion of a senior project, and 2 credits of PHYS 490.
— Senior capstone course. Participation in this course requires the completion of a senior project that integrates the student’s knowledge and skills acquired during the undergraduate curriculum. Students will be required to complete: i) an APS-style abstract, ii) an APS-style 10-minute oral presentation, iii) a poster session, and iv) a written research report, based on their research/creative activity.

PHYS 411 INTRODUCTORY QUANTUM MECHANICS I
S 4 cr. LEC 4 (Will be offered Fall terms only starting Fall 2013 as 3 credit course with PHYS 322 as prerequisite. Not offered Fall 2013)
PREREQUISITE: PHYS 301.
— Operators, eigenvalues, and correspondence with observables. Solutions to the Schrodinger equation: one dimensional problems, bound and unbound states, harmonic oscillator, and angular momentum.

PHYS 412 INTRODUCTORY QUANTUM MECHANICS II
F 5 cr. LEC 5 (Will be offered Spring terms only starting Spring 2014. Not offered Fall 2013)
PREREQUISITE: PHYS 411.
— Three-dimensional problems, hydrogen atom, matrix mechanics, spin, perturbation theory, and applications to atomic, molecular, nuclear, and particle physics.

PHYS 425 THERMODYNAMICS AND STATISTICAL PHYSICS
S alternate years, to be offered odd years 3 cr. LEC 3 (Will be offered every year starting Spring 2014)
PREREQUISITE: PHYS 251.
— Statistical physics and thermodynamics and their applications to physical phenomena. This course is strongly recommended for students intending to study physics in graduate school.

PHYS 426 MODERN OPTICS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 213 and M 274 or M 284.
— Emphasis is on new developments in optics triggered by the laser. Provides a good foundation in wave optics, nonlinear optics, integrated optics, and spectroscopy.

PHYS 441 SOLID STATE PHYSICS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PHYS 213.
— A treatment of the classification and electronic structure of solids. Properties of conductors, superconductors, insulators, and semiconductors will be discussed. This course is strongly recommended for students intending to study physics in graduate school.
PHYS 442 NOVEL MATERIALS FOR PHYSICS AND ENGINEERING
S alternate years, to be offered every 3 cr.
PREREQUISITE: Knowledge of introductory solid state physics; PHYS 441 or consent of instructor.
- Provides basic physical knowledge of advanced natural/artificial materials; ferroelectrics, superconductors, nanotubes, superlattices, photonics materials, materials with giant magnetoresistance and negative susceptibility, molecular magnets, and biomaterials.

PHYS 451 ELEMENTARY PARTICLE PHYSICS
F alternate years, to be offered every 3 cr. LEC 3 (Will be taught alternate spring terms starting Spring 2013. Not taught Fall 2012.)
PREREQUISITE: PHYS 251 (Will have PHYS 322 as prerequisite starting Fall 2013).
- A survey of elementary particle physics, beginning with an historical viewpoint and leading up to today's remarkably successful 'Standard Model' of quarks, leptons, and gauge bosons.

PHYS 461 SENIOR LAB
F, S 4 cr. LAB 4 Maximum 8 cr
PREREQUISITE: PHYS 361.
COREQUISITE: PHYS 411.
- Introduction to methods, instrumentation, and data acquisition techniques used in modern physics research. Different experiments are offered in the two semesters. For students desiring a strong experimental exposure, taking both courses is recommended. Experiments in the fall semester are typically in the optical area and include interferometers, fiber optics, spectral measurement, polarization, and laser optics. Experiments in spring semester are typically in solid state physics and particle spectroscopy.

PHYS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed study on an individual basis.

PHYS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. END Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHYS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 3 cr. END May be repeated. Max 6 cr.
PREREQUISITE: Junior standing and signed consent of instructor/research advisor and academic advisor.
- Directed undergraduate research/creative activity, which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

PHYS 500 SEMINAR
On Demand 1 cr. SEM Maximum 8 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHYS 501 ADVANCED CLASSICAL MECHANICS
F 3 cr. LEC 3
PREREQUISITE: PHYS 301.

PHYS 506 QUANTUM MECHANICS I
S 3 cr. LEC 3
PREREQUISITE: PHYS 412.

PHYS 507 QUANTUM MECHANICS II
F 3 cr. LEC 3
PREREQUISITE: PHYS 506.

PHYS 511 ASTRONOMY FOR TEACHERS
F, S 3 cr. RCT 3
PREREQUISITE: PHYS 206 or PHYS 212 or PHYS 222, and secondary certification in teaching and two years of teaching experience.
- This is an online, distance education course primarily intended for science educators. Topics include: the laws of gravity and orbital dynamics, a survey of the solar system, stars and stellar evolution, galaxies, and the Big Bang cosmology.

PHYS 512 GENERAL RELATIVITY ONLINE
S alternate years, to be offered every 3 cr. LEC 3
PREREQUISITE: PHYS 212 or PHYS 222; M 182, PHYS 405 and Bachelor's degree and one year teaching experience.
- This online course addresses the theory of general relativity, which underlies our understanding of gravity and the largescale structure of the cosmos. Designed for practicing high school physics teachers. Assignments and discussions use electronic computer conferencing and simulation software.

PHYS 513 QUANTUM MECHANICS ONLINE
F alternate years, to be offered every 3 cr. LEC 3
PREREQUISITE: PHYS 212 or PHYS 222; M 182, EDSD 566 and Bachelor's degree and one year teaching experience.
- This online course addresses the key ideas behind quantum mechanical observations and devices, including the fundamental behavior of electrons and photons. Designed for practicing high school physics teachers. Assignments and discussions use electronic computer conferencing and simulation software.

PHYS 514 COMPARATIVE PLANETOLOGY: ESTABLISHING A VIRTUAL PRESENCE IN THE SOLAR SYSTEM
S 3 cr. LEC 3
PREREQUISITE: EDSD 366 or EDIC 325, professional teaching certification, Bachelor's degree and at least one year K-12 teaching experience, and a background knowledge of astronomy at the level of PHYS 161 (or its equivalent).
- Establishing a Virtual Presence in the Solar System has been developed and tested as an Internet-delivered course for off-campus students. Its audience consists of practicing elementary and secondary teachers who have experience in teaching general science but have little, if any, formal course work in astronomy. Its goal is to help graduate-level teachers learn solar system astronomy concepts to integrate the new National Science Education Standards and NASA resources into existing instructional strategies. Course participants learn advanced solar system concepts, utilize WWWresources, communicate with research scientists using the Internet, analyze digital images using image processing software, and organize materials for use in K-12 classroom environments.

PHYS 515 ADVANCED TOPICS IN PHYSICS
On Demand 3 cr. LEC 3 Maximum 6 cr.
PREREQUISITE: Graduate standing.
- Topics in astrophysics, condensed matter physics, optics, mathematical physics, or particle physics are presented as needed to supplement the curriculum.

PHYS 516 EXPERIMENTAL PHYSICS
F, S 3 cr. LAB 3 Maximum 6 cr.
PREREQUISITE: PHYS 261, PHYS 317, and PHYS 411.
- Experiments chosen from laser optics and atomic, solid-state, and nuclear physics are carried out in depth to introduce the graduate student to methods, instrumentation, and data acquisition techniques useful for experimental thesis projects.

PHYS 519 ELECTROMAGNETIC THEORY I
S 3 cr. LEC 3
PREREQUISITE: PHYS 318.
- Electro- and magnetostatics, conservation laws and covariance of Maxwell's equations, and dynamics of relativistic particles and fields.

PHYS 520 ELECTROMAGNETIC THEORY II
F 3 cr. LEC 3
PREREQUISITE: PHYS 519.
- Radiation by moving charges. Electromagnetic waves in condensed matter and plasma.

PHYS 523 GENERAL RELATIVITY I
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PHYS 519.
- Tensor calculus, differential geometry, and an introduction to Einstein's theory of gravity. The Schwarzschild solution and black hole physics.

PHYS 524 GENERAL RELATIVITY II
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 523.
- Advanced topics in gravitation theory such as singularities, cosmological models, and gravitational waves.
PHYS 531 NONLINEAR OPTICS & LASER SPECTROSCOPY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PHYS 507.
- Two-level atoms in laser fields and applications to nonlinear optics such as photon echoes, second harmonic generation, and stimulated Raman scattering.
- Atomic and molecular energy level structure, linear and nonlinear spectroscopy, and applications to gaseous and solid state laser materials.

PHYS 535 STATISTICAL MECHANICS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 425.
- Basic concepts of equilibrium statistical mechanics, with application to classical and quantum systems, will be presented as well as theories of phase transitions in fluid, magnetic, and other systems.

PHYS 544 CONDENSED MATTER PHYSICS I
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 425, PHYS 507.
- Crystal structure and the reciprocal lattice. Quantum theory of electrons and phonons.

PHYS 545 CONDENSED MATTER PHYSICS II
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PHYS 544.
- Applications to the transport, optical, dielectric, and magnetic properties of metals, semiconductors, and insulators.

PHYS 555 QUANTUM FIELD THEORY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PHYS 507.
- Techniques of canonical and path integral quantization of fields; renormalization theory.
- Quantum electrodynamics; gauge theories of the fundamental interactions.

PHYS 560 ASTROPHYSICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 318, PHYS 412, PHYS 425, and PHYS 435.
- The purpose of this course is to prepare graduate students for thesis-level research in astrophysics, solar physics or related fields. Topics covered include: fluid mechanics, hydrodynamics, plasma physics, radiation processes and stability of equilibrium states.

PHYS 561 MODERN PHYSICS FOR TEACHERS: PARTICLES AND WAVES
Su 5 cr. LAB 3
PREREQUISITE: Secondary teaching certificate; 2 years teaching experience. PHYS 213, PHYS 401, and PHYS 580 (Advanced Physics by Inquiry.)
- Students in this capstone course will discuss, perform, and analyze several experiments that demonstrate the particle and wave behaviors of light and electrons. Students will develop methods and models for teaching these concepts of modern physics to high school students.

PHYS 565 ASTROPHYSICAL PLASMA PHYSICS
F alternate years, to be offered odd years 3 cr. LEC 3
COREQUISITE: PHYS 520.
- An introduction to the physics of fluids and plasma relevant to astrophysical plasmas such as the solar corona. Topics covered include: magnetostatics, one-fluid (MHD) and two-fluid approaches, linear waves and instabilities, shocks, transonic flows and collisional effects.

PHYS 566 MATHEMATICAL PHYSICS I
F 3 cr. LEC 3
PREREQUISITE: M 349, M 472, PHYS 501.

PHYS 567 MATHEMATICAL PHYSICS II
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PHYS 566.
- Theory of computational techniques, and applications such as numerical integration, differential equations, Monte Carlo methods, and fast Fourier transforms.

PHYS 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

PHYS 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHYS 582 ASTROBIOLOGY FOR TEACHERS
F, S 3 cr. Online Lec 3
PREREQUISITE: PHYS 311, PHYS 511, or equivalent; PHYS 205, PHYS 211, PHYS 221, or equivalent; BIOL 301 or equivalent; EDSD 366 or equivalent; and Bachelor's degree and minimum of one year of full-time teaching experience at the secondary level or above.
- Astrobiology is the study of the origin, evolution, distribution, and destiny of life in the universe. It defines itself as an interdisciplinary science at the intersection of physics, astronomy, biology, geology, and mathematics, to discover where and under what conditions life can arise and exist in the universe.
- The course topics will cover the discovery of planetary systems around other stars, the nature of habitable zones around distant stars, the existence of life in extreme environments. These concepts will serve as a foundation to study possible extraterrestrial ecosystems on planets and moons like Mars and Europa.

PHYS 583 THE INVISIBLE UNIVERSE ONLINE: THE SEARCH FOR ASTRONOMICAL ORIGINS
F, S 3 cr. Online Lec 3
PREREQUISITE: PHYS 311, PHYS 511, or equivalent; PHYS 205, PHYS 211, PHYS 221, or equivalent; EDSD 366 or equivalent; and Bachelor's degree and minimum of one year of full-time teaching experience at the secondary level or above.
- This course covers the long chain of events from the birth of the universe in the Big Bang, through the formation of galaxies, stars, and planets by focusing on the scientific questions, technological challenges, and space missions pursuing the search for origins in alignment with the goals and emphasis of the National Science Education Standards.

PHYS 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

PHYS 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

PHYS 689 DOCTORAL READING & RESEARCH
On Demand 3 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: Doctoral standing.
- This course may be used by doctoral students who are reading research publications in the field in preparation for beginning doctoral thesis research.

PHYS 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

PSCI Political Science
Department of Political Science
(406) 994-4111

PSCI 200 CONDUCTING POLITICAL INQUIRY
S 3 cr. LEC 3
- Research design and measurement of political behavior at the level of the individual and the political unit. Techniques of gathering and analyzing attitudinal data, voting records, policy outputs, and other political variables. Use of nonparametric statistics.

PSCI 210S INTRODUCTION TO AMERICAN GOVERNMENT
F, S, Su 3 cr. LEC 3
- Examines the major institutions of national government and politics. Special emphasis on the constitution and other political rules of the game as shapers of public consciousness and government policy.

PSCI 214S PRINCIPLES OF POLITICAL SCIENCE
F 3 cr. LEC 3
- Major concepts and values of democracy in the United States including the founding, power, behavioral concepts, and sense of community.

PSCI 230D INTRODUCTION TO INTERNATIONAL RELATIONS
S 3 cr. LEC 3
- A survey of the major global issues and the means nations-states use to resolve them. The students will explore the concepts of sovereignty, the elements of power, and the global trends of regionalism and internationalism.

PSCI 240 INTRODUCTION TO PUBLIC ADMINISTRATION
S 3 cr. LEC 3
- Implementation of public policy in American government. Topics include but are not limited to: bureaucratic politics, decision making, budgeting, personnel management, ethics, organization theory, and organization behavior.

PSCI 260 INTRODUCTION TO STATE AND LOCAL GOVERNMENT
S 3 cr. LEC 3
- Examines the changing role of state and local government in the American federal system. Emphasis on the constitutional basis of the distribution of governing powers and upon the problems confronting state and local government in Montana.
COURSE DESCRIPTIONS: PSCI 290R - PSCI 441

PSCI 290R UNDERGRADUATE RESEARCH
F, S 1-4 cr. INDI may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

PSCI 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand for requesting a regular course number.

PSCI 302 MEDIA & POLITICS
F alternate years, to be offered odd years 3 cr. LEC 3
- Explores role of the media in the political process with special emphasis on various print media, television, film, and cyberspace.

PSCI 306 LEGISLATIVE PROCESS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 214, 240.
- Examines legislative decision-making in a constitutional, political, and comparative context. Special emphasis on how institutional rules and relationships shape the making of public policy at both the Congressional and state legislative level.

PSCI 310 APPLIED POLICY ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, Quantitative Core Course.
- Provides an introduction to methods and techniques in quantitative political statistics. Topics covered range from levels of measurement and descriptive statistics to logistic regression, using political science data sets and examples.

PSCI 323 MODERN POLITICAL THOUGHT
S 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 214, 240.
- Significant modern and post-modern thinkers, ideologies, utopias, movements, and discourses. May include variants of liberalism, Marxism, anarchism, feminism, political ecology, Freud, and political dimensions of popular culture and cultural theory.

PSCI 331 INTERNATIONAL RELATIONS THEORY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSCI 250. Junior or Senior standing is required.
- Overview of the idealism versus realism debate during the first half of the twentieth century. Followed by theories formulated in the postwar period to study causes of war/conflict, problems of interdependence, and recent developments such as the end of the Cold War, global democratization, growing ethnic conflict, and a more active United Nations.

PSCI 341 POLITICAL PARTIES AND ELECTIONS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 214, 240.
- Examines the structure and function of political parties, interest groups, and the mass media in the electoral process. Special emphasis on electoral rules and citizen participation from a comparative democratic perspective.

PSCI 346 AMERICAN PRESIDENCY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 214, 240.
- The American presidency as a government institution. Examination of the legal, political, administrative, and policy making roles of the president. Emphasis on recent issues of responsiveness to national needs and public accountability.

PSCI 352 AMERICAN POLITICAL THOUGHT
F, S, Su 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 214, 240.
- Themes and issues in political discourse from Plato through Rousseau with emphasis on contemporary relevance.

PSCI 354 CONTEMPORARY ISSUES IN POLITICAL THEORY
S 3 cr. LEC 3
- Significant modern and post-modern thinkers, ideologies, utopias, movements, and discourses. May include variants of liberalism, Marxism, anarchism, feminism, political ecology, Freud, and political dimensions of popular culture and cultural theory.

PSCI 356 NATURAL RESOURCE POLICY
S 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 214, 240.
- Public lands policy and the economic and political issues that emerge. Special emphasis is placed on the National Parks and Federal public lands of the Greater Yellowstone Ecosystem.

PSCI 365 PUBLIC POLICY ISSUES AND ANALYSIS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 214, 240.
- Analysis of impact of public decisions with emphasis placed on secondary data sources and interpretation.

PSCI 394 SEMINAR/WORKSHOP
F, S, Su 3 cr. SEM 3
PREREQUISITE: Junior standing.
- Topics covered range from levels of measurement and descriptive statistics to logistic regression, using political science data sets and examples.

PSCI 415 THE POLITICS OF WAR & PEACE
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSCI 250. Junior or Senior standing is required.
- The nature and origin of modern public international law and its role in contemporary world politics. Topics include the rights and duties of states, human rights, law pertaining to armed conflict, aggression and international crimes, and the role of international law in conflict management.

PSCI 436 POLITICAL AND ECONOMIC FORECASTING
S 3 cr. LEC 3
PREREQUISITE: PSCI 354, junior standing or consent of instructor.
- Two well-established subjects in the area of international relations, the causes of war and peace studies, with an emphasis on the latter. Covers a range of theorizing, research, and practice in both areas and will consider the relationship between them in constructive and critical ways.

PSCI 437 INTERNATIONAL POLITICAL ECONOMY
F 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 240.
- Political and economic perspectives are integrated in an analysis of the issues affecting the domestic and international economy and their interface. International institutions, trade, exchange rates and the monetary system, regionalism and development are critiqued with different political perspectives.

PSCI 450 INTERNATIONAL LAW
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSCI 250, 210, 214, 240.
- Significant modern and post-modern thinkers, ideologies, utopias, movements, and discourses. May include variants of liberalism, Marxism, anarchism, feminism, political ecology, Freud, and political dimensions of popular culture and cultural theory.

PSCI 481 THE EUROMED POLICY PROCESS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSCI 250, 210, 214, 240.
- The evolution of the environmental movement and the various types of environmental approaches will be examined. Special emphasis on the role of electoral and non-electoral politics, strategy, and tactics will be assessed.

PSCI 486 ENVIRONMENTAL POLITICS
Su 3 cr. LEC 3
PREREQUISITE: Junior standing, PSCI 210.
- The role of civil society, government and multilateral organizations are examined in a comprehensive analysis of food and hunger, including the issues presented by agricultural policy, famine, biotechnology and food safety, domestic and international food aid, and the right to food.

PSCI 499 INDEPENDENT STUDY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSCI 250, 210, 214, 240.
- Development of human rights in legal and political context of the post World War II period. Civil and political rights of the process: political participation and fundamental democratic freedoms; as well as social, cultural, and economic rights including basic human needs, self-determination, gender equality, and cultural integrity. National and International implementation is also considered.
COURSE DESCRIPTIONS: PSCI 451 - PSCI 576

PSCI 451 ANCIENT & MEDIEVAL POLITICAL PHILOSOPHY
F 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 214, 240.
- Themes and issues in political discourse from Plato through Rousseau with emphasis on contemporary relevance.

PSCI 454 CINEMA AND POLITICAL THEORY
Su 3 cr. LEC 3
PREREQUISITE: PSCI 200, 208, 210, 230, and 214 or consent of the instructor.
- Explores the intersection of political theory with topics such as civil society, bureaucracy and public policy through the use of film. Special attention given to both descriptive and prescriptive applications of modern and contemporary political theory to these topics.

PSCI 461 ADMINISTRATIVE LAW
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing, PSCI ???.
- Explores the evolution of the administrative state and regulatory policy. Emphasis on the constitutional and statutory basis for administrative law and the public policy effects which flow from administrative rulemaking.

PSCI 465 PUBLIC ADMINISTRATION AND POLICY
S 3 cr. LEC 3
PREREQUISITE: PSCI 200, 210, 214, 230, and 260.
- Examines the major political and strategic processes of public policy development and implementation. Topics covered include agenda setting, stakeholder influence, use of political narratives, decision making and implementation strategies.

PSCI 471 AMERICAN CONSTITUTIONAL LAW
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing and PSCI 210.
- Explores the relationship between law, individual rights, and public policy. Legal research and case law approach are stressed. Topics will include, but are not limited to the aspects of the Bill of Rights and the 14th and 15th Amendments.

PSCI 490R UNDERGRADUATE RESEARCH
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior standing, cumulative g.p.a. of 2.5 or better, consent of the instructor and approval of the department head.
- Students propose, develop, and complete an individual research project under the direction of a faculty mentor. Written and oral presentation of the results are expected. Course will address responsible conduct of research.

PSCI 491 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSCI 492 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, cumulative g.p.a. of 2.5 or better, consent of the instructor, and approval of the department head.
- Directed research and study on an individual basis.

PSCI 494 SEMINAR/WORKSHOP
F, S, Su 3 cr. SEM 3
PREREQUISITE: Junior standing.
- Topics offered at the upper division level which are not covered by catalogued courses. Students are expected to do individual research projects leading to an oral and written report of each student’s findings.

PSCI 498 INTERNSHIP
F, S, Su 6 - 12 cr. IND 5-11 RCT 1-2
PREREQUISITE: Junior standing, cumulative g.p.a. of 2.5 or better, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

POLS 499R SENIOR PROJECT/THESIS
F, S 3 cr. SEM
PREREQUISITE: Senior standing, PSCI major.
- Senior capstone course. Required course for graduation. Students examine the major concerns and issues in the discipline of political science in a mentored research project.

PSCI 520 GOVERNMENT LEADERSHIP & ADMINISTRATION
F alternate years, 3 cr. LEC 3
- This course exposes students, using the most current theoretical and empirical literature, to the essential competencies need for management and leadership roles in public organizations.

PSCI 551 RESEARCH METHODS
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- The research process as a means of acquiring knowledge that is reliable and relevant to the making of public management decisions. Students will prepare and submit a research design that meets social scientific standards.

PSCI 552 PUBLIC POLICY PROCESSES
S, alternate years, to be offered odd years 3 cr. LEC 3
- This course exposes students, using the most current theoretical and empirical literature, to the essential competencies needed to understand the development and implementation of public policy.

PSCI 554 FOUNDATIONS OF PUBLIC ADMINISTRATION
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Theoretical, historical, intellectual foundations of public administration. Examines the relationship between public administration theory and practice, the political context and the intellectual heritage of the field. Examines basic functions and processes of public administration. Examines the relationship between public administration and contemporary issues of governance facing the public sector.

PSCI 555 HUMAN RESOURCES MANAGEMENT
F alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: PSCI 554, graduate standing.
- The development of the concept of “public service” in the United States. Topics include historical development of public personnel, position classification, recruitment, selection, equal opportunity, affirmative action, collective bargaining and flexible employment relationships under more limited and decentralized government.

PSCI 557 PUBLIC BUDGETING & FINANCE
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSCI 554, graduate standing.
- Public sector budgeting as a tool for financial management and the implementation of fiscal and programmatic policy. Emphasis on the political context.

PSCI 558 PUBLIC ORGANIZATION DYNAMICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSCI 554, graduate standing.
- Examines alternative organization structures for public management and the influence of those structures upon organization behavior and performances. Influence of management styles and individual differences are examined as well as issues relating to personal development and organizational mission. Public and non-profit organizations are contrasted.

PSCI 559 PROGRAM EVALUATION AND POLICY ANALYSIS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSCI 554, graduate standing.
- Methods of program evaluation and policy analysis for public programs. Quantitative and qualitative methods of analysis are contrasted. Implementation, utilization, and political context of the analysis and evaluation process are examined. Philosophical and ethical issues underlying alternative methods are examined.

PSCI 560 ETHICS AND PUBLIC SERVICE
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSCI 554.
- Explores ethics and selected issues in public service and policy making through theoretical and case study approaches. Emphasis on the relation of continuing issues and problem areas to individual ethics in policy making and administrative decision making.

PSCI 562 LOCAL GOVERNMENT ADMINISTRATION
F alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: PSCI 554, graduate standing.
- In the administration of municipal and county governments for graduate students who intend a career in agencies of these governments, or instate and federal agencies whose programs focus on local governments.

PSCI 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

PSCI 574 DIRECTED PROFESSIONAL RESEARCH PROJECT
F, S 3 cr. RCT 3
PREREQUISITE: Graduate standing.
- Write, complete and present a graduate professional paper under the supervision of a faculty mentor.

PSCI 576 INTERNSHIP
F, S, Su 3-12 cr. IND 10-11 RCT 1-2 Maximum 12 cr.
- An individualized preprofessional assignment arranged with an agency, business, or other organization.
PSCI 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering, consent of instructor.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

PSCI 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Courses offered on a one time basis to fulfill professional development needs of inservice educators. A specific focus is given to each course which is appropriately subtitled.

PSCI 589 GRADUATE CONSULTATION
F, S, Su 1-3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

PSPP
Plant Sciences
Department of Plant Sciences and Plant Pathology
(406) 994-4832

PSPP 101 CS INTRODUCTION TO BIOTECHNOLOGY
F 3 cr. LEC 2 SEM 1
- Introduction to an ever-growing industry. Course is designed to demonstrate the significance of biotechnology in today’s world. Lecture series presented by research professors, social scientists, and industrial experts. Cross-listed with VTMB 101 and MB 110.

PSPP 102 CS PLANT SCIENCE, RESOURCES AND THE ENVIRONMENT
S 3 cr. LEC 3
- Provides an understanding of basic plant science principles and the related environmental components that impact society. Current questions in plant biology, agriculture, and ecology are used to develop problem-solving skills and integrative thinking.

PSPP 105 MIRACLE GROWING: INTRODUCTION TO HORTICULTURE
S 3 cr. LEC 3
- Science in the context of horticulture. Learn environmental factors affecting horticulture and current measurement technology. Projects explore global and regional issues, careers, and tools necessary to be a successful horticulturist. Culminates in a presentation at the Horticulture Open House.

PSPP 131 LANDSCAPE DESIGN HISTORY: THEORY
S 3 cr. LEC 3
- Introduction to the history of landscape design from ancient civilizations to the present. The evolution of design theory as it relates to visual arts, material palettes, climate, ecology, cultural, and social issues. Current trends in landscape industry and the work of major designers will be studied.

PSPP 146 INTRODUCTION TO SUSTAINABLE FOOD AND BIOENERGY SYSTEMS
S 3 cr. LEC 3
- A systems perspective on local, state and national food, agriculture and energy issues. Key topics include Agroecology, Sustainable Crop Production, and Sustainable Food Systems. For majors and non-majors. Cross-listed with HDFN 146 and LRES 146.

PSPP 212 METHODS IN BIOTECHNOLOGY
F, S cr. LAB 4
- This course will challenge students in the biotech major to learn a series of essential molecular techniques focusing on research and faculty interaction. The techniques learned will be highly applicable to the biotech industry, giving students a post-graduation competitive edge.

PSPP 225 LANDSCAPE GRAPHICS
F 3 cr. LEC 1 LAB 2
PREREQUISITE: ME 116 or TE 250 or AutoCAD experience.
- Landscape graphic communication including review of graphic enhancing techniques, rendering and computer presentation drawing applications of site analysis, site planning, landscape and planting design.

PSPP 226 COMPUTER GRAPHICS
S 3 cr. LAB 3
PREREQUISITE: ME 116 or TE 250 and PSPP 225.
- Understanding of the opportunities offered by computer-based modeling technologies; exploring software common to the profession of landscape architecture including desktop publishing, image manipulation, modeling and drafting; utilizing computer-aided methods at different phases of a design project.

PSPP 231 WOODY ORNAMENTALS
F 3 cr. LEC 1 LAB 2
PREREQUISITE: BIOL 101 (may be used as a corequisite).
- Identification, culture and uses of deciduous and evergreen trees, shrubs and vines commonly used as ornamentals in Montana, and some species utilized outside of Montana. Lab includes extensive plant walks.

PSPP 232 HIBRACEOUS ORNAMENTALS
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 101.
- Identification, characteristics, cultural requirements and ornamental uses of indoor tropical foliage and flowering plants, herbaceous landscape annuals and perennials and flowering bulbs. This is a hybrid course requiring student participation in one lab each week, with all other course information and participation via the web.

PSPP 242 CROP IDENTIFICATION
F 1 cr. LAB 1
- Meets first third of semester. Recognition and identification of seed, vegetative parts, and floral structure of the major species of cereals, forage legumes, and grasses.

PSPP 245 PLANT PROPAGATION
S 3 cr. LEC 2 LAB 1
PREREQUISITE: CHMY 121 or 131 and BIOL 101.
- Traditional sexual and asexual reproduction of plants including seed germination, stem and leaf cuttings, grafting, and layering. Includes discussion of the biology and physiology of propagation methods. Lab includes experimentation with the various propagation methods using native plants as model systems.

PSPP 250 IDENTIFICATION OF SEED PLANTS
S 4 cr. LEC 2 LAB 2
PREREQUISITE: BIOL 101.
- Identification of conifers, trees and shrubs, and herbaceous seed plants; determination by use of manuals; vocabulary, classification and nomenclature; preparation and collection of seed plant specimens. Cross-listed with BIOL 250.

PSPP 290 SPECIAL TOPICS
On demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required, but some may be necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSPP 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 4 cr. RCT May be repeated
COREQUISITE: Freshman or sophomore standing and approval of instructor.
- Undergraduate research which may culminate in a research paper, journal article, or other creative project. Course will address responsible conduct of research.

PSPP 305 PRACTICAL GENETICS
S 3 cr. LEC 5
PREREQUISITE: BIOL 102 or BIOL 214 or consent of instructor.
- Examination of the modes of inheritance, gene expression and genetic manipulation of eukaryotic organisms, particularly those of flowering plants and mammals. Population genetics, genetic diversity and quantitative genetics are also discussed.

PSPP 310 TURFGRASS MANAGEMENT
F 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 101, Quantitative Reasoning Core, and PSPP 105.
- Turfgrass propagation, fertilization, establishment, and maintenance. Recognition and adaptabilities of Northern and Southern turfgrasses used for landscape and sports use. Includes irrigation principles and basic hydraulics, establishment and fertilizer calculations, and pest management. Lab includes experimentation with establishment techniques, equipment calibration, soil testing, and turfgrass maintenance.

PSPP 318 BIOMETRY
F 3 cr. LEC 3
PREREQUISITE: M 145 and computer literacy.
- Analysis and interpretation of biological data. Topics include: analysis of frequency data, measures of center and spread, probability distributions, statistical inference for single means, and proportions, two sample means and proportions, linear regression, and correlation. Use of computer software is emphasized in solving problems.
COURSE DESCRIPTIONS: PSPP 331 - PSPP 441

PSPP 331 PLANTING DESIGN
F 3 cr. LEC 1 STU 2
PREREQUISITE: PSPP 231 (may be taken as a corequisite).
- Graphic communication skills; landscape trends and styles; landscape design principles; and plant-
ing design for engineering, architectural, climate control, and aesthetic uses. Emphasis on residential landscape planning. Specification writing and cost estimating for landscape installation.

PSPP 355 SITE ENGINEERING
S 4 cr. LEC 3 LAB 1
PREREQUISITE: M 145, PSPP 331.
- Site analysis, site survey, structure siting, roadway and parking lot planning, grading and earthwork modifications, site drainage, pedestrian circulation design. Lab includes practical assistance with problem-solving and field measurement for: site analysis, boundary survey, leveling and topographic survey.

PSPP 356 LANDSCAPE CONSTRUCTION
S 4 cr. LEC 2 LAB 2
PREREQUISITE: PSPP 351, PSPP 335 (may be taken as a corequisite).
- Understanding of construction materials used to create the built landscape. Design and production of working drawings for walls, patios, steps, ramps, retaining walls, decks, fences, irrigation systems, and other landscape features. Production of landscape construction portfolio which details a complete site development project including cost estimating and bidding for construction.

PSPP 357 VEGETABLE PRODUCTION
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSPP 102 or PSPP 256.
- Modern production practices for all major temperate-zone vegetable crops, including crop management, development, storage, and post-harvest physiology. The class will include production of transplants and detailed discussion of several major vegetable crop families, including Solanaceae, Cucurbitaceae, Brassicaceae, Liliaceae, and the Fabaceae.

PSPP 358 FRUIT PRODUCTION
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSPP 102 or PSPP 256.
- Modern production practices for all major temperate-zone tree and small fruit, including crop management, fruit crop growth and development, storage, and post-harvest physiology. The class will include a discussion of rootstocks, grafting, pruning, trellising, and quality control as they impact today’s fruit production system.

PSPP 341 FIELD CROP PRODUCTION
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSPP 102.
- Production of field crops using practical and applied crop management principles. Emphasis includes understanding of crop management principles and application of problem solving capabilities to field crop management situations.

PSPP 342 FORAGES
F 3 cr. LEC 3
PREREQUISITE: PSPP 102.
- Principles of applied forage crop management including establishment, irrigation, fertilization, pests, harvesting, and forage integration of many legume and grass species.

PSPP 343 COMMERCIAL PLANT PRODUCTION
S 3 cr. LEC 3
PREREQUISITE: PSPP 245.
- Focus is on greenhouse and nursery design and operation, including environmental control, grow-
ing media, irrigation, and fertilization of field and container grown ornamental crops. Retail and wholesale marketing strategies will be explored. Sustainable practices will be emphasized.

PSPP 344 ORGANIC MARKET GARDENING
Su 3 cr. LEC 1 LAB 2
PREREQUISITE: PSPP 102, LRES 201 and Junior standing.
- Focus is on the production of quality vegetable, herb and flower products for sale through local, regional or non-traditional marketing avenues. Special attention is made to present and analyze sustainable food crop production systems.

PSPP 421 CONCEPTS OF PLANT PATHOLOGY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 101.
- An introductory course in the study of plant dis-
ases. Includes plant pathogens, etiology of disease, and various control strategies.

PSPP 422 PLANT DISEASE CONTROL
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSPP 421 or consent of instructor.
- This course will provide comprehensive coverage of the concepts of integrated management of plant diseases. Concepts covered include regulatory, cul-
tural, chemical, host plant resistance, and biological controls. Students will be introduced to epidemi-
ology and weather-based predictive computer models for use in disease management programs.

PSPP 423 MYCOLOGY
F alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 101.
- This course surveys the immense diversity of fungi, including all major groups with emphasis on structures, life cycles, identification, and ecology. It provides a basis of knowledge for the rapidly expanding relevance of fungi in research, medicine, agriculture, biotechnology, and industry.

PSPP 424 ECOLOGY OF FUNGI
F alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 101, BIOL 213, a compara-
table course in introductory biology, or consent of instructor.
COREREQUISITE: None, but an upper division biol-
ogy course is recommended.
- This course emphasizes the important and varied roles of the higher fleshy fungi in natural and man-
gaged systems, focusing on forest habitats. Fungi are the ecological backbone of many terrestrial systems; yet, their ecological roles as saprophytes, symbionts, and mycorrhizal mutualists are often minimized. Both traditional techniques and more recent molecular methods will be presented at the individual, population, community, landscape, and biome levels, along with topics on fungal conserva-
tion and global change. This course consists of twice weekly sessions of two hours each for lecture, discus-
sions, and demonstrations. One or two afternoon or morning field trips to nearby forests are required to initiate a final project.

PSPP 425 HORTICULTURE
F 1 cr. END 1
PREREQUISITE: Senior standing, for majors only.
- First semester of a two-semester project for seniors majoring in Horticulture Science. This capstone course allows students to pursue a contemporary issue or problem in horticulture within a team research project.

PSPP 426 PLANT BIOTECHNOLOGY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BCHM 340 or BIOL 301 or PSPP 305.
- Humans have historically altered plants to meet food and fiber needs. Our ability to transfer genes from organism to organism is accelerating this process. The principles of plant genetic engineering will be discussed along with hands-on laboratory.

PSPP 427R HORTICULTURE SENIOR CAPSTONE II
S 2 cr. END 1 RCT 1
PREREQUISITE: Junior or Senior standing.
- Senior capstone course. Participants in this seminar section will bring closure to the student’s required internship. Students will have the opportu-
nity to refine their public speaking and writing skills through synthesis of the goals, progress, and outcome of their industrial or research laboratory experience. Exposure to many different types of internship outcomes will broaden the student’s per-
ception of the disciplines which contribute to the field of Biotechnology.

PSPP 431 TOUGH PLANTS IN TOUGH PLACES
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BIOL 101, PSPP 102, (PSPP 231 and PSPP 232) or PSPP 250.
- Delve into the physiological adaptation for both native and non-native plants to survive in urban and highly disturbed landscapes of the intermounta-
west. Explore the roles and interactions of turfgrass, trees, shrubs, perennials and annuals in the ecology of the developed landscape. Learn about the inter-
action of the built landscape with natural systems.

PSPP 432 SENIOR DESIGN STUDIO
F 4 cr. LEC 1 STU 3
PREREQUISITE: PSPP 331, PSPP 335, PSPP 356.
- Senior capstone course. Advanced graphic com-
munication skills, environmental land use planning, master plan design, site specific design, and con-
struction detailing. Individual and group problem-
solving skills are stressed through graphic, verbal, and written landscape design solutions.

PSPP 441 PLANT BREEDING
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BIOL 301 or PSPP 305.
- The genetic principles and practices involved in plant breeding. Selection of plant breeding methods based on an understanding of a plant species genet-
ics and reproductive mechanisms. The class includes hands on experience in plant breeding through a series of lab exercises.
PSPP 447 ADVANCED PLANT PROPAGATION
F 3 cr. LEC 1 LAB 2
PREREQUISITE: PSPP 245.
- Students will learn specialized sexual and asexual propagation techniques, with an emphasis on the physiological and environmental manipulation of plants associated with in vitro, seed and grafting production. Students will receive extensive tissue culture experience.

PSPP 450 PLANT PHYSIOLOGY
S 3 cr. LEC 3
PREREQUISITE: Junior standing, BIOL 101, PSPP 251 and one of the following: CHMY 211, CHMY 311, or CHMY 125.
- Physiological processes of higher plants, including photosynthesis, water relations, mineral nutrition, development, stress physiology, and biotechnology. Cross-listed with BIOL 430.

PSPP 454 AGROSCIENCE
F alternate years, to be offered odd years 5 cr. LEC 1 LAB 2
PREREQUISITE: BIOL 250.
- Determination, classification, evolution, and nomenclature of grasses and grass-like plants; morphological and ecological features; preparation of reference specimens. Cross-listed with BIOL 454.

PSPP 456 PLANT SYSTEMATICS
F alternate years, to be offered even years 5 cr. LEC 1 LAB 2
PREREQUISITE: BIOL 101, BIOL 250.
- Introduction to the local vascular plant flora emphasizing characteristics of the common families and genera. Lab concentrates on plant identification of common angiosperm plant families in Montana; preparation of about 120 reference specimens taken from the local flora. Cross-listed with BIOL 456.

PSPP 457 PLANT DEVELOPMENT
F alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: BIOL 301.
- Cellular and molecular mechanisms of the development of plants. Topics include developmental differences between plants and animals, regulation of gene expression, environmental effects on plant development, and computer modeling of development. Cross-listed with BIOL 457.

PSPP 460 PLANT METABOLISM
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSPP 250, BCHM 340.
- In-depth overview of plant metabolism; photosynthesis including C4 and CAM metabolism; intermediary carbon metabolism; lipids; nitrogen and sulfur assimilation and metabolism; amino acid biosynthesis; secondary metabolism (terpenoids, alkaloids, phenylpropanoids, flavonoids); metabolic changes during plant development.

PSPP 465R HEALTH, AGRICULTURE, POVERTY: CONCEPTS AND ACTION RESEARCH
S 3 cr. LEC 1 IND 1 RCT 1
PREREQUISITE: Junior standing in student’s major.
- Students will explore causes and solutions to rural, economic poverty holistically by discovering the interconnections of health, agriculture, and governance. Students will gain skills appropriate to their own academic major to provide leadership in alleviating poverty worldwide.

PSPP 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

PSPP 476 INTERNSHIP
F, S, Su 2 - 12 cr. IND.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

PSPP 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

PSPP 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Maximum 4 cr.
COREQUISITE: PSPP 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

PSPP 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 4 cr. IND
PREREQUISITE: Junior or Senior standing and approval of instructor.
- Undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

PSPP 500 SEMINAR
F 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Students prepare, present, and critique scientific presentations.

PSPP 516 RESEARCH DESIGN AND ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: STAT 401.
- Data analysis and interpretation of problems unique to agricultural and biological research. Topics include: sample size determination, transformation of data scale, completely random, randomized block and Latin square designs, comparisons among means, factorial experiments with restricted randomization and analysis of covariance.

PSPP 518 PLANT VIRUS DISEASES
F alternate years, to be offered even years 3 cr. LEC 5
- An in-depth study of viruses with emphasis on plant viruses.

PSPP 519 PLANT VIRUS DISEASES LAB
F alternate years, to be offered even years 1 cr. LAB 1
COREQUISITE: PSPP 518.
- Laboratory exercises related to plant virology.

PSPP 524 ADVANCED PLANT PATHOLOGY
F alternate years, to be offered odd years 3 cr. LEC 3
- This course is designed to give graduate students in the Department of Plant Sciences & Plant Pathology or other departments a broad survey of plant pathology subject matter at the graduate level and to give all graduate students in PSPP a common experience and introduction to PSPP graduate faculty. This course will serve as a companion to 'Genetic Plant Improvement (PSPP 542)' taught in spring even years and alternate years by our plant breeding faculty.

PSPP 526 PLANT BACTERIAL DISEASES
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PSPP 421.
- An in-depth study of bacteria and their etiology in causing plant disease.

PSPP 527 PLANT BACTERIAL DISEASES LAB
F alternate years, to be offered odd years 1 cr. LAB 1
PREREQUISITE: PSPP 421.
COREQUISITE: PSPP 526.
- Laboratory exercises related to the study of plant bacterial diseases.

PSPP 531 PHYSIOLOGY OF HOST-PARASITE INTERACTIONS
S alternate years, to be offered even years 1 cr. LAB 1
PREREQUISITE: PSPP 421.
- Advanced study of the physiological and biochemical aspects of host-parasite interactions.

PSPP 541 ADVANCED PLANT GENETICS
F alternate years, to be offered odd years 5 cr. LEC 3
- Genome and genetic analysis of flowering plants, including structure of the genome, methods of genetic analysis and the genetic basis of plant morphology and development. A familiarity with current and classical literature is stressed.

PSPP 542 GENETIC PLANT IMPROVEMENT
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSPP 441, STAT 401.
- The past, present and future of plant improvement. Emphasis on genetical principles underlying classical plant breeding, and on molecular biological principles underlying plant genetic engineering.

PSPP 546 HERBICIDE PHYSIOLOGY
F 3 cr. LEC 3
PREREQUISITE: BCHM 340 and PSPP 450 or equivalents.
- A team-taught, distance delivery course on the biochemistry and physiology of herbicide action in plants. Herbicide discovery, classification, and mechanisms of action and resistance are explored. Offered through Extended University.

PSPP 548 FLOWERING PLANTS OF THE NORTHERN ROCKY MOUNTAINS
Su alternate years, to be offered even years 2 cr. LEC 2
- A field oriented study of the flowering plants of Montana with a emphasis on plant keying skills. Objectives are: 1) to identify the parts of flowering plants and become familiar with botanical terms; 2) to learn morphological characteristics of common plant families; 3) to learn how to use a plant key to successfully identify flowering plants; application of these skills and botanical texts to the classroom. Mon - Tues are class/lecture days; Wed - Fri are day field trips to local trailheads.
COURSE DESCRIPTIONS: PSPP 552 - PSYX 335

PSPP 552 ADVANCED SOIL AND ENVIRONMENTAL MICROBIOLOGY
5 alternate years, to be offered every even 3 cr. LEC 3
PREREQUISITE: Graduate standing and instructor’s permission.
  - Advanced laboratory course. Microorganisms are targeted for isolation and characterization, emphasizing those not normally encountered in general microbiology laboratory. Biogeochemical cycling, contaminant biodegradation, extremophiles, and plant-microbe interactions are typical topics investigated. Students employ classic and novel cultivation approaches, identifying microbes based on morphology, physiology, and phylogeny. Crosslisted with LRES 552.

PSPP 553 PLANT FUNGAL DISEASE
5 alternate years, to be offered every even 3 cr. LEC 3
PREREQUISITE: PSPP 421.
  - An in-depth study of fungi and their etiology in causing plant diseases.

PSPP 554 PLANT FUNGAL DISEASE LAB
5 alternate years, to be offered every even 1 cr. LAB 1
PREREQUISITE: PSPP 421.
  - Laboratory exercises related to the study of plant fungal diseases.

PSPP 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.
  - Directed research and study on an individual basis.

PSPP 575 PROFESSIONAL PAPER
F S Su 1-10 cr. IND 1-10 cr.
PREREQUISITE: Graduate standing.
  - A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

PSPP 576 INTERNSHIP
On Demand 2 - 4 cr. END Maximum 12 cr.
PREREQUISITE: Graduate standing, consent of instructor and approval of Department Head, and Dean of Graduate Studies.
  - An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

PSPP 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
  - Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand.

PSPP 589 GRADUATE CONSULTATION
F S Su 3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
  - This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan), but who needs additional faculty or staff time help.

PSPP 590 MASTER’S THESIS
F S Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

PSPP 690 DOCTORAL THESIS
F S Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

PSYX

Psychology
Department of Psychology
(406) 994-3801

PSYX 100BS INTRODUCTORY PSYCHOLOGY
F S Su 3 cr. LEC 2 RCT 1
  - Introduction to methods and approaches to psychology including exploration of problems in psychological testing and measurement, and information processing, abnormal behavior, and social psychology, with selected individual study of other areas related to the student’s interests.

PSYX 223 RESEARCH DESIGN AND ANALYSIS I
F S 4 cr. LEC 3 LAB 1
PREREQUISITE: PSYX 100 and either M 145 (or higher) or STAT 216.
  - Introduction to the design and analysis of psychological research. Topics include logic and philosophy of psychological research, conceptualizing research questions, hypothesis testing, data collection and analysis strategies used by researchers in psychology, and introduction to using statistical software for data analysis.

PSYX 225 RESEARCH DESIGN AND ANALYSIS II
F S 3 cr. LEC 3
PREREQUISITE: PSYX 223.
  - Continuation of PSYX 223. Topics include experimental, quasi-experimental, and non-experimental designs and methodological issues; assessing research questions; reliability and validity of psychological research; writing research reports; using statistical software for data analysis.

PSYX 230 DEVELOPMENTAL PSYCHOLOGY
F 3 cr. LEC 3
PREREQUISITE: PSYX 100.
  - Human development across the lifespan using major theories of development including psychoanalytic, psychosocial, learning, and cognitive. Physical, cognitive, social, emotional, and personality development are explored from conception to death.

PSYX 235D CONTEMPORARY ISSUES IN HUMAN SEXUALITY
S 3 cr. LEC 3
PREREQUISITE: PSYX 100.
  - Issues of diversity and difference in human sexuality will be examined. The development and expression of sexual behavior as a complex sociocultural, biological, psychological, and historic phenomenon will be discussed. Course will examine sexual behavior and identity in both the majority culture and other cultures in the U.S. and world.

PSYX 265C PSYCHOLOGY OF FILM
S S 3 cr. LEC 3
PREREQUISITE: College Writing (W) and University Seminar (US) core.
  - Uses psychological science to understand the persuasive power of media as portrayed in popular films. Evaluates the media’s ability to both reflect and affect behavior. Focus is on contemporary themes such as aggression, drug use, sexuality, and prejudice.

PSYX 270 FUND PSYCHOLOGY OF LEARNING
On Demand 3 cr. LEC 3
PREREQUISITE: PSYX 100.
  - Introduction to scientific principles, theories, and applications of learning, including respondent and operant conditioning, social learning, verbal learning. Other topics and approaches to learning will also be discussed.

PSYX 274 PSYCHOLOGICAL MEASUREMENT
On Demand 3 cr. LEC 3
PREREQUISITE: PSYX 231.
  - Principles of psychological testing and measurement as related to intelligence, aptitudes, attitudes, occupations, and personality. Topics include nature and types of psychological tests, test construction, test administration, basic psychometric theory, methods for estimating the reliability and validity of psychological tests, and ethical issues regarding psychological testing and measurement.

PSYX 290R UNDERGRADUATE RESEARCH
F S 1-6 cr. IND may be repeated
  - Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

PSYX 291 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
  - Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSYX 292 INDEPENDENT STUDY
On Demand 1 - 3 cr. END Maximum 6 cr.
PREREQUISITE: Consent of instructor.
  - Directed research and study on an individual basis.

PSYX 325 APPLIED CRITICAL THINKING
On Demand 3 cr. LEC 2 RCT 1
PREREQUISITE: PSYX 100, and any Quantitative core course.
  - Study of critical thinking skills through an understanding of psychological factors involved. Practical strategies are explored in relation to hypothesis formation and evaluation, decision making, problem solving and creativity, reasoning, and memory. Applications are emphasized.

PSYX 333 PSYCHOLOGY OF AGING
S 3 cr. LEC 3
PREREQUISITE: PSYX 100 and Junior standing or consent of instructor.
  - Surveys different domains in which human behavior is influenced by aging. Topics include the influence of age on cognitive processes (e.g., attention and memory), social processes (e.g., personality and well being), and biological processes (e.g., brain-related changes).

PSYX 335 PSYCHOLOGY OF GENDER
F S 3 cr. LEC 3
PREREQUISITE: PSYX 100.
  - Traditional and feminist perspectives on psychological needs and concerns specific to women, including gender stereotyping and beliefs, cognitive differences between the sexes, psychological disorders common to women, women’s sexuality; and cultural and biological roles and norms.
COURSE DESCRIPTIONS: PSYX 340 - PSYX 539

PSYX 340 ABNORMAL PSYCHOLOGY
F 3 cr. LEC 3
PREREQUISITE: PSYX 100.
- Historical and current perspectives on psychopathology, including neuroscience, behavioral cognitive, psychodynamic, and humanistic/existential approaches. Traditional approaches and recent innovations in therapy and diagnosis are considered along with current diagnostic categories, especially DSM.

PSYX 350 PHYSIOLOGICAL PSYCHOLOGY
F 3 cr. LEC 3
PREREQUISITE: PSXN 100 and BIOL 100, BIOL 102, or BCHM 104.
- Introduction to the biological bases of behavior; brief review of functional neuroanatomy and physiology in relation to such topics as sensation, movement, motivation, emotion, sleep, learning and memory, consciousness, and abnormal behavior.

PSYX 354 SENSATION & PERCEPTION
F 3 cr. LEC 3
PREREQUISITE: PSXN 350.
- Basic principles of sensory systems (with emphasis on the visual system), contemporary psychophysical procedures, and principles of perception.

PSYX 356 SOCIAL PSYCHOLOGY
F 3 cr. LEC 3
PREREQUISITE: PSXN 100.
- Experimental research and theoretical viewpoints in social psychology, including such topics as interpersonal attraction, perception, aggression, attitudes and attitude change, altruism, group behavior, social influence, stereotypes and prejudice, and the self.

PSYX 370 PSYCHOLOGY OF LEARNING
S 3 cr. LEC 3
PREREQUISITE: PSXN 231.
- Examines basic principles and theories of learning and motivation. Classical and operant conditioning, discrimination learning, incentive motivation, reward and punishment, and concept learning.

PSYX 375 BEHAVIOR MODIFICATION
F 3 cr. LEC 3
PREREQUISITE: PSXN 231 and PSXN 270 or PSXN 370.
- Human behavior change with emphasis on practical techniques for changing individual and group behavior in real-life situations.

PSYX 380 MEMORY & COGNITION
F, S 3 cr. LEC 3
PREREQUISITE: PSXN 100, Junior standing or consent of instructor.
- Theories and evidence concerning human information processing, focusing especially on attention and memory, problem solving, decision making, reasoning, and related topics.

PSYX 384 CONSCIOUSNESS
On Demand 3 cr. LEC 3
PREREQUISITE: PSXN 231 and PSXN 350.
- Theories and evidence concerning consciousness and altered states of consciousness, including dreaming, meditation, hypnosis, sensory depriva-
tion, psychoactive drug effects, temporal experience, psychic phenomena, and related topics.

PSYX 385 PSYCHOLOGY OF PERSONALITY
S 3 cr. LEC 3
PREREQUISITE: PSXN 231.
- Theories and evidence on processes that underlie consistent and enduring differences in behavior, cognition, and affect. Topics include emotion, motivation, temperament, inner experience, identity and the self, personality change, the influence of socio-cultural context, and related topics.

PSYX 400 HISTORY & SYSTEMS IN PSYCHOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: PSXN 231.
- Examination of the historical development of major concepts, theoretical ideas, and approaches to psychology, with emphasis on perspectives of broad current interest such as behavioral science, cognitive science, and neuroscience.

PSYX 461 INDUST & ORGANIZ PSYCH
On Demand 3 cr. LEC 3
PREREQUISITE: PSXN 231.
- Basic concepts and theoretical frameworks for the fundamental areas of industrial and organizational psychology. Topics include hierarchy of I/O psychology, personnel selection, psychological testing, personnel training, performance appraisal, managerial decision making, job satisfaction, work motivation, leadership, job stress, organizational conflict, job design, and organizational development.

PSYX 465 SOCIAL COGNITION
F 3 cr. LEC 3
PREREQUISITE: PSXN 100.
- Addresses how fundamental cognitive processes (e.g., concept activation, attention, memory) influence social behavior and thought. Topics include impression formation, mental simulations of alternative realities, nonconscious mental processes, subliminal stimuli, mental representations, stereotypes, and heuristics and biases.

PSYX 481 JUDGMENT & DECISION MAKING
On Demand 3 cr. LEC 3
PREREQUISITE: PSXN 100, Quantitative core and Junior standing.
- Theories and evidence on the psychology of judgment and decision making, including rationality, normative rules for choice, irrationality of some human judgments, and group decision making. Applications of decision theory at the personal, organizational, and societal levels are reviewed.

PSYX 482 PSYCHOLINGUISTICS
F 3 cr. LEC 3
PREREQUISITE: PSXN 100 and either PSXN 380 or ENGL 256.
- Examines the psychological processes that make it possible for humans to learn and acquire language. Emphasizes on how spoken and written language is understood, how speech is produced, and how language is acquired.

PSYX 499R UNDERGRADUATE RESEARCH
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior or Senior standing, PSXN 231 and consent of instructor.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

PSYX 500 SEMINAR
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSYX 501 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor.
- Directed research and study on an individual basis.

PSYX 491 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: PSXN 231, Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students help prepare and present discussion material, and attend presentations by guest speakers.

PSYX 495 FIELD PRACTICUM
IN APPLIED PSYCHOLOGY
F, S, Su 3 - 12 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: PSXN 231. Junior standing and as determined for each offering.
- Exposure to the various roles and demands of a field setting, including specialization in one of the following areas: applied research, behavior modification, psychological assessment, industrial/organizational behavior, or others (to be arranged).

PSYX 499R SENIOR THESIS/CAPSTONE
F, S 3 cr. SEM 3
PREREQUISITE: PSXN 490 (minimum 3 cr.) or PSXN 491.
- Senior capstone course. Written and oral presenta
tion of senior thesis work.

PSYX 500 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or consent of instructor.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PSYX 501 ADVANCED RESEARCH
DESIGN AND ANALYSIS
F 3 cr. LEC 5
PREREQUISITE: Graduate standing or PSXN 231.
- Advanced topics in the design and analysis of psychological research.

PSYX 539 PHYSIOLOGICAL PROCESSES
S 3 cr. LEC 5
PREREQUISITE: Graduate standing or consent of instructor.
- Overview of research methods and relevant aspects of neurophysiology, neuroanatomy and neuropsychology. Application of prior work to the problem of discovery in biopsychology.
PSYX 541 COGNITIVE PROCESSES
3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Theories, methods, findings, and applications concerning memory and cognitive processes.

PSYX 542 LEARNING
3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Principles and theories of learning and motivation. Topics include conditioning, learning, incentive motivation, reward, and punishment.

PSYX 543 MEMORY
3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Theories and applications of human memory from cognitive psychological perspective. Topics include memory in social, legal, and educational contexts; memory conformity; memory across the lifespan; memory and expertise; autobiographical memory; metememory; and forgetting.

PSYX 544 SOCIAL PSYCHOLOGY
3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Social cognition, interpersonal attraction, aggression, attitudes and attitude change, the self, group dynamics, stereotypes, prejudice, and social influence.

PSYX 545 ORGANIZATIONAL PSYCHOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Introduction to major concepts and theories in organizational psychology through examination of research, theory, and application in organizational psychology topics such as organizational entry and socialization, leadership, motivation, group processes, conflict, job design, and personality.

PSYX 546 SOCIAL COGNITION
3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course examines decision making, judgment, cognition, and affect from a social-cognitive perspective. Topics may include theory development, stereotypes, prejudice and discrimination, group behavior, attitudes and attitude change, mood and affect, heuristics and biases, memory, the self, and decision making. The primary goal is to understand theory and research in social cognition.

PSYX 550 SPECIAL TOPICS
On Demand 1 - 4 cr.
PREREQUISITE: Graduate standing and consent of instructor.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

REL 105D INTRODUCTION TO THE STUDY OF RELIGION
On Demand 3 cr. LEC 3
- The great themes of the world’s religions and the methodologies approaches to the academic study of religion and culture.

REL 110D RELIGION, CONFLICT AND POLITICS
4 cr. LEC 3 RCT 1
- This course will focus on issues in which political events and conflict have had their roots in religion or in specific interpretations of different aspects of religion.

REL 201D RELIGION IN LATIN AMERICA
S alternate years, to be offered odd years 3 cr. SEM 3
- This course examines the history of religion in Latin America from pre-conquest times to the present and traces the mutual influences of indigenous, African, and Iberian traditions. It will emphasize "popular" beliefs, symbols, and rituals and their relationship with elite religion and state power. Cross-listed with HISTR 292.

REL 202D ASIAN RELIGIONS: HINDUISM AND BUDDHISM
On Demand 3 cr. LEC 3
- The sacred texts and the historical forms of religious thought and practice in the traditions of India.

REL 203D ASIAN RELIGIONS: FROM TAOISM TO ZEN
On Demand 3 cr. LEC 3
- The sacred texts and images of the religious thought and practices in the traditions of China, Korea, and Japan.

REL 204H INTRODUCTION TO HEBREW BIBLE
On Demand 3 cr. LEC 3
- The Hebrew Bible (Old Testament) and its interpreters will be studied from literary, historical, archaeological, anthropological, and cultural perspectives.
RELS 520 PHILOSOPHY OF RELIGION
On Demand 3 cr. LEC 3
PREREQUISITE: One of the following: PHIL 105, PHIL 120, RELS 206, RELS 207, PHIL 220, PHIL 231, or PHIL 290.
- Analysis of concepts of God, revealed truth, and immortality; the nature of religious emotion and experience, and of religious language; relation of faith to reason; traditional proofs of God's existence; the problem of evil.

RELS 521 GENDER AND RELIGION
On Demand 3 cr. LEC 2 RCT 1
PREREQUISITE: One of the following: HUM 204, HUM 205, RELS 105, RELS 110, RELS 202, RELS 205, RELS 204, RELS 205 or RELS 220.
- Investigation of metaphors and myths of gender and world cultures.

RELS 525 LITERATURE AND RELIGION
On Demand 3 cr. SEM 3
PREREQUISITE: At least two 200 level courses in any one or combination of Religious Studies, English, Humanities, Modern Languages, or permission of the instructor.
- Exploration of the relationship between the sacred and the aesthetic in a variety of ancient, modern, and postmodern texts.

RELS 526 MYSTICS, FOUNDERS, REFORMERS
On Demand 3 cr. SEM 3
PREREQUISITE: One of the following: RELS 105, RELS 202, RELS 203, RELS 204, RELS 205, RELS 206, RELS 207, or permission of the instructor.
- The varieties of religious experience and the varieties of theories describing and analyzing those texts considered mystical. Questions of foundation and reform periods considered in light of mystical experience.

RELS 530 RELIGION AND SOCIETY IN ANCIENT EGYPT
5 alternate years, to be offered every 5 cr. LEC 3
PREREQUISITE: RELS 105 or RELS 110, RELS 204 or RELS 206.
- Survey Egyptian culture, religion, and society from the beginning of the history of a unified Kingdom of Ancient Egypt in the middle of the third millennium BCE through the Hellenistic conquest of Egypt by Alexander the Great in 322 BCE.

RELS 532 BIBLICAL ARCHAEOLOGY
5 alternate years, to be offered every 5 cr. LEC 3
PREREQUISITE: RELS 105 or RELS 110, RELS 204 or RELS 206.
- This course will examine the archaeology of the biblical world. Major topics to be covered will be the interaction of archaeological and biblical scholarship, and the history and background of those peoples and cultures that make up the “biblical world.”

RELS 405 TEXT AND IMAGE
On Demand 4 cr. LEC 3 RCT 1
PREREQUISITE: One of the following: RELS 105, RELS 110, RELS 204, RELS 205, RELS 206, HUM 201 or HUM 205.
- If western religions are grounded in an iconoclastic imagination, what are the theories of reading and of seeing? This course examines the histories of literacy and of visual representation as keys to the foundations of western culture and religion.

RELS 407 forms: THE RELIGIOUS BACKGROUND OF SOCIAL & POLITICAL CATEGORIES
F,S, alternate years, to be offered Fall every even years 5 cr. SEM 3
PREREQUISITE: RELS 110.
- This course will examine the religious roots of various social and political categories in today’s world which might include, among other, nationalism, fundamentalism, or sexism, and examine the means by which these religiously-influenced categories have affected contemporary society and events.

RELS 410 PSYCHE AND THE SACRED
On Demand 3 cr. LEC 3
PREREQUISITE: One of the following: RELS 105, RELS 202, RELS 203, RELS 204, RELS 205, HUM 201, or permission of the instructor.
- This course is a cross cultural investigation of the ideas of personhood, including theories of the individual, the social, the body, and the transpersonal and trans temporal.

RELS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

RELS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

RELS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F,S,Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
PREREQUISITE: Student of RELS 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

RELS 490R UNDERGRADUATE RESEARCH/Creative Activity
F,S,Su 1 - 6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior standing and consent of department head.
- Directed undergraduate research. Course will address responsible conduct of research.

RELS 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean, and Dean of Graduate Studies.
- Directed research and study on an individual basis.

SOCI

Department of Sociology and Anthropology
(406) 994-4201

SOCI 101S INTRODUCTION TO SOCIOLOGY
F,S 3 cr. LEC 3
- Theoretical and methodological underpinnings of sociology. How theory guides investigation of social life and results in creation of factual knowledge. How sociological questions are studied and results are interpreted.

SOCI 110S HONORS SOCIOLOGICAL INQUIRY
On Demand 3 cr. LEC 3
- In-depth study of the sociological enterprise: the broad range of theories and research used by sociologists to think about and examine the social world. All major areas of sociology are covered with an emphasis on institutions and systems of stratification.

SOCI 150D SOCIAL DIFFERENCE
S 3 cr. LEC 3
- Examination of social differences by focusing on the construction and consequences of a limited set ascribed social characteristics: race, ethnicity, gender, sexual orientation and class. Focus on how these ascribed statuses are central to the sociological study of inequality.

SOCI 201D SOCIAL PROBLEMS
On Demand 3 cr. LEC 3
- Major social problems such as human deviance, discrimination, crime, mental illness, and economic inequality. These problems will be considered primarily as consequences of cultural premises and values in American society. Competing theoretical explanations.

SOCI 202 SOCIAL STATISTICS
F,S 3 cr. LEC 3
PREREQUISITE: SOCI 101 or equivalent course; Quantitative Core; or consent of instructor.
- Topics covered include: Levels of measurement; measures of central tendency; dispersion and association; normal curve, statistical inference; logic of quantitative comparison and decision making utilized by social scientists; introduction to data collection techniques.

SOCI 221S CRIMINAL JUSTICE SYSTEM
On Demand 3 cr. LEC 3
- This course is an overview of the institutions that comprise our justice system. The emphasis is on criminal justice and the sources of crime but topics relevant to the broader study of the law and justice included.

SOCI 303 SOCIETY AND THE INDIVIDUAL
F 3 cr. LEC 3
PREREQUISITE: SOCI 101 or equivalent course, Quantitative core; or consent of instructor.
- Social behavior of the individual in the group, linguistic behavior, social perception, motivation and learning, and self focus on symbolic interaction.

SOCI 307 SOCIOLOGY OF CHILDHOOD AND ADOLESCENCE
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: SOCI 101 or equivalent course, Quantitative core; or consent of instructor.
- Examination of cultural and societal forces influencing development among children and adolescents from a sociological perspective.
COURSE DESCRIPTIONS: SOCI 311 - SOCI 434

SOCI 311 CRIMINOLOGY
Varies, to be offered F even years, S odd years and S even years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, SOC 202 or STAT 216, or consent of instructor.
- Discussion of major theories of crime and delinquency with special attention to systems of adult and juvenile deterrence.

SOCI 313 PRINCIPLES OF CRIMINAL LAW AND PROCEDURES
F S 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, QM 101 or consent of instructor.
- This course introduces the student to fundamental American legal principles as developed in criminal law. In addition, the student will gain a basic understanding of key issues in the application and development of contemporary legal procedures.

SOCI 318 RESEARCH METHODS
F S 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, STAT 216 or SOC 202, or consent of instructor.
- Introduction to research methods in sociology with emphasis given to defining variables, hypothesis formation, and development of strategies used to test hypotheses. Student research project.

SOCI 320 SOCIOLOGY OF RELIGION
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.

SOCI 325 SOCIAL STRATIFICATION
S 8 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.

SOCI 326 SOCIOLOGY OF GENDER
F 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- Examine the biological and social bases of gender; how gender is constructed through socialization, social interaction and institutional processes, and the social, cultural and economic consequences of gender differences for men and women.

SOCI 332 SOCIOLOGY OF FAMILY
Alternate years, to be offered every even years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- The family as a structural and functional unit in social life and organization, as a unit of social control; its status, change, and associated problems.

SOCI 333 SOCIOLOGY OF EDUCATION
F alternate years, offered even years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- This course will focus on the relationship between education and society including the role of education in structuring socialization; racial, ethnic, gender and class stratification; human capital development; economic, political and labor market opportunities; and the political system.

SOCI 340 SOCIAL MOVEMENTS
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- Of all the means of achieving social change, movements are among the most controversial. This course looks at movements through the theories used to interpret their activities in order to improve our understanding of their dynamics.

SOCI 341 SOCIOLOGY OF RACE AND ETHNICITY
F 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- Historical, comparative, and social psychological study of race and ethnic relations in the U.S. and elsewhere. Power, prejudice, and discrimination relating to minority status are emphasized.

SOCI 345 SOCIOLOGY OF ORGANIZATIONS
F 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- Rational, natural, and open systems theories of complex organizations. Introduction to organizational structure. Irrational aspects of organizations. Organizational environments and their effects on structure and activity.

SOCI 355 POPULATION AND SOCIETY
F 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- Distribution, growth trends, and future prospects of human population numbers in local, national, and world communities including analysis of birth, death, and migration changes. Elementary methods and theories of demographic analysis.

SOCI 357 OCCUPATIONAL / CORPORATE CRIME
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- A sociological analysis of crimes committed by individuals within the work place and by corporations. Addressed are the extent of the problems, social costs, legal responses, and theoretical perspectives assessing the etiology of such crimes.

SOCI 358 CRIME & INEQUALITY
F 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- This course examines how crime amid justice play out in the context of a stratified society. Students explore how social organization, inequality and conflict influence and shape the nature and distribution of crime and social control.

SOCI 359 CRIME, JUSTICE, AND THE MEDIA
F 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- Application of analytical tools to the analysis of sociological data.

SOCI 368 LATINO IMMIGRATION
F alternate years, to be offered every even years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- In this course we explore the forces behind labor flows between Latin America and the U.S. and the parallel reality of immigrant life. Although rooted in immigration theory, we use Latino daily life experience as our primary analytical lens.

SOCI 370 SOCIOLOGY OF GLOBALIZATION
S 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- Examines the global interconnectedness of economic, political and cultural processes. Topics covered include theories and historical analysis of globalization, global culture and consumerism. The human struggles that accompany these changes including gender, family, and immigration.

SOCI 373 SOCIOLOGY OF INDIGENOUS PEOPLES
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: SOC 101 and Quantitative core, or consent of instructor.
- A survey of indigenous peoples in global, historical, and comparative perspective, with special emphasis on the development of indigenous rights and identity in the Anglo-derived settler societies of North America and Australasia (although other regions will be considered).

SOCI 380 SOCIOLOGY OF HEALTH & MEDICINE
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core, or consent of instructor.
- An in-depth exploration of differing perspectives on health, medicine, practitioners, and healthcare systems with a focus on how gender, race/ethnicity, and social class affect health care systems, policies, practice and individual experiences of health and illness.

SOCI 394 FAMILY VIOLENCE
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: SOC 101, or equivalent course, Quantitative core, or consent of instructor.

SOCI 427 SOCIOLOGICAL ANALYSIS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: SOC 101, or equivalent course, Quantitative core, or consent of instructor.

SOCI 434 SOCIOLOGY OF HUMAN SEXUALITY
S 3 cr. LEC 3
PREREQUISITE: SOC 101, or equivalent course, Quantitative core, or consent of instructor.
- Investigation of human sexuality from a sociological perspective. Focus on social aspects of human desires experiences, and meanings in historical and cultural context primarily using a social construction of human sexuality perspective.
SOCI 435 LAW & SOCIETY
S 3 cr. LEC 3
PREREQUISITE: SOCI 101 or equivalent course, Quantitative core; or consent of instructor.
- Analysis of law, legal processes, and legal and quasi-legal institutions from sociological and philosophical perspectives. Some issues that are addressed include the functions of the law in modern society, the issue of the law’s power (or impotence) in the everyday, and the law’s violence.

SOCI 436 LAW & INEQUALITY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: SOCI 101 or equivalent course, Quantitative core; or consent of instructor.
- This course addresses the problem of social inequality by examining the contradictory ways in which the law may be used as both an instrument of social change and as a medium to formalize and solidify social inequality.

SOCI 455 CLASSICAL SOCIOLOGICAL THEORY
F, S 3 cr. LEC 3
PREREQUISITE: SOCI 101 or equivalent course, Quantitative core; or consent of instructor.
- Introduction to major sociological theories with focus on the implication for the development of empirical research. Theory as a set of tools to guide research. The explanations provided by theorists are compared and their contributions to the study of selected social phenomena are discussed.

SOCI 470 ENVIRONMENTAL SOCIOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: SOCI 101 or equivalent course, Quantitative core; or consent of instructor.

SOCI 485 POLITICAL SOCIOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: SOCI 101 or equivalent course, Quantitative core; or consent of instructor.
- Power. Who has it, who doesn’t, and why. Political sociology explores the omnipresence of power in society from political power in government to power relationships in our day-to-day lives. Political economy will also be examined.

SOCI 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 3 cr. IND
PREREQUISITE: SOCI 101 or equivalent course, Quantitative core; or consent of instructor.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

SOCI 492 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

SOCI 494 SEMINAR/WORKSHOP
On Demand 1 - 3 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: As determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

SOCI 498 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, SOCI 318, consent of instructor, approval of department head, and at least one additional upper division sociology course.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. See departmental qualification standards for internships.

SOCI 499 SENIOR THESIS CAPSTONE
F, S 3 cr. SEM 3
PREREQUISITE: Senior standing, SOCI 455, and SOCI 318 and at least one additional upper division Sociology course.
- Senior capstone course. The application of theory and methods in the development of an integrated framework for understanding and explaining issues of current concern. Verbal and written presentation of research paper.

SOCI 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

SOCI 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

SOCI 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular need, or on a trial basis to determine acceptability and demand.

SPNS
Modern Languages, Spanish
Department of
Modern Languages & Literatures
(406) 994-4448

SPNS 101 ELEMENTARY SPANISH I
F, S Su alternate years 4 cr. RCT 4
NOTE: Offered on a rotating basis with French and German in the summer.
- An elementary level course designed to help students acquire basic proficiency in communicating within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures.

SPNS 102D ELEMENTARY SPANISH II
F, S Su alternate years 4 cr. RCT 4
PREREQUISITE: SPNS 101 or equivalent, or two years of high school Spanish. Offered on a rotating basis with French and German in Summer.
- This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues.

SPNS 201D INTERMEDIATE SPANISH I
F, S 3 cr. RCT 3
PREREQUISITE: SPNS 102 or equivalent, or a minimum three years of high school Spanish, or placement interview.
- Intensive, methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate-level readings and discussions. Increased emphasis on written communication.

SPNS 220D SPANISH LANGUAGE & CULTURE
F, S 3 cr. RCT 3
PREREQUISITE: SPNS 201 or equivalent, or placement interview.
- Designed to follow the third semester review of grammar and basic skills. Taught through a series of carefully selected readings in Spanish culture, civilization, and literature which will provide the basis for writing essays and reports and developing advanced language skills.

SPNS 320 SPANISH CULTURE & CIVILIZATION
F 3 cr. LEC 3
PREREQUISITE: SPNS 220
- Readings, lectures, and discussions in Spanish. This course examines the historical, social, and ideological aspects of Spanish culture from the Middle Ages to the modern period. Taught in Spanish.

SPNS 323 SPANISH ADV GRAMMAR & PHONETICS
F 3 cr. LEC 3
PREREQUISITE: SPNS 220 for majors & minors; or Junior standing for non-majors.
- Examination of the major authors, works, and literary movements of U.S. Latino literature. Taught in English. Spanish majors and minors will read and write in Spanish.

SPNS 324 SPANISH ADV CONVERSATION & COMP
S 3 cr. RCT 3
PREREQUISITE: SPNS 323
- Development and refinement of advanced oral and written skills, intensive practice in expository and imaginative composition, review of idiomatic expressions, and vocabulary expansion.

SPNS 325 SURVEY OF SPANISH LIT
S alternate years, to be offered every even years 3 cr. LEC 3
PREREQUISITE: SPNS 325 or 324.
- A survey of Spanish literature from the Middle Ages to the modern period through an examination of the masterpieces of each literary period. Taught in Spanish.

SPNS 329 EARLY CULTURES OF LATIN AMERICA
F 3 cr. LEC 3
PREREQUISITE: SPNS 220.
- Readings, lectures, and discussions in Spanish. This course examines the historical, social, and ideological aspects of Latin American culture from the pre-Columbian period through independence.

SPNS 330 MODERN CULTURES OF LATIN AMERICA
F 3 cr. LEC 3
PREREQUISITE: SPNS 325 or 324.
- Readings, lectures and discussions in Spanish. This course examines the historical, social, and ideological aspects of modern Latin American culture. Taught in Spanish.
SPNS 332 CONTEMPORARY LATIN AMERICAN LITERATURE
F 3 cr. LEC 3
PREREQUISITE: SPNS 323 or 324.
- An examination of the major authors, works, and literary movements of the 19th and 20th centuries as Latin American literature has come of age and established its independence from Spanish peninsular influences. Taught in Spanish.

SPNS 335H TRAVEL IN LATIN AMERICAN LIT & FILM
Su 3 cr. RCT 3
PREREQUISITE: SPNS 220 or junior standing.
- The course examines travel in Latin America in texts and films as exploration and search for individual and national identity and as disruptive forces which are changing the world. Taught in English.

SPNS 350 US LATINO CULTURES
F 3 cr. LEC 3
PREREQUISITE: SPNS 220 for majors and minors or junior standing for non-majors.
- Examines the history and culture of Latin American communities in the United States. It centers on the largest Hispanic populations found in the United States today: Mexican, Dominican, Puerto Rican, and Cuban. Taught in English. Spanish majors and minors will read and write in Spanish.

SPNS 351 US LATINO LITERATURE
F 3 cr. RCT 3
PREREQUISITE: SPNS 220.
- In-depth review of problem areas in grammar, complete review of the verb system and a practical study of Spanish sounds. The class is designed to provide a working knowledge of the vocabulary and grammar for students with an understanding of the function of Spanish grammar. In Spanish.

SPNS 352 HISPANIC TEXTS AND CINEMA
S 3 cr. LEC 3
PREREQUISITE: SPNS 323.
- This course will focus on different topics of Latin America and/or Spain through the reading and viewing of a variety of Hispanic literature and movies. These themes may include history, race, gender, politics and literary trends in Latin America or Spain. Focus will vary depending on the professor. In Spanish.

SPNS 353 HISPANIC POETRY
F 3 cr. SEM 3
COREQUISITE: SPNS 325.
- Examines 20th century poetry from several Latin American countries and Spain including the poetics of biographies and their historical, social, and political contexts. Students will watch three movies pertaining to Hispanic poets and also listen to music that uses poetry. In Spanish.

SPNS 430 LATIN AMERICAN PERSPECTIVES
S 3 cr. LEC 3
PREREQUISITE: SPNS 220 or equivalent.
- This course approaches historical developments, literature, and constructions of identity in twentieth-century Latin America. Taught in English with Spanish reading/writing option. Focus will vary by professor.

SPNS 460 CONTEMPORARY SPAIN AND NATIONS
F 3 cr. LEC 3
- Examines several facets of contemporary Spain, including three of Spain’s peripheral nations: Basque Country, Catalonia, and Galicia. Students read and write about issues such as the current battle of memory, immigration, feminism, and cinema.

SPNS 470R SEM: MODERN HISPANIC LITERATURE
F, S 3 cr. SEM 3
PREREQUISITE: SPNS 325 or SPNS 332 or SPNS 351.
- Senior capstone course. An in-depth examination of the most important Hispanic works and authors of the 19th and 20th, and 21st centuries. In Spanish.

STAT Statistics
Department of Mathematical Sciences
(406) 994-3601

The Department of Mathematical Sciences enforces prerequisites. By University policy, in order for any course to serve as the prerequisite you must earn a "C-" or better. In addition to the specific prerequisite courses listed, students in 100 level Math courses and STAT 216 may also meet the prerequisite with the appropriate Math ACT, Math SAT, or Math Placement Exam score. Specific levels and scores for these courses can be found at: http://www.math.montana.edu/undergrad/documents/MIHierarchy.pdf.

STAT 216Q INTRODUCTION TO STATISTICS
F, S 5 cr. LEC 3
PREREQUISITE: C- or better in any 100 level or above M course, or Math Placement Test within the past 12 months.
- Traditional and robust estimates of location and variability, fundamentals of probability theory, confidence intervals, and tests of hypothesis for normal distributions.

STAT 217Q INTERMEDIATE STATISTICAL CONCEPTS
F, S, Su 5 cr. LEC 3
PREREQUISITE: C or better in any 100 level or above M course, or Math Placement Test within the past 12 months.
- One- and two-sample tests and associated confidence intervals for means and proportions; analysis of variance; F-tests, correlation, regression, contingency tables. Statistical analysis using the computer.

STAT 225Q HONORS INTRODUCTION TO STATISTICS
S 5 cr. LEC 3
PREREQUISITE: Enrollment in the MSU Honors Program or consent of instructor.
- Honors section of STAT 216. Topic coverage parallels STAT 216 but with greater emphasis on applications, data analysis and interpretation, statistical computing, and statistics in the media.

STAT 290R UNDERGRADUATE RESEARCH
F, S, Su 1 - 8 cr. IND
PREREQUISITE: Consent of department head.
- Directed undergraduate research. Course will address responsible conduct of research.

STAT 332 STATISTICS FOR SCIENTISTS & ENGINEERS
F, S 3 cr. LEC 3
PREREQUISITE: M 172.
- Methods of estimation, collection, analysis, and display of quantitative information, continuous and discrete random variables, families of probability distributions, hypothesis testing, regression, ANOVA.

STAT 338 STATISTICAL COMPUTING AND GRAPHICAL ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: One of the following: STAT 217, STAT 332, or STAT 401.
- Introduction to statistical packages SAS and S, including data importation, graphing, and basic analysis. Emphasis on use of graphical displays to explore, understand and present data.

STAT 401 APPLIED METHODS IN STATISTICS
F, S 3 cr. LEC 3
PREREQUISITE: Graduate standing and STAT 216.
This course is intended for graduate students not majoring in a mathematical science.
- Graphical techniques, data collection plans, populations, samples, and sampling distributions, inferences on means and proportions of one and two populations, analysis of variance for one-way classifications and multiple comparisons, simple linear regression.

STAT 410 METHODS FOR DATA ANALYSIS I
F, S 3 cr. LEC 3
PREREQUISITE: M 161, and either STAT 217, STAT 332, or STAT 401.
- Intro to statistical inference and design, t-tests, non-parametric alternatives, one-way ANOVA, simple linear regression, multiple linear regression, and variable selection procedures, with an emphasis on scope of inference and interpretation of results.

STAT 412 METHODS FOR DATA ANALYSIS II
S 3 cr. LEC 3
PREREQUISITE: STAT 410.
- Two-way ANOVA, studies with no replication, serial correlation, repeated measures, Intro to multivariate analysis, principles of experimental design, factorial and blocked designs, comparisons of proportions or odds, logistic regression, Poisson log-linear regression.

STAT 421 PROBABILITY THEORY
F 3 cr. LEC 3
PREREQUISITE: M 273.
- Fundamentals of probability; discrete and continuous random variables; expected value; variance; joint, marginal, and conditional distributions; conditional expectations; applications; simulation; central limit theorem, order statistics.
STAT 422 MATHEMATICAL STATISTICS
S 3 cr. LEC 3
PREREQUISITE: STAT 421.
- Senior capstone course. Introduction to the theory of point estimation, interval estimation, and hypothesis testing.

STAT 431 NONPARAMETRIC STATISTICS
F alternate years, to be offered every even year 3 cr. LEC 5
PREREQUISITE: One of the following: STAT 217, STAT 352, or STAT 401.
- Sign test, permutation tests, Wilcoxon and Mann-Whitney tests, the Kruskal Wallis test, Spearman and Kendall’s measures of association, bootstrap techniques, and smoothing methods for model fitting. Emphasis on methods and interpretation rather than theory.

STAT 436 INTRODUCTION TO TIME SERIES ANALYSIS
F alternate years, to be offered every even year 3 cr. LEC 3
PREREQUISITE: STAT 410.
- An introduction to time series analysis considering time series regression, autoregressive, moving average, and ARIMA models, time series model building, estimation, and forecasting, and basic frequency domain methods.

STAT 437 INTRODUCTION TO APPLIED MULTIVARIATE ANALYSIS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: STAT 410.
- Classic multivariate methods, including but not limited to principal components analysis, canonical correlation analysis, factor analysis, discrimination and classification methods, and cluster analysis.

STAT 439 INTRODUCTION TO CATEGORICAL DATA ANALYSIS
S alternate years, to be offered every year 3 cr. LEC 3
PREREQUISITE: STAT 412.
- Contingency table analysis, Poisson regression, logistic regression, log-linear models, multiclassification logit models

STAT 446 SAMPLING
F 3 cr. LEC 3
PREREQUISITE: One of the following: STAT 217, STAT 352 or STAT 401.
- Probability sampling, sources of bias and uncertainty, survey design, methods for the natural sciences, simple random sampling, stratified random sampling, systematic sampling, cluster sampling.

STAT 448 MIXED EFFECTS MODELS
F alternate years, offered in odd years 3 cr. LEC 3
PREREQUISITE: STAT 410.
- In-depth analysis of random, fixed and mixed effects models including use of stata software and interpretation of results. Emphasis on observations correlated in time (repeated measures) and space, and on random coefficients models (growth curves).

STAT 490R UNDERGRADUATE RESEARCH
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior standing in statistics and consent of department head.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

STAT 491 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

STAT 492 INDEPENDENT STUDY
F, S, Su 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

STAT 494 SEMINAR
On Demand 1 cr. IND
PREREQUISITE: Graduate standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting material.

STAT 498 INTERNSHIP
F, S 2-12 cr.
PREREQUISITE: STAT 410.
- On Demand 1 cr. SEM 1 Maximum 6 cr.
- Maximum 12 cr.

STAT 501 INTERMEDIATE PROBABILITY & STATISTICS
F 3 cr. LEC 3
PREREQUISITE: STAT 422 or M 382.

STAT 502 INTERMEDIATE MATHEMATICAL STATISTICS
S 3 cr LEC 3
PREREQUISITE: STAT 501 or M 501.

STAT 505 LINEAR MODELS
F 3 cr. LEC 3
PREREQUISITE: STAT 502 or M 502.
- Special matrix theory for statistics, multivariate normal distribution, distributions of quadratic forms, estimation and testing for the general linear model, one-way and two-way classification models, contrasts (main effect, simple effect and interaction), multiple comparison techniques.

STAT 506 ADVANCED REGRESSION ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: STAT 505.
- Applications of linear models using statistical packages; detecting and dealing with violations of assumptions including nonconstant variance, nonnormality, and collinearity; mixed effects models.

STAT 509 STOCHASTIC PROCESSES
S alternate years, to be offered every even year 3 cr. LEC 3
PREREQUISITE: STAT 421.
- Conditional probability theory, discrete and continuous time markov chains including birth and death processes and long run behavior; Poisson processes; queueing systems; system reliability. Cross-listed with M 509.

STAT 510 STATISTICAL CONSULTING SEMINAR
F, S 1 cr. SEM 1 Maximum 6 cr.
PREREQUISITE: Graduate standing in statistics.
- Seminar discussions of issues and cases in statistical consulting. Supervised practice in consulting with researchers from various disciplines.

STAT 527 TOPICS IN APPLIED STATISTICS
F alternate years, offered in even years 3 cr. LEC 3
PREREQUISITE: STAT 422 and consent of instructor.
- Current topics selected from computational statistics, time series and spatial statistics, decision theory, sampling, linear and mixed models, and multivariate statistics.

STAT 528 BIOSTATISTICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: STAT 410.
- Statistical methodology applicable to vital statistics, life tables and survival curves, clinical trials, epidemiologic investigations, and cause-effect studies.

STAT 529 EXPERIMENTAL DESIGN
F alternate years, to be offered every even year 3 cr. LEC 3
PREREQUISITE: STAT 510.
- Randomization, multiple comparisons and contrasts, balanced complete and incomplete blocking designs, Latin square designs, factorial designs, nested designs, split-plot designs, random and fixed effects.

STAT 532 STATISTICAL QUALITY CONTROL
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: STAT 421 or an equivalent transfer course in probability theory.
- Modeling process quality, traditional SPC tools, control charts for variable and attribute data, CUSUM and WMA charts, process capability analysis, reliability statistics, accelerated testing.

STAT 536 DATA ANALYSIS
F alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: STAT 422 or STAT 592 or M 592.
- Decision theory including loss functions, minimax criteria, shrinkage estimators, Bayesian data analysis and applications including posterior simulation via markov chain monte carlo.

STAT 534 SPATIAL DATA ANALYSIS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: STAT 410 and STAT 422, or equivalent, or consent of the instructor.
- Statistical methods of spatial data analysis, stationary and nonstationary random fields, covariance structures, geostatistical models and analysis, spatial point process models and analysis, spatial lattice models and analysis.
STAT 536 INTRODUCTION TO TIME SERIES ANALYSIS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: STAT 410 and consent of the instructor.
- An introduction to time series analysis considering time series regression, autoregressive, moving average, and ARIMA models, time series model building, estimation, and forecasting, and basic frequency domain methods.

STAT 537 MULTIVARIATE ANALYSIS I
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: STAT 505.
- Multivariate graphical methods, Wishart distribution, Hotelling’s T-squared, multivariate regression, multivariate analysis of variance and covariance, analysis of repeated measures, principal components analysis, factor analysis, canonical correlation, multivariate graphical displays, robust estimation discriminant and classification analysis, cluster analysis.

STAT 538 MULTIVARIATE ANALYSIS II
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: STAT 537.
- Special topics in multivariate analysis including general latent variable methods, analysis of covariance structures, common principle components, robust and distribution free multivariate analysis.

STAT 539 GENERALIZED LINEAR MODELS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: STAT 422 and STAT 410.
- Analysis of categorical data including logistic regression, log-linear models, analysis of deviance, extrabinnomial variation, quasi-likelihood.

STAT 550 ADVANCED MATHEMATICAL STATISTICS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: STAT 502 or M 502 and either M 382, M 565, or M 547.
- Sufficiency, completeness, ancillary statistics, invariance, likelihood-based inference, large sample theory, Edgeworth and saddlepoint approximations.

STAT 570 INDEPENDENT STUDY
F, S, Su 1-3 cr. IND 3
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

STAT 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1-4 cr. IND 3
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

STAT 576 INTERNSHIP
F, S, Su 2-12 cr. IND Maximum credits unlimited.
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

STAT 578 RESPONSE SURFACE METHODOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: STAT 526.
- Diagnostics; fractional-factorial designs; method of steepest ascent; canonical analysis; response optimization; ridge analysis; response surface design including central composite designs, orthogonal designs, rotatable designs, and optimal designs; mixture designs.

STAT 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

STAT 589 GRADUATE CONSULTATION
F, S, Su 5 cr. IND 3
PREREQUISITE: Master’s standing.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time.

STAT 590 MASTER’S THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

STAT 680 DOCTORAL READING & RESEARCH
F, S, Su 5-5 cr. IND Maximum 15 cr.
PREREQUISITE: Doctoral standing.
- This course may be used by doctoral students who are reading research publications in the field in preparation for doctoral thesis research.

STAT 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

TE Technology Education
Department of Education
(406) 994-3120

TE 101 INTRODUCTION TO TECHNOLOGY EDUCATION
F 1 cr. LEC 1
- Introduction to the rationale, principles, concepts, and philosophy of technology education. An overview of the Technology Education paradigm is provided through a variety of class activities.

TE 115 BASIC ELECTRONICS/COMPUTER NETWORKS
S 2 cr. LEC 1 LAB 1
- Provides basic understanding of electricity/electronics as it can be used to design and control devices. Basic principles and theory behind computer operation and networking are also reviewed.

TE 200 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
- Topics offered at the lower division level which are not covered in regular courses.

TE 207 MATERIALS AND PROCESSES
F, S alternate years, to be offered 2010 4 cr. LEC 2 LAB 2
- Exploration of technical competencies using tools and equipment common to wood, metal and composite materials related to industrial usage.

TE 214 MATERIALS MACHINING AND SAFETY
S alternate years, to be offered 2010 3 cr. LEC 1 LAB 2
PREREQUISITE: TE 207
- Materials processing information and laboratory practice with emphasis on laboratory/machine facility safety. Machine tool technology practices emphasized.

TE 250 CS TECHNOLOGY & SOCIETY
F, S 3 cr. LEC 3
- The major technological periods, inventions, and innovations that have altered the course of humanism and their impact on the civilization process, leading to a perspective on technological literacy.

TE 280 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

TE 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

TE 298R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

TE 330 TRANSPORTATION TECHNOLOGY
S alternate years, to be offered 2009 3 cr. LEC 1 LAB 2
PREREQUISITE: TE 101 and TE 207
- Systems analysis of transportation technologies. Study of transportation systems of land, sea, and air, and the dependence on energy forms to operate transportation systems. Development of technological literacy pertinent to transportation and energy systems through problem solving activities.

TE 331 ELECTRONIC COMMUNICATION TECHNOLOGY
S 4 cr. LEC 2 LAB 2
- Students explore the technical and technological concepts of communication systems and subsystems.

TE 355 TEACHING PRACTICES
F 1 cr. LAB 1
COREQUISITE: ESDS 452
- Provides additional experiences in planning, teaching and evaluating lessons in Technology Education.
TE 360 TECHNOLOGY PRACTICUM
F, S 3 cr. LAB 3
PREREQUISITE: Consent of Instructor.
- Self-selected, self-directed interdisciplinary field experience arranged with and supervised by an academic advisor. This practicum will pertain to the transfer of technological literacy in a variety of settings.

TE 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

TE 406 CURRICULUM AND FACILITIES PLANNING
F 3 cr. LEC 3
PREREQUISITE: Acceptance in Teacher Education program; junior standing.
COREQUISITE: EDSD 352
- Determining appropriate development of Technology Education and Agricultural Education programs based on an analysis of student and community needs. Organizing subject matter materials and laboratory resources to promote the development of standard based curricula.

TE 410 COMPUTER AIDED MACHINING & MANUFACTURING
On Demand 3 cr. LEC 1 LAB 2
PREREQUISITE: TE 250.
- Understanding of computer aided machining and manufacturing. Includes instruction in the use and operation of a complete CAM system including applications on a CNC milling machine.

TE 417C MANUFACTURING TECHNOLOGY
F 3 cr. LEC 1 LAB 2
PREREQUISITE: TE 207 and TE 250 and junior or senior standing.
- Capstone course. Study and application of manufacturing concepts common to industry, including the stages of initial planning, prototype construction through the use of modern manufacturing techniques, market research, and analysis.

TE 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

TE 476 INTERNSHIP
F, S, Su 2 - 12 cr. IND (Maximum 12 cr.)
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in a technology field.

TE 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

TE 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: TE 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

UH University Honors
University Honors Program (406) 994-4110

UH 1508 THE ECONOMICS OF LIFE
F 3 cr. LEC 3
PREREQUISITE: Member of University Honors Program.
- This class applies the concepts and methods of economics to the choices people make during their life cycles. Students will explore economic analysis of issues such as marital choices, child bearing, voting, explanations for the rise in obesity, the effect of legalized abortion, and the advantages and disadvantages of estate taxes. The course encourages students to apply economic concepts to diverse topics, to assess the difficulty of empirically testing the predictions of an economic model, and to debate the current research in economics.

UH 201US TEXTS AND CRITICS: KNOWLEDGE
F 4 cr. SEM 4
PREREQUISITE: Restricted entrance; admission to the University Honors Program.
- University Seminar in critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analysis and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations.

UH 202 TEXTS AND CRITICS: IMAGINATION
S 4 cr. SEM 4
PREREQUISITE: Restricted entrance; admission to the University Honors Program.
- Critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analysis and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations. Honors students completing this course are exempt from the IH requirements in the core.

UH 204 GREAT EXPEDITIONS
On Demand 3 cr. SEM 3 Maximum credits unlimited.
PREREQUISITE: Consent of instructor.
- Preparation and execution of an expedition paralleling a portion of a historically and/or culturally significant expedition. Students study the original expedition journals, history, social, scientific, artistic, and environmental context as well as plan their own expedition. The expedition occurs over a vacation break and students are required to make a public presentation on the expedition and their specific research project during the subsequent semester.

UH 210 MENTORING GIFTED STUDENTS
F, S 2 cr. SEM 2 Maximum 4 cr.
PREREQUISITE: Admission to the University Honors Program.
- University Honors Program students mentor gifted children from the Bozeman Public Schools. Students meet together in seminar discussion, plan and implement projects, and evaluate their projects.

UH 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of Director.
- Directed research and study on an individual basis.
PREREQUISITE: None required but some may be determined necessary by each offering department.

- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

UH 280R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr.
RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

UH 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr.
IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

UH 400 HONORS SEMINAR
On Demand 2 - 4 cr.
SEM Maximum credits unlimited.
PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UH 401RA HONORS RESEARCH SEMINAR IN THE ARTS
On Demand 2 - 4 cr.
SEM Maximum credits unlimited.
PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 402RH HONORS RESEARCH SEMINAR IN THE HUMANITIES
On Demand 2 - 4 cr.
SEM Maximum credits unlimited.
PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 403RS HONORS RESEARCH SEMINAR IN THE SOCIAL SCIENCES
On Demand 2 - 4 cr.
SEM Maximum credits unlimited.
PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 404RN HONORS RESEARCH SEMINAR IN THE NATURAL SCIENCES
On Demand 2 - 4 cr.
SEM Maximum credits unlimited.
PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 450 ADVANCED HONORS TUTORIAL
F, S 4-6 cr.
RCT 4 TUT 2 May be repeated; maximum 12 cr.
PREREQUISITE: UH 201 and UH 202.
- Weekly seminar and tutorial supervision with extensive interdisciplinary reading, analytic writing, and oral argument, leading to comprehensive examinations.

UH 451 ADVANCED HONORS TUTORIAL
F, S 4 - 6 cr.
RCT 4 TUT 2 May be repeated; maximum 12 cr.
PREREQUISITE: UH 450, admission to the University Honors Program, and approval of Director.
- Weekly seminar and tutorial supervision with extensive interdisciplinary reading, analytic writing, and oral argument, leading to comprehensive examinations.

UH 470 INDEPENDENT STUDY
On Demand 1 - 3 cr.
IND Maximum 12 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of Director.
- Directed research and study on an individual basis.

UH 480 SPECIAL TOPICS
On Demand 1 - 4 cr.
Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

UH 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 cr.
SEM 1
- Classroom instruction associated with directed undergraduate research/creative activity projects.

UH 490 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY/THESIS
F, S 1 - 6 cr.
IND May be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

US

University Studies

University College

(406) 994-3532

US 101US FIRST YEAR SEMINAR
F, S 3 cr.
SEM
PREREQUISITE: First year students (less than 30 credits) only.
- This multidisciplinary course, presented in seminar format, draws from the disciplines of psychology, sociology, history, and philosophy and encourages students to explore issues critical to their academic goals and objectives. The course emphasizes verbal communication, critical thinking, intellectual development, and academic choices. Fulfills university seminar requirement of the core curriculum. This course cannot be repeated.

US 102 CAREER CONNECTIONS
S 1 cr.
SEM 1
- Course is designed to assist students in the selection of a major in accordance with their interests and abilities.

US 202 LEADERSHIP FELLOWS I
F, S 3 cr.
SEM 3
- Introductory course for students pursuing the MSU Leadership Fellows Certificate. Examines leadership for change through case studies of organizations on campus, in the community, and nationally.

US 370 INDEPENDENT STUDY
On Demand 1 - 3 cr.
IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of the Director of University Studies.
- Directed study on an individual basis.

US 280 SPECIAL TOPICS
On Demand 1 - 4 cr.
Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

US 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr.
RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

UNIV

University Courses

University College

(406) 994-4371

UNIV 125CS MICROBES IN THE ENVIRONMENT
F 3 cr.
LEC 3
- During the semester, students will explore contemporary issues related to microorganisms in the environment through a series of lectures and hands-on activities. Topics will include microbes in environmental, industrial, and medical settings. Examples include the beneficial role microbes play in treating waste water and making beer, wine, cheese and other food products as well as problems caused by microbes in medical infections, hot tubs, drinking water, and other industrial systems. Completing this course will advance a student’s awareness and appreciation of scientific thought and critical thinking and will improve communication skills.
US 460 PEER LEADERSHIP
F, S 3 cr. LEC 1 RCT 2 Maximum 6 cr.
PREREQUISITE: Accepted Peer Leader Status, Restricted Entry.
– Provides selected upper division students an opportunity to develop leadership and mentoring skills through the involvement with the US 101US First Year Seminar course. Includes training in group leadership and includes topics such as counseling and communication skills, student development, problem solving, and conflict resolution. Peer leaders work closely with faculty to enhance the academic, cultural, and social experiences of students in the seminar course.

US 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of the Director of University Studies.
– Directed study on an individual basis.

US 476 INTERNSHIP
On Demand 1 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of the Director of University Studies.
– An individual assignment arranged with an agency, business, or other organization to provide guided experience in the field.

US 480 SPECIAL TOPICS
On Demand 1 - 3 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

US 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 6 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: US 490.
– Classroom instruction associated with directed undergraduate research/creative activity projects.

US 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
– Directed undergraduate research/creative activity projects which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

VTMB Veterinary Molecular Biology
Department of Veterinary Molecular Biology
(406) 994-4705

VTMB 105CS INTRODUCTION TO BIOTECHNOLOGY
F 3 cr. LEC 2 SEM 1
– Introduction to an ever-growing industry. Course is designed to demonstrate the significance of biotechnology in today’s world. Lecture series presented by research scientists, covering four areas (scientific basis of biotechnology, experimental techniques, applications and societal issues). History of 20th-century biotechnology will be followed in a student seminar. Cross-listed with PSPP 101 and MB 110.

VTMB 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
– Directed research and/or study on an individual basis.

VTMB 271 FUNCTIONAL ANATOMY OF DOMESTIC ANIMALS
F 4 cr. LEC 3 LAB 1
PREREQUISITE: BIOL 102, Sophomore standing.
– Location, structure and function of various tissues, organs, and systems of domestic animals. Lab utilizes ruminants and monogastric species.

VTMB 280 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined by each offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

VTMB 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT may be repeated. Max 4 cr.
COREQUISITE: VTMB 290.
– Classroom instruction associated with directed undergraduate research projects.

VTMB 290R UNDERGRADUATE RESEARCH
On Demand 1 - 4 cr. IND
PREREQUISITE: Sophomore standing.
– Directed undergraduate research. Course will address responsible conduct of research.

VTMB 410 INFECTIONOUS DISEASES
S 5 cr. LEC 2 RCT 1
PREREQUISITE: MB 301; Recommended MB 401.
– Selected viral, bacterial and protozoan infections of man and domestic animals will be covered with an emphasis on disease process and immune responses.

VTMB 411 HYBRIDOMAS
F 2 cr. LEC 1 LAB 1
PREREQUISITE: MB 301 or consent of instructor.
– This course will provide students with a thorough theoretical and practical appreciation and understanding of the uses and methods involved in the production of monoclonal antibodies.

VTMB 412 ADVANCED IMMUNOLOGY
F 1 cr. LAB 1
PREREQUISITE: MB 301, BIOL 301, or consent of instructor.
– This course provides hands-on experience on assays commonly used in immunology for the detection of an immune response.

VTMB 413 FLOW CYTOMETRY
F 1 cr. LAB 1
PREREQUISITE: MB 301, BIOL 301, or consent of instructor.
– Theory and practice of flow cytometry with an emphasis on the analysis of mammalian cells.

VTMB 414 ADVANCED MICROSCOPY
F 1 cr. LAB 1
PREREQUISITE: MB 301, BIOL 301, or consent of instructor.
– Introduction to instrument design, operation and applications, and to modern techniques in preparing specimens for microscopic analyses, including computer-assisted microscopic imaging technology and microinjection.

VTMB 421 GENOME SCIENCE
S, 3 cr., LEC 1 LAB 2
PREREQUISITE: BCHM 340 or consent of instructor.
– Course will train students in modern practice of genomics and functional gene expression using DNA cloning, automated DNA sequencing, and comprehensive sequence analysis.

VTMB 422 FUNCTIONAL GENE EXPRESSION
S, 2 cr. LEC 1 LAB 1
PREREQUISITE: BCHM 340 or consent of instructor.

VTMB 424 ETHICAL PRACTICE OF SCIENCE
S 3 cr. Sem 3
PREREQUISITE: PHIL 332, PHIL 338, or at least one three-hundred level series of any science course.
– Examines the evolution of the scientific process with specific focus on the ethical responsibilities of scientists and to examine policies and procedures developed by the scientific community to ensure integrity in the research process.

VTMB 452 PROTEIN BIOCHEMISTRY
On Demand 1 cr.
PREREQUISITE: VTMB 410 or consent of instructor.
– Principles and techniques involved in biochemical analysis of proteins.
VTMB 470 INDEPENDENT STUDY  
On Demand 1 - 3 cr. END Maximum 6 cr.  
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.  
- Directed research and study on an individual basis.

VTMB 475 PREVETERINARY INTERNSHIP  
F, S, Su 2 - 4 cr. IND  
PREREQUISITE: Junior standing and consent of instructor.  
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

VTMB 476R BIOTECHNOLOGY INTERNSHIP  
ON DEMAND 4 cr. IND 4 (change effective Summer odd years)  
PREREQUISITE: Junior standing and consent of department head.  
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

VTMB 477 BIOTECHNOLOGY CAPSTONE  
F, S 2 cr. SEM 2  
PREREQUISITE: VTMB 476.  
- Senior capstone course. Participants in this seminar section will bring closure to the student’s required internship. Students will have the opportunity to refine their public speaking and writing skills through synthesis of the goals, progress, and outcome of their industrial or research laboratory experience. Exposure to many different types of internship outcomes will broaden the student’s perception of the disciplines which contribute to the field of biotechnology.

VTMB 480 SPECIAL TOPICS  
On Demand 1 - 4 cr. Maximum 12 cr.  
PREREQUISITE: Course prerequisites as determined by each offering.  
- Courses not required in any curriculum for which there is a pardon will only come, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

VTMB 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION  
F, S 1 - 2 cr. RCT May be repeated. Max 4 cr.  
COREQUISITE: VTMB 490.  
- Classroom instruction associated with directed undergraduate research/creative activity.

VTMB 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY  
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.  
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

VTMB 500 SEMINAR  
F, S 1 cr. SEM 1 Maximum 4 cr.  
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.  
- Topics offered at the graduate level which are not covered in regular courses.

VTMB 501 EXPERIMENTAL IMMUNOLOGY/PATHOLOGY  
S alternate years, to be offered even years 3 cr. LEC 3  
PREREQUISITE: MB 401.  
- Recent advances in and history of immunochromistry, immunogenetics, immunopathology, molecular and cellular immunology. Cross-listed with Microbiology 525.

VTMB 505 ADVANCED VIROLOGY  
F alternate years, to be offered 2006 5 cr. LEC 3  
PREREQUISITE: Graduate Standing or permission of instructor.  
- Considers the primary literature on viruses of animals, plants, and bacteria with the goals of understanding (1) the ubiquity of viruses in nature and (2) the solutions that viruses have evolved to maintain themselves in a host species.

VTMB 505 EUKARYOTIC GENE REGULATION  
S alternate years, to be offered odd years 3 cr. LEC 3  
PREREQUISITE: CHMY 442 and graduate standing.  
- Students in this course study the fundamental mechanisms of eukaryotic gene expression and this knowledge is placed within the context of modern genomics approaches. The course is divided between traditional lectures and a review of current literature in genotype, functional genomics (mRNA expression), and proteomics. Students learn basic informatics skills through a hands-on analysis of genome data with an emphasis on what can, and cannot, be learned from genome data.

VTMB 521 LABORATORY ROTATION I  
F 2 cr. LAB 2  
PREREQUISITE: Must be a first year VMB Graduate Student.  
- An independent scientific project within a VMB research laboratory. Student should identify a question, master the necessary methods, collect and analyze data, and interpret how the data addresses the question. Final results are presented in a 15-minute departmental seminar.

VTMB 522 LABORATORY ROTATION II  
S 2 cr. LAB 2  
PREREQUISITE: Must be a first year VMB Graduate Student. The VMB laboratory in which VTMB 522 is performed must be different from the laboratories in which VTMB 521 was performed.  
- An independent scientific project within a VMB research laboratory. Student should identify a question, master the necessary methods, collect and analyze data, and interpret how the data addresses the question. Final results are presented in a 15-minute departmental seminar.

VTMB 523 LABORATORY ROTATION III  
S 2 cr. LAB 2  
PREREQUISITE: Must be a first year VMB Graduate Student. The VMB laboratory in which VTMB 523 is performed must be different from the laboratories in which VTMB 521 and VTMB 522 were performed.  
- An independent scientific project within a VMB research laboratory. Student should identify a question, master the necessary methods, collect and analyze data, and interpret how the data addresses the question. Final results are presented in a 15-minute departmental seminar. An independent scientific project with a VMB research laboratory.

VTMB 570 INDEPENDENT STUDY  
On Demand 1 - 3 cr. IND Maximum 6 cr.  
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.  
- Directed research and study on an individual basis.

VTMB 580 SPECIAL TOPICS  
On Demand 1 - 4 cr. Maximum 12 cr.  
PREREQUISITE: Upper division courses and others as determined for each offering.  
- Courses not required in any curriculum for which there is a particular time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

VTMB 589 GRADUATE CONSULTATION  
F, S, Su 3 cr. TUT 3 Maximum credits unlimited.  
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.  
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

VTMB 590 MASTER’S THESIS  
F, S, S 1 - 10 cr. IND Maximum credits unlimited.  
PREREQUISITE: Doctoral standing.

WS 480R DOCTORAL THESIS  
F, S, S 1 - 10 cr. IND Maximum credits unlimited.  
PREREQUISITE: Doctoral standing.

WS Women’s Studies  
College of Letters and Science  
(406) 994-4288

WS 201IH INTRODUCTION TO FEMINIST THEORIES AND METHODOLOGIES  
F 3 cr. LEC 3  
- Major directions in feminist scholarship. Examination of the various schools of thought which have addressed gender inequities, and review of the strategies of cultural criticism which incorporate gender.

WS 209R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION  
F, S 1 - 3 cr. RCT may be repeated  
- Classroom instruction associated with directed undergraduate research/creative activity projects.

WS 209R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY  
F, S 1 - 6 cr. IND may be repeated  
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

WS 301RH INTEGRATIVE SEMINAR IN WOMEN’S STUDIES  
S 3 cr. SEM 3 Maximum 9 cr.  
- The seminar builds on the theoretical issues in women’s studies and addresses special topics each year from a variety of disciplines.
Academic Faculty

The following alphabetized list contains the titles and degrees of the faculty in MSU’s academic colleges.

A

AAMOT, KIRK
Associate Professor, Music
M.A. University of Colorado-Boulder 2001
M.A. University of Minnesota 1996
B.A. St Olaf College 1992

ABDELFATTAH, NABIL
Adjunct Associate Professor, Arabic
Ph.D. Univ of Texas-Austin 1990
M.A. Indiana University 1983
B.A. Tanta University 1979

ADAMS, EDWARD E
Professor, Civil Engineering
Ph.D. Montana State Univ-Bozeman 1987
M.S. Montana State Univ-Bozeman 1982
B.S. Montana State Univ-Bozeman 1979
B.A. Mount Saint Mary's College 1972

ADAMS, JEFFREY P
Associate Professor, Physics
B.Ed. Queens University 1992
Ph.D. Queens University 1991
B.S. Queens University 1988

ADAMS, LINDA DEAN
Adjunct Instructor, Management
Bachelors of Science SUNY at Albany 2001

AGRE-KIPPENHAN, SUSAN
Professor, Art
M.F.A. School Of Art Inst Chicago 1994
B.S. Skidmore College 1979

AGRUSS, DAVID I
Assistant Professor, English
Ph.D. Montana State Univ-Bozeman 1985
M.A. Cornell University 2000
B.A. Wesleyan University 1991

AIK, DENNIS
Professor, Film
Ph.D. Ohio State University 1983
M.A. Ohio State University 1973
B.A. City University of New York 1971

AL KAISY, AHMED
Associate Professor, Civil Engineering
Ph.D. Queens University 1999
M.S. University of Baghdad 1985
B.S. University of Baghdad 1982

ALLARD, JIM
Professor, Philosophy
Ph.D. Princeton University 1976
M.A. University of Montana 1970
B.A. University of Montana 1969

ALLEN, THOMAS LEE
Assistant Professor, Extension Agents
Bachelor of Science Montana State Univ-Bozeman 1988

ALLINGER, GLENN D
Professor Emeritus of Mathematical Sciences
Doctor of Philosophy University of Utah 1972
M.A. Washington State University 1967
B.S. Baldwin-Wallace College 1962

ALZHEIMER, TIMOTHY C
Adjunct Assistant Professor, Business
M.S. Montana State Univ-Bozeman 1995
B.S. Montana State Univ-Northern 1980

AMBERSON, MAX
Professor Emeritus of Agriculture & Tech. Edu

AMENDE, KEVIN LEE
Adjunct Assistant Professor, Mechanical and Industrial Engineering
M.S. Montana State Univ-Bozeman 2009
Bachelor of Science Montana State Univ-Bozeman 2001

AMIN, MOHAMMAD RUHUL
Professor, Mechanical Engineering
Ph.D. University of Tennessee 1989
B.S. University of Tennessee 1983
B.S. Univ Engineering & Technology 1977

ANACKER, MELODY D
Adjunct Instructor, Food & Nutrition
M.S. Montana State Univ-Bozeman 1987
B.S. University of Montana 1976

ANDERSON, CHRISTINA ZAPFTE
Assistant Professor, Photography
M.F.A. Clemson University 2005
B.F.A. Montana State Univ-Bozeman 2000
B.A. Art Institute of Minnesota 1979

ANDERSON-MCNAMEE, JONA KATHLEEN
Assistant Professor, Health & Human Development
M.Ed. University of Great Falls 2004
B.S. Montana State Univ-Bozeman 1974

ANDROES, SHARON R
Adjunct Assistant Professor, Nursing
M.S. Tulane University 1967
B.S.N. Idaho State University 1964

ANGRYK, RAFAL A
Assistant Professor, Computer Science
M.S. Tulane University 2004
Ph.D. Tulane University 2004
M.S. University of Szczecin 2002
M.A. University of Szczecin 1999

APPLEBY, SANDRA STONE
Adjunct Assistant Professor, Nursing
M.S. Univ of California-Davis 1983
B.S. University of Virginia 1976

ARGUELLES, MARTHA M
Adjunct Assistant Professor, Nursing
M.S.N. University of Philippines 1983
B.S. University of New Hampshire 1977

ARNOLD, ROBERT
Associate Professor, Film
Ph.D. University of Iowa 1994
M.A. University of Iowa 1980
B.F.A. University of Illinois-Chicago 1977

ARNOLD, SHANNON KRISTIN
Assistant Professor, Agricultural Education
Ph.D. University of Florida 2007
M.S. Texas A&M University-Commerce 2003
B.S. Texas A&M University-Commerce 1997

ATWOOD, JOSEPH A
Professor, Agricultural Economics
Ph.D. University of Nebraska-Lincoln 1985
M.S. University of Nebraska-Lincoln 1980
B.S. University of Nebraska-Lincoln 1978

AULT, STEVEN LAING
Adjunct Instructor, Business
M.S. Montana State Univ-Bozeman 1994
B.S. Montana State Univ-Bozeman 1985

AUSTIN, CAROLINE GRAHAM
Assistant Professor, Business
M.A. University of Notre Dame 1996
B.A. Mercer University 1994

AUSTIN, ERIC K
Associate Professor, Political Science
Ph.D. Virginia Polytechnic Institute 2002
M.P.A. Virginia Polytechnic Institute 1993
B.A. University of Wyoming 1992

AVCI, RECEP
Research Professor, Physics
Ph.D. U. of Illinois at Urbana-Champaign 1978
M.S. U. of Illinois at Urbana-Champaign 1974

B

BABCOCK, ALEX M
Professor, Psychology
Ph.D. Colorado State University 1985
M.S. Colorado State University 1982
B.S. Colorado State University 1981

BABBIT, ELIZABETH P
Assistant Professor, Library
M.S. University of Washington 1994
B.A. Harvard University 1986

BABBITT, WILLIAM RANDALL
Professor, Physics
Ph.D. Harvard University 1987
B.S. Stanford University 1982

BABCOCK, ALEX M
Professor, Psychology
Ph.D. Colorado State University 1985
M.S. Colorado State University 1982
B.S. Colorado State University 1981

BABCOCK, ALEX M
Professor, Psychology
Ph.D. Colorado State University 1985
M.S. Colorado State University 1982
B.S. Colorado State University 1981
FACULTY

BABCOCK, TRACY C
Adjunct Instructor, Psychology
M.S.N. University of South Alabama 1989
B.S.N. University of South Alabama 1988

BAIN, CHRISTIAN S
Adjunct Instructor Chemistry & Biochemistry
Ph.D. Colorado School of Mines 1996
B.S. United States Naval Academy 1987

BAILEY, SANDRA JO
Associate Professor, Health and Human Development
Ph.D. Oregon State University 1996
M.S. Montana State Univ-Bozeman 1995
B.S. Montana State Univ-Bozeman 1988

BAJARIAN, KYLE
Adjunct Instructor, Photography
M.F.A. Arizona State University 1997
M.S. Boston University 1987
B.A. University of Vermont 1982

BAKER, DOROTHY L
Adjunct Associate Professor, Education
B.A. University of Virginia 1994
Ed.D. Montana State Univ-Bozeman 1990
M.Ed. Montana State Univ-Bozeman 1982

BALES, RONDA LYNN
Adjunct Assistant Professor, Nursing
M.S.N. Montana State Univ-Bozeman 2002
B.S. Bachelor of Science Montana State Univ-Bozeman 1996

BANCROFT, JERRY A
Professor Emeritus of Architecture
M.Arch. University of Washington 1971
B.Arch. Univ of Southern California 1968

BANDOPADHYAY, PRASANTA S
Associate Professor, Philosophy
Ph.D. University of Rochester 1995
M.A. University of Rochester 1990
M.A. Jadavpur University 1981
B.A. University of Calcutta 1979

BANFIELD, JEFFREY D
Associate Professor, Statistics
Ph.D. University of Washington 1987
M.S. Univ of Arkansas-Little Rock 1982
B.S. Colorado State University 1979

BANGERT, ARTHUR WILLIAM
Associate Professor, Education
Ed.D. University of South Dakota 1995
Education Specialist University of Nebraska-Kearney 1991
M.S. Youngstown State University 1979

BANTA, CHRISTINE MICHELLE
Adjunct Assistant Professor, Nursing
M.S.N. University of Pennsylvania 1997
B.S.N. University of Scranton 1987

BARGE, MARCY M
Professor, Mathematics
Ph.D. University of Colorado-Boulder 1980
M.A. Arizona State University 1974
B.A. Fort Lewis College 1972

BARRETT, JOHN CAMPBELL
Assistant Professor, Extension
M.S.Ed. Virginia Polytechnic Institute 2004
B.B.A. Roanoke College 1996

BARTHOLOMEW, DOUGLAS
Professor, Music
Ph.D. Case Western Reserve Univ 1985
M.A. Ball State University 1976
B.Ed. University of North Texas 1972

BAUDER, JAMES W
Professor, Land Resources and Environmental Sciences
Ph.D. Utah State University 1974
M.S. U of Massachusetts-Amherst 1971
B.S. U of Massachusetts-Amherst 1969

BAUMBAUER, DAVID A
Adjunct Assistant Professor, Plant Sciences & Plant Pathology
M.S. University of Montana 1985
B.S. Purdue University 1982

BEAMISH, ROLLIN
Assistant Professor, School of Art
M.F.A. Ohio University 2004
B.F.A. Cleveland Institute of Art 2000

BECKER, JAMES P
Associate Professor, Electrical & Computer Engineering
Ph.D. Univ of Michigan-Ann Arbor 2001
M.S. Colorado State University 1995
B.S. U of Illinois at Urbana-Champaign 1991

BEEHLER, MICHAEL
Professor Emeritus, English

BEEHLER, SHARON
Professor Emeritus, English

BEKKERMAN, ANTON
Assistant Professor, Agricultural Economics/Economics
Ph.D. North Carolina St Univ-Raleigh 2009
M.S. North Carolina St Univ-Raleigh 2007
B.B.A. Loyola College 2005

BELTJENS, NELLEKE
Assistant Professor, Art
M.F.A. Univ of California-Davis 2001
M.A. Northern Illinois University 1998
B.F.A. 1996

BENHAM, HARRY CUNNINGHAM
Associate Professor, Business Management
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<td>Professor, Mechanical Engineering</td>
<td>Ph.D. University of Wyoming 1979</td>
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<td>Professor, Civil Engineering</td>
<td>Ph.D. University of Nevada-Reno 1977</td>
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<td>Associate Professor, Business</td>
<td>J.D. Stanford University 1989</td>
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<td>Adjunct Instructor, English</td>
<td>M.Ed. 2001</td>
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<td>M.F.A. Calif College of the Arts 2007</td>
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<td>ZULKOWSKI, KAREN M</td>
<td>Associate Professor, Nursing</td>
<td>D.N.S. SUNY at Buffalo 1998, M.S. Kent State University 1989, B.S. University of Akron 1972</td>
</tr>
</tbody>
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### Agricultural Experiment Station and Extension Service Faculty

The following alphabetized list contains the titles and degrees of faculty working at the Agricultural Experiment Station Research Centers and county Extension Service offices.

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<tr>
<th>Name</th>
<th>Title</th>
<th>Degrees and Institutions</th>
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<tbody>
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<td>ADDY JR, DONALD P</td>
<td>Fort Belknap Reservation Agent</td>
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</tr>
<tr>
<td>AMARAL-LOMBARD, PEGGY</td>
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<tr>
<td>ANDERSON, JENNIFER C</td>
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</tr>
<tr>
<td>ANDREAZZI, BARBARA</td>
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</tr>
<tr>
<td>ANDREWS, TARA M</td>
<td>Custer County Agent</td>
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</tr>
<tr>
<td>ANGVICK, TERRY G</td>
<td>Sheridan County Agent</td>
<td>Instructor, Extension, B.S., Montana State Univ-Bozeman, 1979</td>
</tr>
<tr>
<td>ARNOLD, DENISE</td>
<td>Missoula County Agent</td>
<td>Assistant Professor, Extension, B.A., University of Washington, 1987, M.H.R., University of Oklahoma, 1996, Ph.D., Gonzaga University, 2000</td>
</tr>
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### B

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<th>Title</th>
<th>Degrees and Institutions</th>
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<tr>
<td>BAILEY, DEREK W</td>
<td>Assistant Professor, Ag Research Center</td>
<td>B.S., Colorado State University 1980, M.S., 1985, Ph.D., 1988</td>
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<tr>
<td>BAKER, RONALEE A</td>
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<td>BENNETT, GLORIA</td>
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<tr>
<td>BENSON, RAE LYNN</td>
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<tr>
<td>BERGMAN, JERALD W</td>
<td>Superintendent</td>
<td>Professor, Ag Research Center, B.S., North Dakota State University, 1966, M.S., Oregon State University, 1968, Ph.D., North Dakota State University, 1972</td>
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<tr>
<td>BERTESEN, DAVID L</td>
<td>Wibaux County Agent</td>
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<tr>
<td>BILLEDEAUX, Verna J</td>
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</tr>
<tr>
<td>BRENCSE, LARRY D</td>
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<tr>
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<tr>
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</tr>
</tbody>
</table>
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Ph.D., 1975

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<th>Title/Role</th>
<th>Affiliation/Institution</th>
<th>Years/Other Details</th>
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<tr>
<td>LANE, TYLER</td>
<td>Adjunct Instructor, Extension</td>
<td>B.S., Montana State Univ-Bozeman, 1991</td>
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<tr>
<td>LARSEN, BEN A</td>
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<tr>
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<tr>
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</tr>
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<tr>
<td>MASON, BERNICE</td>
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<td>McCOY, ELIZABETH M</td>
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<td>Assistant Professor, Extension</td>
<td>B.S., Montana State Univ-Bozeman, 1967</td>
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<td>MENDENHALL, SCOTT</td>
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<tr>
<td>MILLER, ERIC T</td>
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</tr>
<tr>
<td>MOORE, JAMES D</td>
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<td>NELSON, KENNETH</td>
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<tr>
<td>OELKERS, ARDIS</td>
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<tr>
<td>PEREZ, KATHLEEN</td>
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<tr>
<td>PHILLIPS, JAMES D</td>
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<td>Assistant Professor, Extension</td>
<td>B.S., Western Montana College - UM, 1974</td>
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<tr>
<td>POMMER, DIANN L</td>
<td>Missoula 4H EFNEP Agent</td>
<td>Adjunct Instructor, Extension</td>
<td>B.A., University of Montana, 1977</td>
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<td>REVELLO, KATHERINE A</td>
<td>Missoula County Agent</td>
<td>Adjunct Instructor, Extension</td>
<td>B.S., Texas Tech University, 1981</td>
</tr>
<tr>
<td>RILEY, JULIE A</td>
<td>Powder River County Agent</td>
<td>Adjunct Assistant Professor, Extension</td>
<td>B.S., Montana State Univ-Billings, 1982</td>
</tr>
<tr>
<td>RINEHART, LEE</td>
<td>Powell County Agent</td>
<td>Adjunct Instructor, Extension</td>
<td>B.S., Texas A&amp;M University, 1995</td>
</tr>
<tr>
<td>ROOS, BOBBI D</td>
<td>Daniel County Agent</td>
<td>Associate Professor, Extension</td>
<td>B.S., Colorado State University, 1981</td>
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<tr>
<td>SACKMAN, SHARLA J</td>
<td>Adjunct Instructor, Extension</td>
<td>B.S., Montana State Univ-Bozeman, 1997</td>
<td></td>
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<tr>
<td>SCHMELZER, LEE</td>
<td>Stillwater County Agent</td>
<td>Adjunct Instructor, Extension</td>
<td>B.S., University of Idaho, 1983</td>
</tr>
<tr>
<td>SCHULTDT, MICHAEL W</td>
<td>Blaine County Agent</td>
<td>Adjunct Instructor, Extension</td>
<td>B.S., Montana State Univ-Bozeman, 1990</td>
</tr>
<tr>
<td>SEILSTAD, DENISE K</td>
<td>Missouri River County Agent</td>
<td>Extension Specialist, Community Dev</td>
<td>M.S., 1975</td>
</tr>
<tr>
<td>SMITH, BRUCE A</td>
<td>Dawson County Agent</td>
<td>Associate Professor, Extension</td>
<td>B.S., Montana State Univ-Bozeman, 1977</td>
</tr>
<tr>
<td>STARKWEATHER, GILBERT F</td>
<td>Associate Professor, Ag Research Center</td>
<td>B.S., University of Minnesota, 1962</td>
<td>M.S., 1966</td>
</tr>
<tr>
<td>STIVERS, JACK I</td>
<td>Lake County Agent</td>
<td>Associate Professor, Extension</td>
<td>B.S., Colorado State University, 1980</td>
</tr>
<tr>
<td>STORY, JIM M</td>
<td>Associate Research Professor, Ag Research Center</td>
<td>B.S., Montana State Univ-Bozeman, 1973</td>
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</tr>
<tr>
<td>STOUGAARD, ROBERT N</td>
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<td>B.S., Univ of Wisconsin-Madison, 1978</td>
<td>M.S., Southern Illinois Univ-Carbond, 1983</td>
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</tbody>
</table>
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T

TANNER, JOHN P
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B.S., Utah State University, 1997
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ZARTMAN, MARY K
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B.S., Montana State Univ-Bozeman, 1973
M.A., University of Montana, 1982
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