The College of Agriculture and Natural Resources offers a wide variety of course work in agriculture, natural resources, molecular biology, and family and consumer sciences. The curriculum provides a sound background in basic sciences and the choice of a number of fields in which to specialize. Students are trained in principles which apply throughout the world, with special emphasis on agriculture and natural resources found in the Rocky Mountain region.

Laboratory work is stressed in all programs because of its importance in agricultural and natural resource professions. Students receive excellent training from case studies and practical experience provided at research and extension centers. Other facilities include modern laboratories and classrooms, an abattoir, meat processing rooms, farm shop, greenhouses, and wool laboratory.

In addition to the academic departments, the college includes the Agricultural Experiment Station and the Cooperative Extension Service. Materials and techniques resulting from this effective triple combination benefit both students and staff in the never-ending search for problem-solving information. The close relationship between teachers, researchers, and extension workers creates a learning atmosphere that encourages the development of the finest students.

Programs of Study

Undergraduate Degrees

Bachelor of Science

Agricultural business
Agricultural communications
Agroecology
Animal and veterinary sciences
Microbiology
Molecular biology
Rangeland ecology and watershed management

Bachelor of Science in Family and Consumer Sciences

Bachelor of Applied Science

Organizational leadership

Graduate Degrees

Master of Arts

Molecular biology

Master of Science

Agricultural and applied economics
Agricultural economics/water resources
Agronomy
Animal and veterinary sciences
Entomology
Entomology/water resources
Family and consumer sciences
Family and consumer sciences/Early childhood development
Food science and human nutrition
Molecular biology
Rangeland ecology and watershed management
Rangeland ecology and watershed management/water resources
Reproductive biology
Soil science
Soil science/water resources

Doctor of Philosophy

Agronomy
Animal and veterinary science
Entomology
Molecular and cellular life sciences
Molecular biology
Rangeland ecology and watershed management
Reproductive biology
Soil science

The following certificates and/or degrees in the College of Agriculture and Natural Resources are available through the UW Outreach School:

Certificate: Early Childhood Program Director
Bachelor of Applied Science
Online bachelor's degrees: Family and Consumer Sciences (Professional Child Development or Family and Community Services Options)

For more information, contact the UW Outreach School at (800) 448-7801 or go to the web at outreach.uwyo.edu.

The College of Agriculture and Natural Resources also offers a graduate certificate in reclamation and restoration ecology. For more information, contact the Department of Renewable Resources.

Basic Education Core

All undergraduates in College of Agriculture and Natural Resources curriculums are required to follow the basic education core as noted below. This core meets the University Studies Program requirements and all-university requirements for state and national constitution and physical education.

Core Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual Community (I)</td>
<td>1-3</td>
</tr>
<tr>
<td>Writing 1 (WA)</td>
<td>3</td>
</tr>
<tr>
<td>Oral Communication (O)</td>
<td>3</td>
</tr>
<tr>
<td>Quantitative Reasoning 1 (QA)</td>
<td>3</td>
</tr>
<tr>
<td>Quantitative Reasoning 2 (QB)</td>
<td>3</td>
</tr>
<tr>
<td>Science (S, SB, SP, SE)</td>
<td>4-8</td>
</tr>
<tr>
<td>Cultural Context (C, CH, CS, CA)</td>
<td>9</td>
</tr>
<tr>
<td>U.S. and Wyoming Constitutions (V)</td>
<td>3</td>
</tr>
<tr>
<td>Physical Activity and Health (P)</td>
<td>1</td>
</tr>
</tbody>
</table>

Subtotal (min. core requirements) | 30-36 |

Total Hours | 120-126 |

*Core Components are mutually exclusive of each other; hence, two core components may not be fulfilled by the same course. Except for the QA, core courses may have topics from the embeddable components list included in their curriculum, where appropriate.

Courses taken for S/U

A maximum of 20 elective hours with a grade of S (satisfactory) may be included as part of the total credit requirements for graduation; but no S/U hours may be used to satisfy university, major requirements or required electives, unless the course is offered for S/U grading only.

Minors in Agriculture and Natural Resources

Minors provide a formalized recognition of concentrated study in a specific subject area. A minor degree offers recognition for academic achievement outside of the students' major course curriculum and gives students a concentration of work in the chosen minor area.
A minors program can enable students to enhance and expand career opportunities. A minor will also improve the possibility of admission to graduate programs in any chosen major, minor, or related field of study.

**Minors Available in the College of Agriculture and Natural Resources**

- Agricultural business
- Agricultural entomology
- Agroecology
- Animal and veterinary science
- Apparel design
- Child and family studies
- Farm and ranch management
- Food and nutrition
- Forest resources
- General agricultural economics
- Horticulture
- Insect biology
- Interior design
- International agriculture
- Molecular biology
- Natural resource economics
- Plant protection
- Rangeland ecology and watershed management
- Reclamation and restoration ecology
- Soil science

**Agricultural Communications Major**

A wide variety of courses in agriculture, communications, and journalism provides students with basic preparation for positions as broadcasters, editors or writers for farm and home organizations, state and federal agencies, magazines, newspapers, radio and television stations, and commercial businesses. Communication skills are also distinct assets in agricultural sales, research, service and teaching.

Students enrolled in agricultural courses acquire up-to-date and knowledgeable backgrounds of the subject matter. Courses in communication and journalism develop proficiencies demanded by employers of communication professionals.

**Minimum Requirements for Agricultural Communications Majors (B.S.)**

<table>
<thead>
<tr>
<th>Hrs.</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-36</td>
<td>University Studies Program requirements</td>
</tr>
<tr>
<td>24</td>
<td>Communications/journalism core</td>
</tr>
<tr>
<td></td>
<td>and minimum of 12 hours of communication/journalism elective</td>
</tr>
</tbody>
</table>

**Agriculture core requirements**

- At least 18 hours must be lower division (Ag 1000-2000) elective courses, and at least 24 hours must be upper division (Ag 3000-4000) elective courses and include AGRI 4975.
- Supporting course requirement
- Additional hours for major and electives

| Total Hrs: | 120 |

**Agricultural Communications** (AGRI)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2QB]).

**1001. Intellectual Community and Information Literacy in Agriculture.** 2. ([none]I, L) For students interested in Environmental, Human and Life Sciences, Agriculture and Natural Resources, or for anyone with interests in Ecology and Behavior. Comprised of a series of guest presentations, supplemented by class discussions, case studies, field trips, and demonstrations, reflective writings, and small group, active cooperative learning activities. Prerequisites: none.

**1010 [1000]. Computers in Agriculture.** 2. Familiarizes students with computer applications in agriculture. User-friendly course which provides students opportunity to use personal computers in various agriculture applications. Previous computer experience not necessary.

**3000. Discovering and Utilizing Ideas and Information.** 3. ([none]I, L) Learning in this area guides students to accessing, evaluating, and utilizing information and ideas; communicating information and ideas effectively and responsibly; civic engagement for individual, organizational and community problem-solving, and applying new skills, knowledge, and perspectives in a contemporary society. Prerequisites: WA and junior status.

**4500. International Experiences in Agriculture.** 1 (Max. 3). Learn about agricultural customs in another country through classroom lectures, written assignments, and a visit to the host country during the spring break period. Topics discussed include the influence of foreign agriculture on U.S. economies and agricultural practices, focusing on the host country. Prerequisites: completion of WA course and junior standing.

**4520. Field Practicum: Extension Work.** 1-4 (Max. 8). Provides practical experiences to those wanting to pursue a career with Cooperative Extension Service. Interns are matched with county-based personnel for hands-on learning experiences across the state. Develop working knowledge of CES’s mission to provide the citizens of Wyoming with education and applied research. Dual listed with AGRI 5520. Prerequisite: must pass volunteer screening process.

**4546. Agriculture: Rooted in Diversity.** 3. ([none]C, D) Addresses multiple themes related to diversity in agriculture with the goal of making visible the experiences of minorities and women in agriculture. Involves significant independent research, class discussion, project development, and development of oral and written communication skills. Establishes linkages with supporting disciplines. Cross listed with ENGL/AAST/AIST/CHST/FCSC/AMST/HIST 4546. Prerequisites: Junior class standing or consent of instructor and concurrent enrollment or major in any of the following: ethnic studies, agriculture, American studies, anthropology, English, history, sociology, or women’s studies.

**4960. Bachelor of Applied Science Internship.** 6. Provides Bachelor of Applied Science students academic credit for advanced work experiences in their area of specialization. Required to complete academic assignments such as a weekly journal, discussion and writing assignments in addition to their field-based responsibilities. Takes place in a mentored, supervised setting. Prerequisites: Bachelor of Applied Science student, AGRI 3000, senior status, and consent of instructor.

**4975. Agricultural Communications Senior Project.** 1. A baccalaureate degree capstone experience incorporating self assessments of student learning, reflective writings, and an analysis, synthesis and evaluation of the agricultural communications curriculum. Students develop and present a personalized, comprehensive, professional portfolio. Prerequisite: agricultural communication major with senior standing and WB.
4990. Topics. 1-6 (Max. 8). Accommodates topics whose subject matter is not included in other College of Agriculture and Natural Resources and Natural Resources offerings. Please see the class schedule for current topic. Prerequisite: W.B.

5010. Extension Practicum. 8. Agricultural field experience in county extension programs. Prerequisite: AGRI 4010, junior standing and consent of instructor.

5520. Field Practicum: Extension Work. 1-4 (Max 9). Organization, teaching, and promotion of county programs. Prerequisite: AGRI 4010 or consent of instructor.

5900. Practicum in College Teaching. 1-3 (Max 3). Work in classroom with a major professor. Expected to give some lectures and gain classroom experience. Prerequisite: graduate status.


5940. Continuing Registration: Off Campus. 1-2 (Max 16). Prerequisite: advanced degree candidacy.

5959. Enrichment Stds.: 1 - 3. (Max 99). Designed to provide an enrichment experience in a variety of topics. Note: Credit in this course may not be included in a graduate program of study for degree purposes.

5960. Thesis Research. 1 - 12. (Max 16). Graduate level course designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrollment in a graduate degree program.

5980. Thesis Research. 1 - 12. (Max 16). Graduate level course designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrollment in a graduate degree program.

5990. Topics. 1-6 (Max. 8). Accommodates topics whose subject matter is not included in other College of Agriculture and Natural Resources and Natural Resources offerings. Please see the class schedule for current topic. Prerequisite: W.B.

Department of Agriculture and Applied Economics

206 Agriculture Building, 766-2386
FAX: (307) 766-5544
Web site: www.uwyo.edu/ag/agecon
E-mail: ag-econ@uwyo.edu

Department Head: Roger Coupal

Professors:

NICOLE S. BALLINGER, B.A. University of California, Santa Cruz 1975; M.S. University of California, Davis 1980; Ph.D. 1984; Professor of Agricultural Economics 2004.

LARRY J. HELD, B.S. North Dakota State University 1971; M.S. 1973; Ph.D. University of Nebraska 1977; Professor of Agricultural Economics 1988, 1977.

DALE J. MENKHAUS, B.S. Purdue University 1967; M.S. Michigan State University 1970; Ph.D. Purdue University 1973; Professor of Agricultural Economics 1982, 1973.


GLEN D. WHIPPLE, B.A. Brigham Young University 1974; M.S. Utah State University 1976; Ph.D. Washington State University 1980; Professor of Agricultural Economics 1990, 1985; Director, UW Extension.

Associate Professors:

CHRISTOPHER T. BASTIAN, B.S. University of Wyoming 1987; M.S. 1990; Ph.D. Colorado State University 2004; Associate Professor of Agricultural and Applied Economics 2010, 2005.

EDWARD B. BRADLEY, B.S. University of Wisconsin 1971; Ph.D. Pennsylvania State University 1978; Associate Professor of Agricultural Economics 1987, 1977.

ROGER COUPAL, B.S. Utah State University 1978; M.S. University of Arizona 1985; Ph.D. Washington State University 1997; Associate Professor of Agricultural Economics 2003, 1997.

DON MCLEOD, B.S. St. John’s College 1982; M.S. Oregon State University 1987; Ph.D. 1994; Associate Professor of Agricultural Economics 2003, 1995.

ALAN C. SCHROEDER, B.S. North Dakota State University 1971; M.S. University of Wisconsin 1974; J.D. 1974; Ph.D. 1982; Associate Professor of Agricultural Economics 1992, 1986.

Assistant Professors:

MATTHEW A. ANDERSEN, B.A. Colorado College 1991; M.S. Colorado School of Mines 2000; Ph.D. University of California, Davis 2005; Assistant Professor of Agricultural and Applied Economics 2007.

MARIAH D. EHMKE, B.S. Kansas State University 1997; M.S. Ohio State University 2001; Ph.D. Purdue University 2005; Assistant Professor of Agricultural Economics 2005.

KRISTIANA M. HANSEN, B.A. Reed College 1996; M.S. University of California, Davis 2003; Ph.D. 2008; Assistant Professor of Agriculture and Applied Economics 2009.

DANNELE E. PECK, B.S. University of Wyoming 2000; M.S. 2002; Ph.D. Oregon State University 2006; Assistant Professor of Agricultural Economics 2006.

BENJAMIN S. RASHFORD, B.S. University of Wyoming 1999; M.S. 2001; Ph.D. Oregon State University 2006; Assistant Professor of Agricultural Economics 2006.

JOHN RITTEN, B.S. Arizona State University 2001; M.B.A. New Mexico State University 2004; Ph.D. Colorado State University 2008; Assistant Professor of Agriculture and Applied Economics 2008.

Academic Professionals:

COLE EHMKE, B.A. Bethany College 1997; M.S. University of Sydney, Australia 1999; Assistant University Extension Educator 2005.


Temporary Lecturers:

WILLIAM BILES, B.S. University of Nebraska, M.B.A. Wharton School, University of Pennsylvania.

JIM THOMPSON, B.A. Occidental College; M.A., Ph.D. University of Illinois-Chicago.

Professor Emeritus:

James J. Jacobs, Carl Olson

The Department of Agricultural and Applied Economics offers three options within the agricultural business bachelor of science degree program. They are agribusiness management, farm and ranch management, and international agriculture. All three options focus on the development of critical thinking, research, negotiation, and communication skills for students interested in 1. agricultural operations, 2. small rural businesses; 3. community economics, 4. financial institutions, 5. agricultural and natural resources development and; 6. other pursuits where applied economic tools will be useful.

A brief description of minimum course requirements for each of the three options in agricultural business is given below. In addition, faculty advisers will work with students to tailor a curriculum to individual interests and goals.
Agribusiness Management Option

This curriculum is for students preparing for careers in the agribusiness field. Applied agricultural economics courses are supplemented with marketing, management, finance and other courses from the College of Business and production-oriented courses from other departments in the College of Agriculture and Natural Resources.

Minimum Course Requirements for Agricultural Business (B.S.) Majors within the Agribusiness Management Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEC 1000</td>
<td>2</td>
</tr>
<tr>
<td>Writing</td>
<td>9</td>
</tr>
<tr>
<td>ENGL 1010 or 2 (WA), WB-writing course, AGEC 4950 and 4960, or 4965 (WC)</td>
<td>1</td>
</tr>
<tr>
<td>Quantitative (required for major)</td>
<td>6-7</td>
</tr>
<tr>
<td>MATH 1400; 2350</td>
<td>1</td>
</tr>
<tr>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010</td>
<td>3</td>
</tr>
<tr>
<td>Science</td>
<td>8</td>
</tr>
<tr>
<td>Social Science</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 1010</td>
<td>1</td>
</tr>
<tr>
<td>Humanities, Arts, Culture</td>
<td>6</td>
</tr>
<tr>
<td>US Constitution</td>
<td>3</td>
</tr>
<tr>
<td>Diversity</td>
<td>3</td>
</tr>
<tr>
<td>Global Awareness</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 3860 or 4880</td>
<td>2</td>
</tr>
<tr>
<td>Physical Education</td>
<td>2</td>
</tr>
<tr>
<td>Agricultural Economics</td>
<td>2</td>
</tr>
<tr>
<td>1020, 3400, 4050 or MKT 3210 (counts for upper-division AGEC and business credit), 4060, 4500; either 4450 or 4830 or 4840 or 4880; 3 hours of AGEC electives Supporting Agriculture</td>
<td>9</td>
</tr>
<tr>
<td>(other than Agricultural economics)</td>
<td>9</td>
</tr>
<tr>
<td>Statistics</td>
<td>4</td>
</tr>
<tr>
<td>Computers</td>
<td>2</td>
</tr>
<tr>
<td>Supporting Economics</td>
<td>6</td>
</tr>
<tr>
<td>ECON 3010 and 3020</td>
<td>2</td>
</tr>
<tr>
<td>Business</td>
<td>15</td>
</tr>
<tr>
<td>ACCT 1010 and 1020; and 9 hours of 3000-4000 level business courses Electives</td>
<td>15-16</td>
</tr>
<tr>
<td>Total Hours</td>
<td>121</td>
</tr>
</tbody>
</table>

1A minimum of 48 credits must be at the 3000 and 4000 level for graduation. At least 30 of the 48 credits must be earned from UW.

2Recommend or equivalent WA course.

3Majors in agribusiness management option must satisfy this requirement by earning 3 credits in a USP approved WB course.

4MATH 2350 is required as of fall 2008.

5Credits earned in USP approved science courses offered within the College of Agriculture and Natural Resources shall also serve as Supporting Agriculture credits.

Farm and Ranch Management Option

This curriculum is for students intending to become farm and/or ranch operators or professional managers of farms, ranches or feedlots. It is also well suited for students interested in the field of agricultural finance.

In this option, courses in farm and ranch management, finance, and marketing are supplemented by courses in crops, range management, veterinary sciences and animal science, with electives in other areas.

Minimum Course Requirements for Agricultural Business (B.S.) Majors within the Farm and Ranch Management Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEC 1000</td>
<td>2</td>
</tr>
<tr>
<td>Writing</td>
<td>9</td>
</tr>
<tr>
<td>ENGL 1010 or 2 (WA), WB-writing course</td>
<td>1</td>
</tr>
<tr>
<td>Quantitative (required for major)</td>
<td>6-7</td>
</tr>
<tr>
<td>MATH 1400; 2350</td>
<td>1</td>
</tr>
<tr>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010</td>
<td>3</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>8</td>
</tr>
<tr>
<td>Physical Science</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1000 or 1020 or 1050</td>
<td>1</td>
</tr>
<tr>
<td>Social Science</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 1010</td>
<td>1</td>
</tr>
<tr>
<td>Humanities, Arts, Culture</td>
<td>6</td>
</tr>
<tr>
<td>US Constitution</td>
<td>3</td>
</tr>
<tr>
<td>Diversity</td>
<td>3</td>
</tr>
<tr>
<td>Global Awareness</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 3860 or 4880</td>
<td>2</td>
</tr>
<tr>
<td>Physical Education</td>
<td>1</td>
</tr>
<tr>
<td>Agricultural Economics</td>
<td>2</td>
</tr>
<tr>
<td>1020, 2020, 3400, 4640, 9 hours AGEC electives Supporting Agriculture</td>
<td>12</td>
</tr>
<tr>
<td>SOIL 2010 (8 AG college hours other than Agricultural Economics) Statistics</td>
<td>4</td>
</tr>
<tr>
<td>Computers</td>
<td>2</td>
</tr>
<tr>
<td>Supporting Economics</td>
<td>6</td>
</tr>
<tr>
<td>ECON 3010 and 3020</td>
<td>2</td>
</tr>
<tr>
<td>Business</td>
<td>3</td>
</tr>
<tr>
<td>ACCT 1010 Electives</td>
<td>19-20</td>
</tr>
<tr>
<td>Total Hrs.</td>
<td>121</td>
</tr>
</tbody>
</table>

1A minimum of 48 credits must be at the 3000 and 4000 level for graduation. At least 30 of the 48 credits must be earned from UW.

2Recommend or equivalent WA course.

Farming and Ranching Business Option

This curriculum is for students preparing to farm or ranch. It is also well suited for students interested in the field of agricultural finance.

In this option, courses in farm and ranch management, finance, and marketing are supplemented by courses in crops, range management, veterinary sciences and animal science, with electives in other areas.

Minimum Course Requirements for Agricultural Business (B.S.) Majors within the Farming and Ranching Business Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEC 1000</td>
<td>2</td>
</tr>
<tr>
<td>Writing</td>
<td>9</td>
</tr>
<tr>
<td>ENGL 1010 or 2 (WA), WB-writing course</td>
<td>1</td>
</tr>
<tr>
<td>Quantitative (required for major)</td>
<td>6-7</td>
</tr>
<tr>
<td>MATH 1400; 2350</td>
<td>1</td>
</tr>
<tr>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010</td>
<td>3</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>8</td>
</tr>
<tr>
<td>Physical Science</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1000 or 1020 or 1050</td>
<td>1</td>
</tr>
<tr>
<td>Social Science</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 1010</td>
<td>1</td>
</tr>
<tr>
<td>Humanities, Arts, Culture</td>
<td>6</td>
</tr>
<tr>
<td>US Constitution</td>
<td>3</td>
</tr>
<tr>
<td>Diversity</td>
<td>3</td>
</tr>
<tr>
<td>Global Awareness</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 3860 or 4880</td>
<td>2</td>
</tr>
<tr>
<td>Physical Education</td>
<td>1</td>
</tr>
<tr>
<td>Agricultural Economics</td>
<td>2</td>
</tr>
<tr>
<td>1020, 2020, 3400, 4640, 9 hours AGEC electives Supporting Agriculture</td>
<td>12</td>
</tr>
<tr>
<td>SOIL 2010 (8 AG college hours other than Agricultural Economics) Statistics</td>
<td>4</td>
</tr>
<tr>
<td>Computers</td>
<td>2</td>
</tr>
<tr>
<td>Supporting Economics</td>
<td>6</td>
</tr>
<tr>
<td>ECON 3010 and 3020</td>
<td>2</td>
</tr>
<tr>
<td>Business</td>
<td>3</td>
</tr>
<tr>
<td>ACCT 1010 Electives</td>
<td>19-20</td>
</tr>
<tr>
<td>Total Hrs.</td>
<td>121</td>
</tr>
</tbody>
</table>

1A minimum of 48 credits must be at the 3000 and 4000 level for graduation. At least 30 of the 48 credits must be earned from UW.

2Recommend or equivalent WA course.

International Agriculture Option

This curriculum is for students who desire training related to international agricultural business, and with agricultural and economic problems of developing nations. International trade and relations, world food production, agricultural and economic geography, economic development and comparative systems are emphasized in this program.

Minimum Course Requirements for Agricultural Business (B.S.) Majors within the International Agriculture Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEC 1000</td>
<td>2</td>
</tr>
<tr>
<td>Writing</td>
<td>9</td>
</tr>
<tr>
<td>ENGL 1010 or 2 (WA), WB-writing course</td>
<td>1</td>
</tr>
<tr>
<td>Quantitative (required for major)</td>
<td>6-7</td>
</tr>
<tr>
<td>MATH 1400; 2350</td>
<td>1</td>
</tr>
<tr>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010</td>
<td>3</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>8</td>
</tr>
<tr>
<td>Physical Science</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1000 or 1020 or 1050</td>
<td>1</td>
</tr>
<tr>
<td>Social Science</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 1010</td>
<td>1</td>
</tr>
<tr>
<td>Humanities, Arts, Culture</td>
<td>6</td>
</tr>
<tr>
<td>US Constitution</td>
<td>3</td>
</tr>
<tr>
<td>Diversity</td>
<td>3</td>
</tr>
<tr>
<td>Global Awareness</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 3860</td>
<td>3</td>
</tr>
<tr>
<td>Physical Education</td>
<td>1</td>
</tr>
<tr>
<td>Agricultural Economics</td>
<td>2</td>
</tr>
<tr>
<td>1010, 1020, 4060 or 4450, 4600 or 4660, 4880, and 6 hours of AGEC electives Supporting Agriculture</td>
<td>6</td>
</tr>
<tr>
<td>Other than agricultural economics Statistics</td>
<td>4</td>
</tr>
<tr>
<td>Computers</td>
<td>2</td>
</tr>
<tr>
<td>Supporting Economics</td>
<td>6</td>
</tr>
<tr>
<td>ECON 3010 and 3020</td>
<td>2</td>
</tr>
<tr>
<td>Business</td>
<td>3</td>
</tr>
<tr>
<td>ACCT 1010 Electives</td>
<td>19-20</td>
</tr>
<tr>
<td>Total Hrs.</td>
<td>121</td>
</tr>
</tbody>
</table>

1A minimum of 48 credits must be at the 3000 and 4000 level for graduation. At least 30 of the 48 credits must be earned from UW.

2Recommend or equivalent WA course.
Foreign Language............................ 12
1010, 1020, 2030
Electives ........................................ 1-2
Total Hrs. 121

1A minimum of 48 credits must be at the 3000 and 4000 level for graduation. At least 30 of the 48 credits must be earned from UW.

2Recommended or equivalent WA course.

3MATH 2350 is required as of fall 2008.

4Credits earned in USP approved science courses offered within the College of Agriculture and Natural Resources shall also serve as Supporting Agriculture credits.

521 credits in Ag Econ beyond those earned to satisfy University Studies requirements.

6Recommend AECL 1000, ANSC 1010, FDSC 1410, FCSC 1140, PLNT 2300, ENTO 1000 or 1001, REWM 2000 or 3020. Credits earned in USP approved science courses offered within the College of Agriculture and Natural Resources shall serve as Supporting Agriculture credits.

7COSC 1200 recommended.

8The student is required to take one course in POLS, GEOG, and SOC listed plus a minimum of two additional courses. Students may elect to satisfy this with the equivalent INST courses. A minimum of 3 credits of AGEC 4930 can be applied within the International Agriculture option.

9An approved international internship or experience is highly recommended for the AGRI Business majors within the International Agricultural option.

10If a student wishes to use their elective hours to contribute to a minor in foreign language (18 hours beyond the 12 hours required), 6 credits of International Social Sciences, Business and Economics requirement can be waived.

Environment and Natural Resources

Students interested in natural resource or environmental issues or careers may complete any of the three options within agricultural business offered by the department with an environment and natural resource emphasis. Inquiries about environment and natural resource concentrations in agricultural business should be directed to the Department of Agricultural and Applied Economics.

Minors Program

The department also offers five minor programs. These five minors are to give students majoring in other undergraduate curricula in the university a concentration of work in any of the four specialized undergraduate curricula offered by the department or in general agricultural economics. Each minor requires 27 hours in prescribed course work including 6 hours in supporting agriculture. Students need to plan their course work to meet course prerequisites.

Agricultural Business Minor. AGEC 1010, 1020, 4050 or MKT 3210 and 4060; Accounting 1010; 6 additional hours in upper-level agricultural economics courses; 6 hours in supporting agriculture courses.

Farm and Ranch Management Minor. AGEC 1010, 1020, 2020 and 4640; 9 additional hours in upper-level agricultural economics courses; 6 hours in supporting agriculture courses.

International Agriculture Minor. AGEC 1010, 1020, 3860 and 4880; 6 additional hours in upper-level agricultural economics courses; 3 or 4 hours in foreign culture or language; 6 hours in supporting agriculture courses.

Natural Resource Economics Minor.

Required: AGEC 1020, 4700, 4720, and 4750; choose 9 additional hours from AGEC 4450, 4600, 4710; ECON 2400, 4400, 4410, 4520 (note: College of Business prerequisites); ENR 4500.

General Agricultural Economics Minor.

AGEC 1010, 1020 and 15 additional hours in agricultural economics courses with 12 hours at the upper-level; 6 hours in supporting agriculture courses.

Graduate Study

The Department of Agricultural and Applied Economics offers graduate work leading to the Master of Science degree. Students may choose among major options in the areas of agricultural and applied economics and agricultural business. The agricultural economics major emphasizes research with any of the following focus areas:

- production economics and management,
- marketing and market analysis,
- resource and environmental economics,
- international agriculture,
- and economic and rural development.

The agricultural business option offers advanced skills to students who desire professional careers in the business sector. Students in the agricultural business option may concentrate their coursework and writing in management, marketing, or finance. Dual majors in water resources, and environment and natural resources are also offered.

Finally, the Department offers a graduate minor in applied economics. This program is for currently enrolled graduate students in other disciplines seeking a foundation in economics as well as their major discipline.

Program Specific Admission

Requirements

Undergraduate major in agricultural economics or economics is not required.

Students may be required to complete program prerequisite courses, without graduate credit, that were not completed in their undergraduate education.

Specifically, students who have not completed at least one course in calculus, statistics, intermediate microeconomic theory and intermediate macroeconomic theory will be required to complete these courses without graduate credit during their first semester in residence.

Program Specific Degree Requirements

Master of Science in Agricultural Economics

The following courses constitute the M.S. in Agricultural Economics core requirements and are required of both Plan A and Plan B candidates (20 hours).

Economic Theory
AGEC 5310
Theory of the Firm and Producer Behavior ..................................... 3
AGEC 5630
Advanced Natural Resource Economics ..3
AGEC 5710
Advanced Agricultural Market Theory.....3
AGEC 5740
Theory of Consumer Behavior..............3
Quantitative Methods
AGEC 5230
Intermediate Econometric Theory ........3
AGEC 5320
Quantitative Methods in Agricultural Econ .................................. 3
Research
AGEC 5650
Research Methods ................................ 1
AGEC 5880
Advanced Seminar........................... 1
Plan A (thesis):

Minimum of 30 credit hours including AGEC M.S. core requirements, thesis hours and electives.

No more than three hours of AGEC coursework numbered below 5000-level count toward the 30 hour requirement.

Achieve a cumulative 3.0 GPA in the AGEC M.S. core requirements.
The student's graduate committee, nominated by the major professor, the student, and the department head determine the final program of study and thesis research topic.

Presentation of research results at a formal public seminar.

Completion of an oral examination covering the student's thesis research administered by the graduate committee.

Plan B (non-thesis):
Minimum of 32 hours of coursework;
Non-thesis business analysis paper accepted by the student's graduate committee;
Minimum of 13 credit hours of agricultural economics coursework numbered at the 5000-level are required, including:
AGEC 5310
AGEC 5740
AGEC 5880
AGEC 5630 or 5710
AGEC 5320 or 5230

In addition, students are required to complete 3 credit hours from each of the following three areas:
Management:
AGEC 4060, 4640 or 5460; or MGT 4410, 4420, 4440, 4470, or 4520
Marketing:
AGEC 4050, 4830, 4840, 4880, or 5710, or MKT 4240, 4430, 4520, or 4540
Finance:
AGEC 4500; or FIN 4510, 4520, 4610, 4810; or ECON 4740

Remaining credit hours will be filled with electives.

The student's graduate committee, nominated by the major professor, the student and the department head determine the final program of study and business analysis topic.

Presentation of the business analysis paper at a formal public seminar.

An internship experience is strongly encouraged as part of the agricultural business option (AGEC 5990).

Master of Science in Agricultural Economics/Environment and Natural Resources (ENR); Plan A (thesis):

Students must complete the 26 credit hour agricultural and applied economics including M.S. core requirements plus 4 thesis hours and 15 credit hours in environment and natural resources, as approved by the student's committee and the ENR academic adviser;

Achieve a cumulative 3.0 GPA in the AGEC M.S. core requirements;

The student's graduate committee, nominated by the major professor, the student and the department head determine the final program of study and business analysis topic, which must be in the area of environment and natural resources;

Presentation of research results at a formal public seminar;

Completion of an oral examination covering the student's thesis research administered by the graduate committee.

Graduate Minor in Applied Economics:

Graduate standing;
AGEC 5310, or 5740, AGEC 5320 or 5230, and 6 additional credits of graduate AGEC courses;

Committee selection for the student's major thesis or dissertation committee should include at least one faculty member from AGEC.

Please refer to Water Resources Degree program in this Catalog for updated degree requirements.

Achieve a cumulative 3.0 GPA in the AGEC M.S. core requirements.

The student's graduate committee, nominated by the major professor, the student and the department head determine the final program of study and thesis research topic, which must be in the water resources area.

Presentation of research results at a formal public seminar.

Completion of an oral examination covering the student's thesis research administered by the graduate committee.

Master of Science in Agricultural Economics/Environment and Natural Resources (ENR); Plan A (thesis):

Students must complete the 26 credit hour agricultural and applied economics including M.S. core requirements plus 4 thesis hours and 15 credit hours in environment and natural resources, as approved by the student's committee and the ENR academic adviser;

Achieve a cumulative 3.0 GPA in the AGEC M.S. core requirements;

The student's graduate committee, nominated by the major professor, the student and the department head determine the final program of study and business analysis topic, which must be in the area of environment and natural resources;

Presentation of research results at a formal public seminar;

Completion of an oral examination covering the student's thesis research administered by the graduate committee.

Graduate Minor in Applied Economics:

Graduate standing;
AGEC 5310, or 5740, AGEC 5320 or 5230, and 6 additional credits of graduate AGEC courses;

Committee selection for the student's major thesis or dissertation committee should include at least one faculty member from AGEC.

Please refer to Water Resources Degree program in this Catalog for updated degree requirements.

Achieve a cumulative 3.0 GPA in the AGEC M.S. core requirements.

The student's graduate committee, nominated by the major professor, the student and the department head determine the final program of study and thesis research topic, which must be in the water resources area.

Presentation of research results at a formal public seminar.

Completion of an oral examination covering the student's thesis research administered by the graduate committee.

Master of Science in Agricultural Economics/Environment and Natural Resources (ENR); Plan A (thesis):

Students must complete the 26 credit hour agricultural and applied economics including M.S. core requirements plus 4 thesis hours and 15 credit hours in environment and natural resources, as approved by the student's committee and the ENR academic adviser;

Achieve a cumulative 3.0 GPA in the AGEC M.S. core requirements;

The student's graduate committee, nominated by the major professor, the student and the department head determine the final program of study and business analysis topic, which must be in the area of environment and natural resources;

Presentation of research results at a formal public seminar;

Completion of an oral examination covering the student's thesis research administered by the graduate committee.

Graduate Minor in Applied Economics:

Graduate standing;
AGEC 5310, or 5740, AGEC 5320 or 5230, and 6 additional credits of graduate AGEC courses;

Committee selection for the student's major thesis or dissertation committee should include at least one faculty member from AGEC.

Please refer to Water Resources Degree program in this Catalog for updated degree requirements.

Achieve a cumulative 3.0 GPA in the AGEC M.S. core requirements.

The student's graduate committee, nominated by the major professor, the student and the department head determine the final program of study and thesis research topic, which must be in the water resources area.

Presentation of research results at a formal public seminar.

Completion of an oral examination covering the student's thesis research administered by the graduate committee.
4280. International Food and Farm Cultures. 3. Study-tour course in western France of lectures, fieldtrips, and other cultural activities are integrated into a curriculum to study sustainable food cultures and farming systems. Students live with host families and learn about current policies, belief systems and cultural practices that guide food production, consumption and marketing in Europe. Prerequisite: completion of WA and I.

4450. Negotiation. 3. Examines how to use negotiation to resolve conflict. Describes conflict; outlines way to address conflict; examines different negotiation strategies and the impact of cognitive bias, power, ethics, and individual and cultural differences; and explores mediation practices. Students complete negotiations, role-plays, and questionnaires. Dual listed with AGEC 5450. Prerequisites: COJO 1010 and junior standing.

4460 [5460]. Agriculture and Economic Development. 3. Examines the roles of agriculture in the transformation of the economies of underdeveloped countries. Examines development theories, case studies and analytical techniques. Prerequisites: AGEC 1010, 1020 and a G course.

4500 [650]. Agricultural Finance. 3. Principles of financial management; compounding and discounting; leverage and capital budgeting and alternatives in resource control. Prerequisite: AGEC 1020 or equivalent. (Normally offered fall semester)

4600. Community Economic Analysis. 3. Analysis of regions and rural communities; their problems, socioeconomic characteristics, land use and economic development. Provides training in regional economic analysis, fiscal impact analysis and benefit cost analysis. Dual listed with AGEC 5600. Prerequisites: ECON 3010, 3020, and MATH 1400.

4640. Advanced Farm/Ranch Management. 3. [M3♣(none)] Tools of management decision-making applied to problems of farm-ranch management and resource acquisition and use. Prerequisites: AGEC 1020, 2020 and MATH 1400. (Normally offered spring semester)

4660. Community and Economic Development. 3. Community development from an interdisciplinary perspective, integrating theory, concepts and methods from sociology, economics, political science, and community development. Students learn how community theory can be used to design and support effective economic development programs. Includes readings, lectures, guest lectures, field trips and community analysis projects. Dual listed with AGEC 5660. Prerequisites: AGEC/ECON 1020 or SOC 2090 and junior standing.

4700. Economics of Range Resources. 3. Applies economic and decision theory to management and allocation of public and private range resources. Prerequisite: AGEC 1020 or equivalent. (Normally offered fall semester)

4710. Natural Resource Law and Policy. 3. [C2♣(none)] Legal and economic examination of laws intended to resolve environmental conflicts. Surveys economic rationales both for private property and government intervention in environmental disputes; content of selected environmental laws in the U.S.; and basic principles of environmental mediation. Prerequisites: AGEC 1020, ECON 1020 or equivalent and 3 hours of business law or agricultural law. (Offered fall semester of even-numbered years)

4720. Water Resource Economics. 3. Presents principles and procedures appropriate to water resource allocation and development decisions. Studies agricultural, recreational, industrial and other uses of water. Includes a field trip. Prerequisite: AGEC 1020 or equivalent; QB course, WB course; senior standing. (Offered fall semester of even-numbered years)

4740. Agricultural Policy. 3. [C2♣(none)] Identifies problems in agriculture and considers alternative programs. Prerequisite: AGEC 1020 or equivalent. (Offered spring semester of odd-numbered years)

3750 [4750]. Natural Resource Planning and Economics. 3. Economic concepts and rudimentary analytical tools are applied to federal, state and local natural resource planning and management programs. The value of economic input into natural resource policy is examined. Evaluating tradeoffs and resolving conflicts play a particularly important role in the course content. Cross listed with ENR 3750. Prerequisites: QA, WA and junior standing. (Offered spring semester of odd-numbered years)
4830. Agricultural Commodities and Futures Markets. 3. Economics of price determination for agricultural commodities and development of pricing strategies in cash and futures markets. Prerequisite: AGEC 1020 or equivalent. (Normally offered fall semester)

4840. Agricultural Market Analysis. 3. [C2\(\text{none}\)] Applies economic theory to an analysis of economic organization and operation of agricultural markets, including price behavior. Prerequisites: MATH 1400 and ECON 3020. (Offered spring semester of odd-numbered years)

4880. International Agricultural Trade, Markets and Policy. 3. [C2, G1\(\text{G}\)] International agricultural commodity markets, product markets and market channels are characterized and examined. Presents economic theory relevant to description and analysis of international markets. Characterizes and analyzes historical and contemporary U.S. commercial trade policy and agricultural policy and their effect on markets. Prerequisites: AGEC 1010 and 1020 or equivalent and ECON 3020. (Offered spring semester of even-numbered years)

4890. Special Topics in _______. 1-3 (Max. 6). Accommodates seminar series or course offering by visiting faculty whose subject matter is not included in other courses. Prerequisites: junior standing and/or consent of instructor. (Offered based on sufficient demand and resources)

4910. Problems in Agricultural Economics. 1-3 (Max. 6). Consists of supervised study and investigation on topics of current importance in agricultural economics. Prerequisites: 12 hours in AGEC or ECON and consent of instructor.

4930. Agricultural Economics Internship. 1-6 (Max. 6). Provides practical agricultural business firm and/or agency experience. Develops working knowledge of how basic economic concepts are used by firms and agencies in policy and procedures development and decision making by the organization. Prerequisites: 10 hours of AGEC and approval of faculty supervisor.

4950. Senior Seminar and Thesis I. 1. [W3\(\text{WC}\)] Beginning of preparation and presentation of senior research thesis relevant to agriculture economics field. Prerequisites: 15 hours of AGEC and/or ECON and WB writing course.

4960. Senior Seminar and Thesis II. 2. [W3\(\text{WC}\)] Final preparation and presentation of senior thesis and writing of final report. Prerequisite: AGEC 4950.

4965. Agribusiness Strategy and Ethics Capstone. 3. [\(\text{none}\)\(\text{WC}\)] Integrates economic theory, strategic management, and ethical principles into management decision analysis related to food, agricultural, and resource-based industries. Students develop the appropriate professional documents, interpersonal communication skills, and oral presentation skills to pursue career in agribusiness management. Emphasis is placed on refining students’ professional writing abilities. Prerequisites: senior standing, 15 hours of AGEC and/or ECON and WB writing course.

5230. Intermediate Econometric Theory. 3. Covers simple and multiple regression models, problems of estimation, hypothesis and diagnostic testing, dummy variables, autoregressive and distributed lag models, and time-series analysis. The objective is to understand the underlying theory of econometric modeling and obtain operational ability to construct, estimate, and test econometric models. Dual listed with AGEC 4230. Prerequisites: ECON 3020, STAT 2050 and MATH 2350.

5310. Theory of Producer Behavior. 3. Economic models of optimization as they apply to firm-level production decisions. Topics include the properties of production functions, theories of linear and non-linear optimization, firm decision making under perfect and imperfect competition and firm decision making under uncertainty. Prerequisites: ECON 3020, STAT 2050 and MATH 2350.

5320. Quantitative Methods in Agricultural Economics. 3. Covers mathematical programming and simulation techniques for solving applied problems in agricultural economics. Emphasizes the formulation of economic research problems in quantitative terms and the use of computer software packages to derive solutions. Prerequisites: ECON 3020, STAT 2050 and MATH 2350.

5450. Negotiation. 3. Examines how to use negotiation to resolve conflict. Describes conflict; outlines way to address conflict; examines different negotiation strategies and the impact of cognitive bias, power, ethics, and individual and cultural differences; and explores mediation practices. Students complete negotiations, role-plays, and questionnaires. Dual listed with AGEC 4450. Prerequisite: COJO 1010 and junior standing.

5600. Community Economic Analysis. 3. Analysis of regions and rural communities; their problems, socioeconomic characteristics, land use and economic development. Provides training in regional economic theory, regional economic analysis, fiscal impact analysis and benefit cost analysis. Prerequisite: ECON 3010, 3020 and MATH 1400; or consent of instructor.

5630. Advanced Natural Resource Economics. 3. An in-depth treatment of theoretical issues, quantitative techniques, and institutional arrangements in the natural resource field. Topics include welfare economics, property rights, market failure and externalities, and benefit cost analysis. Prerequisites: ECON 3010 and 3020, STAT 2050 and MATH 2350.

5650. Research Methods. 1. Examines scientific methods as they specifically relate to a masters level research project in applied economics. This includes formulating the research question, developing hypotheses, determining a theoretical framework from which the data gathering and analysis will proceed and lead to reporting research outcomes. Prerequisites: ECON 3010 and 3020, STAT 2050.

5660. Community and Economic Development. 3. Community development from an interdisciplinary perspective, integrating theory, concepts and methods from sociology, economics, political science, and community development. Students learn how community theory can be used to design and support effective economic development programs. Includes readings, lectures, guest lectures, field trips and community analysis projects. Dual listed with AGEC 4660. Prerequisite: AGEC/ECON 1020 or SOC 2090 and junior standing.

5710. Advanced Agricultural Market Theory. 3. Theoretical foundations of the study of agricultural markets and how business is conducted in those markets. Topics include pure competition, industrial organization concepts related to imperfect competition including game theory, principal-agent theory, transaction costs economics, intermediary theory, and welfare implications of alternative agricultural market structures. Prerequisites: ECON 3020 and MATH 2350.

5740. Consumer Behavior and Prices Analysis. 3. Focuses on microeconomic consumer theory and its application. Topics include utility theory, market demand theory,
expected utility theory, and econometric applications. Prerequisite: ECON 3020, MATH 2350 and STAT 2050.

5880. Advanced Seminar. 1-2 (Max. 2).
Involves reporting to the seminar group on research methods and results obtained in the investigation of a topic or question relevant to the field of agricultural economics. Prerequisite: 9 credits in AGEC and/or ECON.

5890. Advanced Problems in Agricultural Economics. 1-3 (Max. 6).
Supervised study and research on current problems in marketing, farm and ranch management, policy prices, land economics or finance. Prerequisite: graduate standing in AGEC or ECON.

5900. Practicum in College Teaching. 1-3 (Max. 3).
Work in classroom with a major professor. Expected to give some lectures and gain classroom experience. Prerequisite: graduate status.

5920. Continuing Registration: On Campus. 1-2 (Max. 16).
Prerequisite: advanced degree candidacy.

5940. Continuing Registration: Off Campus. 1-2 (Max. 16).
Prerequisite: advanced degree candidacy.

5959. Enrichment Studies. 1-3 (Max. 99).
Designed to provide an enrichment experience in a variety of topics. Note: Credit in this course may not be included in a graduate program of study for degree purposes.

Graduate level course designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrolled in a graduate degree program.

5990. Internship. 1-12 (Max. 24).
Prerequisite: graduate standing.

Department of Animal Science
101 Animal Science/Molecular Biology Bldg., 766-2224
FAX: (307) 766-2355
Web site: uwyo.edu/anisci
Department Head: Doug Hixon

Professors:
STEPHEN P. FORD, B.S. Oregon State University 1971; M.S. West Virginia University 1973; Ph.D. Oregon State University 1977; Professor of Animal Science 2000.
DANIEL C. RULE, B.S. University of California, Davis 1977; M.S. 1980; M.S. Washington State University; Ph.D. Iowa State University 1984; Professor of Animal Science 1999, 1987.

Associate Professors:
MIN DU, B.S. Zhejiang University 1990; M.S. China Agricultural University 1993; Ph.D. Iowa State University 2001; Associate Professor of Animal Science 2009, 2003.
P A U L A. L U D D E N, B.S. University of Nebraska-Lincoln 1991; M.S. Purdue University 1994; Ph.D. University of Missouri-Columbia 1997; Associate Professor of Ruminant Nutrition 2004, 1998.


Assistant Professors:
BRENDA M. ALEXANDER, B.S. University of Wyoming 1986; M.S. 1988; Ph.D. 1999; Assistant Professor of Animal Science 2006.
KRISTI M. CAMMACK, B.S. South Dakota State University 1999; M.S. University of Nebraska-Lincoln 2001; Ph.D. University of Missouri Columbia 2005; Assistant Professor of Animal Science 2006.
SCOTT L. LAKE, B.S. University of Nevada 1998; M.S. 2001; Ph.D. University of Wyoming 2005; Assistant Professor of Animal Science 2008.
MEIJUN ZHU, B.S. China Agricultural University 1991; M.S. 1994; Ph.D. Iowa State University 2004; Assistant Professor of Animal Science 2008.

Assistant Lecturer:
Amy K. McLean

Adjunct Professors:
Thomas Hansen, John Johnston, Tom McDonald, Peter Nathanielisz, Mark Nijland, Donal Skinner, D. Paul Thomas, Heywood Sawyer

Professors Emeriti:
Ray Field, Frank Hinds, Steven W. Horn, Conrad Kercher, Johannes Nel, Bibek Ray

The Department of Animal Science offers a variety of courses in animal and food science. The department has modern laboratories and excellent animal facilities including a livestock teaching arena and a meat processing facility.

The Department of Animal Science and the Department of Veterinary Science have a combined curriculum under animal and veterinary science. The curriculum has options in production, range livestock, business, communication, animal biology, preveterinary
medicine and meat science and food technology. The curriculum leads to a wide variety of career opportunities for animal and veterinary science graduates.

Animal and veterinary science

The Department of Animal Science and the Department of Veterinary Sciences have combined their efforts to offer several degree options leading to the bachelor of science degree in animal and veterinary science. Courses in animal science, food science, and pathobiology are the core offerings in the various options.

Agriculture, in its broadest definition, is the nation’s largest industry. Livestock production is Wyoming’s largest agricultural enterprise. Animal agriculture and its associated industries offer many opportunities for the interested student. Whether a student is interested in production livestock, allied fields such as meat science, business or animal health, or wants to apply to a college of veterinary medicine, the degree tracks offered will form the basis for a challenging career in animal agriculture/biology. The various options provide maximum flexibility to meet the changing needs of students and their employers. For students interested in pursuing advanced research, M.S. and Ph.D. degrees are offered.

Several degree options allow for specialization and graduate or professional school preparation. A brief description of each option and the educational opportunities they provide is given with the course requirements.

A grade of C or better must be earned in the following courses when the courses are required in the individual option for completion of the degree: ANSC 3010, 3100, 4120, 4540, 4630, FDSC 3060, PATB 4110, LIFE 1010, 2022.

Students are encouraged to participate in activities related to their degree option. The university has judging teams in livestock, meats and wool. Each team travels and participates in at least one major exposition a year. Each year, the Academic Quadrathlon competition is held, combining practical and classroom skills for students. Field trips, as practical teaching aids in many classes, are scheduled throughout the year. Internships are available to gain practical experience.

Student organizations such as the Block and Bridle Club, Food Science Club, Microbiology Club, and the Pre-vet Club provide additional educational and recreational opportunities.

Production Option

This option provides a strong background in livestock production and management. Students interested in livestock production should enroll in this option.

Required courses: ANSC 1010, 3010, 3100, 4100, 4210, 4540 and two courses selected from 3150, 4220 or 4230; PATB 4110. Required: ANSC 1000 (I); remainder see Table 1.

Agricultural sciences ........................................ 37
Biological sciences ........................................ 11
Physical sciences ........................................ 7-8
Quantitative reasoning, statistics or computer science ........................................ 8
Written and Oral Communication Skills ........................................ 12
Cultural Context ........................................ 9
Global Awareness ........................................ 3
Physical Activity and Health ........................................ 1
U.S. Diversity, Information Literacy ........................................ 7-8
Electives to total ........................................ 128

Suggested Courses: AECL 2010; REWM 4530, 4850; AGEC 4640

Business Option

Students desiring a strong background in business in addition to the basic courses in animal and veterinary science should enroll in this option. Graduates will be qualified for careers in the livestock agribusiness industry. Animal and veterinary science ........................................ 32

Required courses: ANSC 1010, 3010, 3100, 2020 or 4100, 4120, 4540 and two courses selected from 3150, 4220, 4230 or 4240; PATB 4110

Required: ANSC 1000 (I); remainder see University Studies Program

Suggested Courses: AECL 2010; REWM 4530, 4850; AGEC 4640

Rangeland ecology and watershed management ........................................ 17

Biological sciences ........................................ 11
Agricultural sciences ........................................ 11
Physical sciences ........................................ 7-8
Quantitative reasoning, statistics or computer science ........................................ 8
Written and Oral Communication Skills ........................................ 12
Cultural Context ........................................ 9
Global Awareness ........................................ 3
Physical Activity and Health ........................................ 1
U.S. Diversity, Information Literacy ........................................ 7-8
Electives to total ........................................ 128

Suggested Courses: AECL 2010; REWM 4530, 4850; AGEC 4640

Agricultural economics and business courses ........................................ 27
AGEC 1010, 1020, 3860, 4050, 4060 or 4880; ACCT 2010

Agricultural sciences ........................................ 4
Required course: FDSC 3060
Skills

Written and Oral Communication

or computer science

Physical Activity and Health

U.S. Diversity, Information Literacy

and Intellectual Community

University Studies Program

Cultural Context

See University Studies Program

U.S. and Wyoming Constitutions

Global Awareness

See University Studies Program

Physical Activity and Health

U.S. Diversity, Information Literacy

and Intellectual Community

Required courses: ANSC 1000 (I); remainder see

University Studies Program

Electives to total 128

Animal Biology Option

This option within the major requires more complete and stringent basic sciences. Students may complete premedical requirements or other pre-professional allied health requirements while completing a B.S. degree that prepares them for alternate career choices. Selected courses provide opportunity for more complete exposure in both biological sciences and pathobiology. Possible alternatives to professional schools include graduate school admission or employment by government or industry in research, promotion or sales.

Because of the variation in pre-professional requirements for different professional programs, students are encouraged to determine the specific requirements of the programs in which they are interested.

Animal and veterinary science

Required courses: ANSC 1010, 3010, 3100, 4120; PATB 4400; Suggested courses: ANSC 4100, 4540, 4260; PATB 4110, 4500, 4140, 4710

Agricultural sciences

FDSC 3060

Biological sciences

Suggested courses: LIFE 3600; ZOO 4410, 4340

Physical and chemical sciences

Suggested courses: LIFE 3600; ZOO 4410, 4340

Quantitative reasoning, statistics

and computer science

Required courses: MATH 4000/4010 or FCSC 4145; PATB 4110

Written and Oral Communication

Skills

Electives to total 128

Agricultural sciences

FDSC 1410, 2040, 3060, 4060, 4090, 4100, 4720, 4760, 4800, 4810

Agricultural Economics/Business

Required course: AGEC 3860

Biological sciences

FDSC 1410, 2040, 3060, 4060, 4090, 4100, 4720, 4760, 4800, 4810

Quantitative reasoning, statistics, computer science

Written and Oral Communication

Skills

Animal Science

See University Studies Program

U.S. and Wyoming Constitutions

Global Awareness

See University Studies Program

Physical Activity and Health

U.S. Diversity, Information Literacy

and Intellectual Community

Required: ANSC 1000 (I); remainder see

University Studies Program

Electives to total 128

Suggested courses: ANSC 4100, 4150, 4260, 4540, 4710

Meat Science and Food Technology Option

Students taking this option will have an excellent background for entering the meat industry. The food industry is the largest employer in this country and offers a wide variety of career opportunities.

Animal and veterinary science

Required courses: ANSC 1010, 3010, 3100 or FCSC 4145; PATB 4110

Food science

FDSC 1410, 2040, 3060, 4060, 4090, 4100, 4720, 4760, 4800, 4810

Agricultural Economics/Business

Required course: AGEC 3860

Biological sciences

FDSC 1410, 2040, 3060, 4060, 4090, 4100, 4720, 4760, 4800, 4810

Quantitative reasoning, statistics, computer science

Written and Oral Communication

Skills

Electives to total 128

Suggested courses: ANSC 4100, 4150, 4260, 4540, 4710

Meat Science and Food Technology Option

Students taking this option will have an excellent background for entering the meat industry. The food industry is the largest employer in this country and offers a wide variety of career opportunities.

Animal and veterinary science

Required courses: ANSC 1010, 3010, 3100 or FCSC 4145; PATB 4110

Food science

FDSC 1410, 2040, 3060, 4060, 4090, 4100, 4720, 4760, 4800, 4810

Agricultural Economics/Business

Required course: AGEC 3860

Biological sciences

FDSC 1410, 2040, 3060, 4060, 4090, 4100, 4720, 4760, 4800, 4810

Quantitative reasoning, statistics, computer science

Written and Oral Communication

Skills

Electives to total 128

Suggested courses: ANSC 4100, 4150, 4260, 4540, 4710
Pre-Veterinary Medicine Option

This option is especially designed to prepare students for application to colleges of veterinary medicine. There is a strong emphasis on the biological, biomedical and physical sciences. This curriculum is also appropriate for students wishing to pursue graduate school opportunities, other professional school applications, or careers in many areas of agribusiness. A minimum of three years of formal course work is required before one can apply to a college of veterinary medicine. Students accepted before completion of their B.S. degree can transfer credits back to UW to complete their degree requirements. Wyoming does not have a college of veterinary medicine. Faculty advisers insure that students meet the variable preprofessional requirements for application to colleges of veterinary medicine in their home state or region.

Animal and veterinary science ...................... 26
Required courses: ANSC 3010, 3100, 4120
and one course selected from 3150,
4220 and 4230; PATB 4110, 4400, 4500
and 4710

Agricultural sciences .................................. 4-5
Required courses: MOLB 2210 or MCR
2240

Biological sciences ..................................... 11
LIFE 1010, 2022, 3050

Chemistry and physics .................................. 24-28
Required courses: CHEM 1020, 1030,
2300; MOLB 3610, 4100, 4105
or
CHEM 1020, 1030, 2420, 2440; MOLB
3610;
PHYS 1110, 1120 or PHYS 1050

Quantitative reasoning and
statistics .................................................. 9-10
Required courses: MATH 1400 and 1405
or 1450; STAT 2050

Written and Oral Communication
Skills .................................................. 12
Required courses: WA, WB, WC (ANSC
4630 rec.), and COJO 1010

Cultural Context ......................................... 9
See University Studies Program

U.S. and Wyoming Constitutions ............... 3
See University Studies Program

Global Awareness ..................................... 3
See University Studies Program

Physical Activity and Health ....................... 1

U.S. Diversity, Information Literacy
and Intellectual Community .................... 7-8
Required: ANSC 1000 (I); remainder see

University Studies Program
Electives to total ...................................... 128
Suggested courses: PHYS 1050, MOLB
3610, FDSC 4900, FCSC 4145

Agriculture Education with Concurrent
Major in Animal and Veterinary Science

This program consists of 128 total hours.
Minimum 2.75 cumulative GPA and minimum
2.5 content GPA required. This major will be
advised in the College of Education with
a secondary adviser in Animal Science. Refer
to the College of Education for specific curriculum
requirements.

Undergraduate Minor

The Departments of Animal Science and
Veterinary Sciences offer a minor in animal
and veterinary science for non-majors. The
courses required for a minor must be taken
for a letter grade and the student must receive
a grade of C or better in each course. Courses
required are: ANSC 3010, 3100, 4120, 4540;
FDSC 3060; PATB 4110 and at least one of
the following: ANSC 3150, 4220 or 4230. The
Department of Animal Science or Veterinary
Sciences undergraduate minor adviser may be
contacted by students needing assistance or
having questions.

Graduate Study

The Departments of Animal Science and
Veterinary Science offer programs leading to
the M.S. (Plan A and Plan B) and Ph.D. degrees
in animal and veterinary science. A M.S. degree
in food science and human nutrition is offered
in cooperation with the Department of Fam-
ily and Consumer Sciences. The Department
of Animal Science also participates in the
interdisciplinary M.S./Ph.D. Reproductive
Biology Program.

Program Specific Degree Requirements
Master’s Program - Plan A (thesis)

The student, major professor, and graduate
committee determine the program of study
and research project, which meets the needs
of the individual student. The candidate’s
graduate committee should be established
and functioning by the time the student has
completed 12 semester hours of formal course-
work. The master of science program should be
approved and filed by the end of the student’s
second semester of graduate study in animal
science. This committee shall also determine
if the student is making satisfactory progress
to be advanced to a candidate for a master’s
degree or continued in a doctoral program by
the end of the student’s third semester follow-
ing matriculation.

The student can specialize in breeding,
food science and human nutrition, nutrition,
physiology, meat science, reproduction or wool
for coursework and thesis/dissertation project.
In addition, supporting coursework is avail-
able in agricultural economics, biochemistry,
microbiology, range management, genetics,
statistics, and other areas of interest to the
individual. In certain cases it is possible to de-
velop a joint research project between animal
science and another department.

Students may use the research facilities and
herds of beef cattle, sheep, and swine at the
university livestock center near the university
or at one of the university research and exten-
sion centers in the state. Research laboratories
are located on campus and include a semi com-
mercial wool scouring and processing labora-
tory and a modern meat processing facility.

The Plan A program is a 30 hour program,
26 hours of coursework and 4 hours of thesis
research.

Master’s Program - Plan B (non-thesis)

The Plan B program requires a course-
work-intensive, non-thesis master of science
program for those students whose career paths
may not require a thesis research program.

The program requires 32 hours of course-
work in addition to an acceptable non-thesis
research paper as defined by the student’s
graduate committee.

Doctoral Program

The program requires 72 hours. Students
must follow minimum graduate requirements.

Animal Science (ANSC)

USP Codes are listed in brackets by the
1991 USP code followed by the 2003 USP
code (e.g. [M2Q1B]).

1000. Intellectual Community in Animal
and Veterinary Sciences. 1. [(none)Q1, L]
Introduction to the field of animal and veteri-

ary science and the purpose and philosophy
of higher education. Major issues in the field
will be explored through writing and class
discussion. The undergraduate curriculum and
career options are also discussed.

1010. Livestock Production. 4. Scope of in-
dustry, management of beef cattle, sheep, dairy

cow, horses, swine and poultry. Introduces
breeding and genetics, reproduction and nutri-
tion of domestic animals. Acquaints students with wool, meat, dairy and poultry products.  (Normally offered fall semester)

1030. Equine Management. 3. An overview of the horse industry and proper way to manage horses.  (Normally offered spring semester)

1070. Livestock Fitting and Showing. 1. Teaches fitting and showing techniques for domestic livestock. Students will have the opportunity to fit an animal of their choice and participate in the Little International Livestock Show at the Animal Science Livestock Center.  (Normally offered fall semester)

2010. Domestic Animal Metabolism. 3. Integrates cellular and whole-animal metabolism through introduction to metabolic regulation. Introduces students to the nomenclature, structures and functions of cellular metabolites and vitamins. Knowledge of chemical structure will be applied to cellular reactions in various tissues of domestic animals. Ruminants and non-ruminants will be contrasted.  Prerequisite: CHEM 1000.  (Normally offered spring semester)

2020. Feeds and Feeding. 4. Nutrient classification and use, feed value, ration formulation and feeding domestic animals.  (Normally offered spring semester)

2035. Companion Animal Nutrition. 3. Nutrition and biology of digestion of companion/pet animals. Fundamentals of nutrition and the nutrients, as well as appropriate terminology will be covered, with direct application to companion animals.  Prerequisites: none.  (Offered spring semester)

3010. Comparative Anatomy and Physiology of Domestic Animals. 4. [S1\(\square\)(none)] Teaches comparative anatomy and physiology of digestion, circulation, production, reproduction and environment of farm animals.  Prerequisites: LIFES 1010 and 2022 with a minimum grade of C.  (Normally offered spring semester)

3100. Principles of Animal Nutrition. 3. Description of the nutrients, nutrient digestion and absorption, and nutrient function within the body of various domesticated animals.  Prerequisite: CHEM 2300 or ANSC 2010.  (Normally offered fall semester)

3150. Equine Nutrition and Physiology. 3. Provides general knowledge of nutrition, physiology and biochemistry of exercise and reproductive processes of equine.  Prerequisite: 4 hours of biology.  (Normally offered fall semester)

3250. Equine Behavior and Welfare. 3. To familiarize students with an equine interest about behavior, learning, and welfare issues associated with management and training of equine.  Prerequisites: ANSC 1030, ANSC 3150.

3550. Livestock Judging. 1-2 (Max. 6). Livestock judging only. Students representing the university in national and regional contests are selected from this course. Requires field trips.  Prerequisite: 6 hours in animal science.

3555. Equine Evaluation and Selection. 2 (Max. 6). Objectively evaluate equine for performance and breeding purposes according to breed standards and or discipline. Emphasis will be placed on learning how conformation relates to overall function and longevity of equine. Competitive horse judging team criteria will be used to build organizational skills, equine terminology, and communication skills.  Prerequisites: ANSC 1010 and ANSC 1030.

3560. Advanced Equine Evaluation and Selection. 2 (Max. 6). Objectively evaluate equine for halter and performance according to breed standards and or discipline. Competitive horse judging team criteria will be used to build organizational skills, equine terminology, and communication skills. Students will compete as members of the Collegiate Horse Judging Team and represent University of Wyoming at national horse judging competitions.  Prerequisites: ANSC 3555.

4050. Animal Growth and Development. 3. Explores aspects of animal growth and development, with a focus on skeletal muscle, adipose, soft connective tissues, and bone. Addresses genetic, endocrine, nutritional, and environmental impacts on tissue development and growth. Dual listed with ANSC 5050.  Prerequisite: LIFE 2022.

4061. Cell Signaling. 3. Cell signaling pathways in animal growth and development. Defines how cells respond to external stimuli. Includes: G-protein couple signaling, calcium signaling, growth factor associated signaling, redox signaling, lipid related signaling, and apoptosis. Dual listed with ANSC 5061.  Prerequisites: MOLB 3610 or an equivalent biochemistry or cell biology course.  (Normally offered fall semester)

4100. Nutritional Management. 3. Integration and application of the principles of nutrition. Addresses nutrient requirements, feed composition and nutritional value, in addition to feeding management strategies for various classes of farm animals. Provides practical nutritional experience through laboratory. Dual listed with ANSC 5100.  Prerequisite: ANSC 3100.

4111. Equine Health and Disease. 2. To familiarize students with identification, prevention and treatment of diseases in horses through proper health management techniques. Cross listed with PATB 4111.  Prerequisites: ANSC 1030, ANSC 3150.

4120. Principles of Mammalian Reproduction. 3. Overview of the anatomy, physiology, endocrinology and biochemistry of reproductive processes in male and female mammals. Dual listed with ANSC 5120.  Prerequisite: a course in systemic anatomy and physiology/endocrinology.  (Normally offered fall and spring semesters)

4130. Management of Reproduction. 3. Lecture-laboratory course. Introduces methods of manipulating reproduction within livestock management systems. Includes artificial insemination, diagnosis of pregnancy, induction and control of estrus and ovulation, induction of parturition, embryo transfer and control and prevention of diseases.  Prerequisite: ANSC 4120.  (Normally offered spring semester)

4150. Physiology of Ruminant Digestion. 3. Anatomical structure, function and symbiotic relationship of ruminant digestive system. Dual listed with ANSC 5150.  Prerequisite: ANSC 3100.  (Normally offered spring semester)

4210. Wool Structures and Properties. 2. Chemical structure and reactions of wool fiber, as well as physical properties as related to structure.  Prerequisite: CHEM 2300 or equivalent.  (Offered based on sufficient demand and resources)

4220. Advanced Beef Production and Management. 3. Integrates animal breeding, nutrition and reproductive physiology in beef production management schemes. Emphasizes analysis and decision making. Consists of two hours of lecture and two hours of lab, with approximately one-half of labs meeting at Animal Science Livestock Center.  Prerequisites: ANSC 3100, 4120, 4540.  (Normally offered spring semester)

4230. Advanced Sheep Production Management. 3. Integrates animal breeding, nutrition and reproductive physiology in sheep production management schemes.  Prerequisites: ANSC 3100, 4120, 4540.  (Normally offered spring semester)

4240 [3330]. Advanced Swine Production and Management. 3. Integrates animal breeding, nutrition and reproductive physiology in swine production management schemes.  Prerequisites: ANSC 3100, 4120, 4540.  (Normally offered spring semester)
4260. Mammalian Endocrinology. 3. Introduces principles of endocrinology, role of endocrine systems in regulating metabolism, growth, reproduction and lactation in mammals. Dual listed with ANSC 5260. Prerequisite: ANSC 3010, ZOO 2110 or 4220. (Normally offered fall semester)

4500. Problems in Animal Science. 1-3 (Max. 6). Provides opportunity for students to conduct supervised research in breeding, genetics, management, nutrition and physiology. Prerequisites: 6 hours in animal science and consent of instructor. (Offered fall, spring and summer)

4540. Principles of Animal Breeding. 3. [M3](none) Discusses genetic principles underlying animal improvement; introductory population genetics; heritability; systems of mating; and selection. Prerequisites: MATH 1000 or a statistics course; LIFE 3050. (Normally offered fall semester)

4550. Internship in Animal Science. 1-8 (Max. 8). Provides opportunities to acquire experience in a field of interest to the student. Offers learning experiences that are difficult, if not impossible, to realize in classroom settings. Following off-campus educational experience, students are more able to evaluate potential career opportunities and select additional classes on-campus to complement career direction. Offered S/U grade only. Prerequisites: sophomore standing; 2.5 GPA. (Offered fall, spring and summer)

4630. Topics and Issues in Animal Science. 3. [W3](none) Writing-intensive course that focuses on writing projects related to current topics and issues in animal science. Emphasizes writing skills, strategies, information gathering and critical judgment. Assignments include short and long papers, resumes, letters of transmittal, and oral presentations. Prerequisites: senior standing and completion of WA and WB writing requirements. (Offered spring semester)

4700. Behavior of Domestic Animals. 2. Applied ethology emphasizing the behavioral biology of domestic and companion animals with a concentration on causes and treatments of unwanted behaviors. Ethological approaches include evolutionary, genetic, neural, and hormonal considerations. The foundations of classical and operant conditioning are discussed in relation to behavior modification techniques. Prerequisites: LIFE 2022 or equivalent; ANSC 3010.

5050. Animal Growth and Development. 3. Explores aspects of animal growth and development, with a focus on skeletal muscle, adipose, soft connective tissues, and bone. Addresses genetic, endocrine, nutritional, and environmental impacts on tissue development and growth. Dual listed with ANSC 4050. Prerequisite: LIFE 2022.


5100. Nutritional Management. 3. Integration and application of the principles of nutrition. Addresses nutrient requirements, feed composition and nutritional value, in addition to feeding management strategies for various classes of farm animals. Provides practical nutritional experience through laboratory. Dual listed with ANSC 4100. Prerequisite: ANSC 3100.

5120. Principles of Mammalian Reproduction. 4. In addition to attendance in the lecture component of this course, graduate students will be expected to participate in in-depth weekly discussions of the scientific literature and to prepare a research grant proposal on a specific topic. Dual listed with ANSC 4120. Prerequisite: a course in systemic anatomy and physiology or consent of instructor.

5150. Physiology of Ruminant Digestion. 3. The anatomical structure, function, and symbiotic relationship of the ruminant digestive system. Dual listed with ANSC 4150. Prerequisite: ANSC 3100.

5170. Feed and Food Analysis. 3. A lecture-laboratory course designed to provide students in animal science, food science and nutrition with instruction and hands-on experience with proximate analysis and instrumentation used for nutrient analysis of foods and foodstuffs as well as discussion of sampling, dilutions, and calculations. Cross listed with FDSC 5170. Prerequisite: 6 credits in chemistry or biochemistry, or consent of instructor.

5180. SAS Applications in Agriculture. 2. Use of PC Statistical Analysis (SAS) software for analysis of data generated using experimental designs common to the agricultural sciences. Course will emphasize applied programming and interpretation of results. Prerequisite: STAT 5080 or equivalent.

5260. Mammalian Endocrinology. 3. Introduction to the principles of endocrinology. The role of endocrine systems in regulating metabolism, growth, reproduction, and lactation in mammals are discussed. Dual listed with ANSC 4260. Prerequisite: ANSC 3010.

5510. Mineral Metabolism. 3. Lectures on current mineral nutrition topics with student reports on recent journal articles. Prerequisite: ANSC 3100.

5530. Topics in Range Nutrition. 3. Lectures on current range nutrition topics with student reports on recent journal articles. Prerequisite: ANSC 3100 and consent of instructor.

5550. Investigations in Animal Nutrition. 2-3 (Max. 6). Special problems involving nutritional research with domestic or laboratory animals. Prerequisite: ANSC 3100 and consent of instructor.

5620. Wool Measurement Methods. 3. Theory and practice relating to routine and standard analytical fiber measurements. Prerequisite: ANSC 3040 and STAT 2050 or consent of instructor.

5680. Wool Problems Analysis. 1-5 (Max. 10). Scientific papers on assigned topics. Prerequisite: STAT 2050.

5770. Lipid Metabolism. 3. An in-depth study of lipid metabolism and regulation of genes and enzymes involved in transport, synthesis, mobilization, and oxidation of lipids with application to ruminant and non-ruminant species as well as to humans. Cross listed with FDSC 5770. Prerequisite: ANSC 3100 or MOLB 3610 or FCSC 4145.

5780. Investigations in Animal Breeding. 1-3 (Max. 6). Assigned problems involving genetic and physiological research with domestic or laboratory animals. Prerequisite: ANSC 4550.

5790. Investigations in Animal Physiology. 2-3 (Max. 6). Special problems involving reproductive physiology or other physiology research with domestic or laboratory animals. Prerequisite: ANSC 3010, 4120 and consent of instructor.

5865. Advanced Seminar in Nutrition. 1-2 (Max. 2). Preparation and presentation of seminars on a variety of topics relating to animal nutrition, metabolism, and livestock production. Prerequisites: graduate standing.

5870. Reproductive Biology Seminar. 1 (Max. 12). A graduate seminar designed to examine a variety of topics relating to the physiological processes of reproduction in mammals. Prerequisite: graduate standing.
Food Science

Food science is the application of basic sciences to the processing, quality control, storage, distribution and consumer use of food products. The microbiological, chemical and physical characteristics of foods as related to food processing and product quality are studied. Major emphasis is placed in the area of animal food products.

Food Science (FDSC)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2QB]).

1410. Food and Our Well Being. 3. Introductory course dealing with current questions and concerns about foods. Considers food composition, effects of food processing, food labeling, diet, degenerative diseases and general health. Students become familiar with foods and food industry. (Normally offered spring semester)

1490. Safety of Our Food. 4. [SI (none)]

For students interested in knowing what makes a food, the most basic necessity of life, safe or unsafe. This will be explored through discussions on factors that make a food safe or unsafe, risk-benefit concepts, the real safety issues and the role of regulatory agencies and consumers to ensure safety of food. When possible, outside experts will be invited to give their views during which students will be encouraged to discuss the issues. Laboratory is required. Course credit cannot be applied toward degree requirements in food science. (Offered once a year)

2040. Principles of Meat Animal Evaluation. 3. Live animal and carcass evaluation of beef, sheep and swine. Slaughter, meat inspection and anatomy are discussed. (Normally offered fall semester)

2060. Principles of Meat Science. 3. Fabrication of carcasses into cuts and associated processing techniques; muscle growth, structure and metabolism; conversion of muscle into meat; fresh meat properties and quality; chemical properties of meat; meat microbiology, preservation and storage; meat by-products; HACCP. Prerequisite: CHEM 1000 and LIFE 3010.

3061. Livestock Slaughter Practicum. 1. Students learn and practice proper techniques of livestock slaughter. Prerequisite: FDSC 3060 or concurrent enrollment.

3062. Carcass Fabrication Practicum. 1. Students learn and practice proper techniques of carcass fabrication. Prerequisite: FDSC 3060 or concurrent enrollment.

3063. Meat Processing Practicum. 1. Students learn and practice proper procedures for the production of sausages and cure meat products. Prerequisite: FDSC 3060 or concurrent registration.

3550 [2100]. Meat Evaluation. 1-2 (Max. 6). USDA grading standards, value pricing, yield and quality attributes of meat are used to evaluate products. Students who represent the university in national and regional contests are selected form this class. Requires field trips. Prerequisites: FDSC 2040 or 6 credits in ANSC/FDSC.

4090. Food Microbiology. 3. Discusses microorganisms and theory of their growth and survival in relation to spoilage and preservation of foods and health hazards in foods. Dual listed with FDSC 4090 or 5090, taken concurrently. (Normally offered spring semester)

4770. Food Chemistry. 3. Studies chemical composition of foods and food products. Emphasizes processing and storage. Dual listed with FDSC 5720. Prerequisite: CHEM 2300. (Normally offered fall semester)

4771. Muscle Structure and Function. 1. Explores properties of skeletal muscle with emphasis on cellular and extracellular proteins, ultrastructure and function. Prerequisite: FDSC 3060 or equivalent.

4772. Conversion of Muscle to Meat. 1. Explores molecular and biochemical changes in postmortem muscle and their impact on meat quality. Prerequisite: FDSC 3060 or equivalent.

4773. Advanced Meat Processing. 1. Explores chemical and physical properties of meat and non-meat ingredients and their effect on meat processing. Prerequisite: FDSC 3060 or equivalent.

4774. Advanced Concepts in Meat Microbiology. 1. Explores spoilage and pathogenic microorganisms in meat products, including shedding, virulence, resistance, and detection methods. Prerequisite: FDSC 3060 or equivalent.

4800. Problems in Food Science. 1-3 (Max. 6). Examines special problems related to quality control, formulation and processing of meat, poultry and dairy foods. Offers research techniques and instrumentation in foods. Prerequisite: 6 hours in FDSC, 6 hours in chemistry and consent of instructor. (Offered fall, spring and summer)
5720. Food Chemistry. 3. A study of the chemical composition of foods and food products with emphasis upon processing and storage. Dual listed with FDSC 4720. Prerequisite: CHEM 2300.

5772. Conversion of Muscle to Meat. 1. Explores molecular and biochemical changes in postmortem muscle and their impact on meat quality. Dual listed with FDSC 4772. Prerequisite: FDSC 3060 or equivalent.

5773. Advanced Meat Processing. 1. Explores chemical and physical properties of meat and non-meat ingredients and their effect on meat processing. Dual listed with FDSC 4773. Prerequisite: FDSC 3060 or equivalent.

5774. Advanced Concepts in Meat Microbiology. 1. Explores spoilage and pathogenic microorganisms in meat products, including shedding, virulence, resistance, and detection methods. Dual listed with FDSC 4774. Prerequisite: FDSC 3060 or equivalent.

5880. Advanced Problems and Topics. 1-3 (Max 6). Designed to allow graduate students to pursue advanced research problems and advanced topics and to obtain experience in the teaching process. Prerequisite: graduate standing and consent of instructor.

5890. Seminar in Food Science and Nutrition. 1. A seminar course on topics in food science and human nutrition. Dual listed with FDSC 4890. Prerequisite: graduate standing.

5900. Practicum in College Teaching. 1-3 (Max 3). Work in classroom with a major professor. Expected to give some lectures and gain classroom experience. Prerequisite: graduate standing.

5920. Continuing Registration: On Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5940. Continuing Registration: Off Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5959. Enrichment Studies. 1-3 (Max 99). Designed to provide an enrichment experience in a variety of topics. Note: credit in this course may NOT be included in a graduate program of study for degree purposes.

5960. Thesis Research. 1-12 (Max. 24). Designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrollment in a graduate degree program.

5980. Dissertation Research. 1-12 (Max. 48). Designed for students who are involved in research for their dissertation project. Also used for students whose coursework is complete and are writing their dissertation. Prerequisite: enrolled in a graduate degree program.

5990. Internship. 1-12 (Max. 24). Prerequisite: graduate standing.
Department of Family and Consumer Sciences
251 Agriculture Building, 766-4145
FAX: (307) 766-5686
Web site: www.uwyo.edu/family
Department Head: Donna Brown

Professors:


SONYA S. MEYER, B.S. Emporia State University 1973; M.S. Kansas State University 1979; Ph.D. 1986; Professor of Textiles and Merchandising 2010, 1986.


Associate Professors:

BRUCE A. CAMERON, B.Sc. University of New South Wales, Australia 1983; Ph.D. 1986; Associate Professor of Textiles and Merchandising 1997, 1986.

RHODA SCHANTZ, B.S. North Dakota State University 1976; M.S. 1978; Ph.D. Kansas State University 1988; Associate Professor of Food and Nutrition 1995, 1990.

Assistant Professors:
D. ENETTE LARSON-MEYER, B.S. University of Wyoming 1987; M.S. MGH Institute of Health Professions, Boston 1990; Ph.D. University of Alabama at Birmingham 1998; Assistant Professor of Human Nutrition 2005.

KARI MORGAN, B.S. University of Wyoming 1991; M.S. University of Maryland 1993; Ph.D. University of Wisconsin-Madison 1998; Assistant Professor of Child and Family Studies 2005.

CHRISTINE WADE, B.S. Willamette University 2001; M.S. University of Wyoming 2005; Ph.D. 2008; Assistant Professor of Human Development and Family Studies 2008.

Academic Professionals:


Distance Instructors:
Dianne Barden, Susan Blumel-Berg, Heidi Christensen, Gail Gordon, Gail Lee, Lisa Marie Mariglia

Professor Emeritus:
Margaret Boyd, Saul Feinman, Judith A. Powell

The department’s mission is to strengthen families and communities with an emphasis on rural environments. We recognize that societies are increasingly dynamic and interdependent. Therefore, we aspire to fulfill our mission through instructional, research, and outreach/extension efforts that challenge, motivate, and inspire learners and educators to be effective personal and professional contributors within this global arena. The uniqueness of this discipline is its holistic approach to understanding critical problems of individuals and families, including consumer problems. This broad approach, combined with attention to professional preparation, enables graduates to enter a variety of careers ranging from dietetics to food product development, sports nutrition to human development, or family sciences to positions in apparel design, interiors and green design, merchandising and other consumer industries. Professional preparation is offered in five options as well as four minors that can enhance degrees in other majors and increase student employability. Integration of knowledge from root disciplines and incorporation of core concepts are the basis for all family and consumer sciences courses.

All students pursuing the Bachelor of Science in Family and Consumer Sciences degree are required to complete: a) University Studies requirements; b) a departmental core curriculum including a senior capstone course; and c) courses in one of the following individual options: dietetics, human nutrition and food, human development and family sciences, professional child development, or textiles and merchandising. Minors in apparel design, human development and family sciences, human nutrition, and interior design are also available.

Grade Requirements
Students are required to pass all courses within the Department of Family and Consumer Sciences with a grade of C or better.

Security Screening
All students applying for admission to the Professional Child Development option are required to complete a security screening before they will be allowed entry into the program. Students in the Human Development and Family Sciences option must complete their security screening upon declaration of their major. In both cases, the student is responsible for the cost of this screening. Failure to satisfactorily complete this requirement will result in the student being dropped from or denied entry to the program.

Family and Consumer Sciences Core Requirements
A core curriculum is required of all family and consumer sciences majors. This requirement is based on a common body of knowledge in family and consumer sciences which contains concepts relevant to all program areas (options). All students must take FCSC 1010 within their first year. FCSC 1010 is the key introductory course in family and consumer sciences. It is the beginning of the electronic portfolio student assessment system. Failure to successfully complete this course within the required time frame can result in a student being dropped from the program.

The family and consumer sciences core consists of the following courses:
FCSC 1010 Perspect. in FCSC........2
FCSC 4010 Philosophical & Research Perspectives in FCSC........2

Choose one of the following:
FCSC 1140 Nutrition or
FCSC 1141 Principles of Nutrition or
FCSC 1150 Scientific Study of Food2-3

Choose one of the following:
FCSC 1180 Applied Design or
FCSC 2170 Clothing in Mod. Society or
FCSC 2180 Housing or
FCSC 3171 Intro Textile Science or
FCSC 4181 Global Textiles.............3

Family and Consumer Sciences Core Requirements

College of Agriculture
Family and Consumer Sciences

Choose one of the following:

**FCSC 2110 Fund of Aging/Human Development or**
**FCSC 2121 Child Development or**
**FCSC 2131 Family Relations or**
**FCSC 2133 Intimate Relationships or**
**FCSC 3110 Personal Finance or**
**FCSC 3220 Multicultural Influences on the Young Child**

Total **12-14**

Family and Consumer Sciences Options

Students must obtain and follow a check sheet for their chosen program area. Standards established by several professional organizations require completion of specific courses in addition to the family and consumer sciences core and USP requirements. All students are assigned a faculty adviser. Students must work closely with their adviser to be sure all requirements are met.

Dietetics

Students who complete the dietetics option meet academic requirements as approved by the Commission on Accreditation for Dietetics Education (CADE). Completion of this curriculum allows students to pursue a postgraduate competitive internship to become eligible to take the examination for Registered Dietitians. The Didactic Program in Dietetics (DPD) is currently accredited.

Entrance into the DPD is made only through an application process. Each prospective DPD student will initially enter the Human Nutrition and Food option. Students will be eligible to apply for the DPD only after completing the required list of courses (59 to 60 credit hours outlined below) and meeting the established minimum overall Grade Point Average (GPA) and GPAs in each category. The application must include a statement of career goals. Entrance decisions will be made after completion of courses specified below. The DPD is structured to have four remaining semesters after acceptance with the upper division courses designed as professional dietetics courses.

Application to DPD can be made after completion of the following courses and attaining an overall GPA of 3.0:

**Science Courses (with a minimum GPA of 3.0)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE 1010</td>
<td>General Biology I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1400</td>
<td>College Algebra</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1020</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1030</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 2300</td>
<td>Intro to Organic Chem</td>
<td>4</td>
</tr>
<tr>
<td>MOLB 2021</td>
<td>General Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>MOLB 2110</td>
<td>Fund of Aging/Human Development or</td>
<td></td>
</tr>
<tr>
<td>FCSC 2110</td>
<td>Child Development</td>
<td></td>
</tr>
<tr>
<td>FCSC 2121</td>
<td>Family Relations</td>
<td></td>
</tr>
<tr>
<td>FCSC 2131</td>
<td>Family Relations</td>
<td></td>
</tr>
<tr>
<td>FCSC 2133</td>
<td>Intimate Relationships</td>
<td></td>
</tr>
<tr>
<td>FCSC 3110</td>
<td>Personal Finance</td>
<td></td>
</tr>
<tr>
<td>FCSC 3220</td>
<td>Multicultural Influences on the Young Child</td>
<td></td>
</tr>
</tbody>
</table>

**Social Science Courses (with a minimum GPA of 2.85)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC 1000</td>
<td>Sociological Principles</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 1000</td>
<td>General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>ECON 1010</td>
<td>Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>STAT 2050</td>
<td>Fund of Statistics</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 1010</td>
<td>Perspectives in FCSC</td>
<td>2</td>
</tr>
<tr>
<td>FCSC 1141</td>
<td>Principles of Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 1150</td>
<td>Scientific Study of Food</td>
<td>3</td>
</tr>
</tbody>
</table>

At least one FCSC Core Elective

**USP Courses (Not already listed in the above categories)**

WA (first USP writing course) ........................................3
WB (second USP writing course) ...................................3
G or D or CA or CH ....................................................3

Total credits needed before applying 59-60

After admission into the DPD, students must complete the following courses and maintain an overall grade point average of 3.0.

**Indicates course with prerequisites**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLS 1000</td>
<td>American &amp; Wyo Gov’t</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 3115</td>
<td>Human Systems Phys</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 3150</td>
<td>Intermediate Foods</td>
<td>2</td>
</tr>
<tr>
<td>FCSC 3140</td>
<td>Maternal, Infant, and Adolescent Nutrition</td>
<td></td>
</tr>
<tr>
<td>FCSC 4142</td>
<td>Nutrition &amp; the Elderly</td>
<td>1</td>
</tr>
<tr>
<td>MOLB 3610</td>
<td>Princ of Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 3147</td>
<td>Community Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4147</td>
<td>Nutrition and Weight Control</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 4010</td>
<td>Technical Writing in the Professions</td>
<td>3</td>
</tr>
<tr>
<td>MOB 4100</td>
<td>Clinical Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4145</td>
<td>Adv Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>MGT 3210</td>
<td>Mgt and Organization</td>
<td>3</td>
</tr>
<tr>
<td>MOLB 3152</td>
<td>Food Systems Prod</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4146</td>
<td>Therapeutic Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 4106</td>
<td>Therapeutic Nutr Lab</td>
<td>1</td>
</tr>
<tr>
<td>FCSC 4104</td>
<td>Clinical Pract in Diet</td>
<td>1</td>
</tr>
<tr>
<td>FCSC 4150</td>
<td>Experimental Foods</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 1110</td>
<td>Gen Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1120</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>PSYC 1000</td>
<td>General Psych</td>
<td>3</td>
</tr>
<tr>
<td>SOC 1000</td>
<td>Sociological Princ</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 2040</td>
<td>Human Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>ZOO 2041</td>
<td>Human Anatomy Lab</td>
<td>1</td>
</tr>
<tr>
<td>ZOO 3115</td>
<td>Human Syst Phys</td>
<td>4</td>
</tr>
</tbody>
</table>

**Indicates course with prerequisites**

Premedicine Career Track in Human Nutrition and Food

Students who wish to pursue the premedicne career track will obtain the necessary coursework to apply to medical or other appropriate professional schools. This track requires that specific substitutions and additions must be made to the general human nutrition and food curriculum (see below).

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1020</td>
<td>Gen Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1030</td>
<td>Gen Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 2300</td>
<td>Intro Organic Chem</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 2420</td>
<td>Organic Chem I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 2440</td>
<td>Organic Chem II</td>
<td>4</td>
</tr>
<tr>
<td>COJO 1010</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 1200</td>
<td>Tech Writing Prof</td>
<td>3</td>
</tr>
<tr>
<td>MATH 1450</td>
<td>Algebra &amp; Trig</td>
<td>5</td>
</tr>
<tr>
<td>MATH 2200</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MOLB 2021</td>
<td>General Mec</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1110</td>
<td>Gen Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1120</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>PSYC 1000</td>
<td>General Psych</td>
<td>3</td>
</tr>
<tr>
<td>SOC 1000</td>
<td>Sociological Princ</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 2040</td>
<td>Human Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>ZOO 2041</td>
<td>Human Anatomy Lab</td>
<td>1</td>
</tr>
<tr>
<td>ZOO 3115</td>
<td>Human Syst Phys</td>
<td>4</td>
</tr>
</tbody>
</table>

**Indicates course with prerequisites**

Additional electives and USP requirements apply. Students should carefully research professional school admission requirements. Many professional schools require additional coursework, especially in the humanities and social sciences.
Professional Child Development

The professional child development option is offered by distance delivery only but has the same quality and requirements as on-campus programs. All students are assigned an adviser who works closely with them throughout their program. Completion of this degree prepares students for teaching and administrative positions in early childhood development and care; work in resource and referral agencies; Early Head Start home visitor positions; and child advocacy. It also provides a foundation for simultaneous completion of a birth-to-five teaching endorsement, for those students who apply, or post-graduate completion of a teaching certificate in early childhood special education. The distance delivery of this program allows students who have existing A.A. or A.S. degrees in child development, early childhood education, or a closely related field to complete their bachelor’s degree. Place bound students, many of whom currently work in early childhood programs, have the opportunity to earn a degree from their own hometown. Many of the courses also satisfy requirements of the Early Childhood Program Director’s Certificate.

Entry into this program is by application only. Students must apply for admission to UW first. Official transcripts from all institutions attended must be submitted to UW Admissions. Applicants must also satisfactorily complete a mandatory security screen (background check). Once a student has applied and their transcripts have been received, their application will be reviewed. Transcripts will not be analyzed prior to application. In addition to an existing associate’s degree, applicants must have successfully completed the following courses prior to entry.

**Required Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COJO 1010</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>SOC 1000</td>
<td>Sociological Principles</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 1000</td>
<td>General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 1020</td>
<td>Intro to Early Childhood Education</td>
<td>3</td>
</tr>
<tr>
<td>USP QA Course</td>
<td>Advanced Placement English</td>
<td>3-4</td>
</tr>
<tr>
<td>USP WA Course</td>
<td>Advanced Placement Essay</td>
<td>3</td>
</tr>
<tr>
<td>USP SP, or SB, or SE</td>
<td>Uniformed Services Program</td>
<td>3-4</td>
</tr>
</tbody>
</table>

*Indicates course with prerequisites.

Additional electives and USP requirements apply. Students should work closely with their adviser on proper course sequencing and prerequisites.

**Required Courses after Program Entry:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCSC 4010</td>
<td>Philosophical and Research Perspectives in Family and Consumer Sciences</td>
<td>2</td>
</tr>
<tr>
<td>FCSC 1140</td>
<td>Nutrition or</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 1141</td>
<td>Principles of Nutrition or</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 1150</td>
<td>Scientific Study of Food 2-3</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 1180</td>
<td>Applied Design or</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2170</td>
<td>Clothing in Modern Society or</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2180</td>
<td>Housing or</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3171</td>
<td>Intro Textile Service</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4181</td>
<td>Global Textiles</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2110</td>
<td>Fundamentals of Aging and Human Development</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2121</td>
<td>Child Development**</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 2131</td>
<td>Family Relations**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2133</td>
<td>Intimate Relationships**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3119</td>
<td>Parent Child Relationships**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3220</td>
<td>Multicultural Influences on Children and Families**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4124</td>
<td>Families of Young Children with Special Needs**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4127</td>
<td>Directing Preschool and Daycare Programs**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3110</td>
<td>Personal Finance** or</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4112</td>
<td>Family Decision Making and Resource Management**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3122</td>
<td>Adolescence** or</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 4300</td>
<td>The Adolescent**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4130</td>
<td>Internship in Child Development** or</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4131</td>
<td>Administrative Internship in Child Development**</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 3000</td>
<td>Observing Young Children**</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 3220</td>
<td>School Programs for Young Children**</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 4320</td>
<td>Oral and Written Language Acquisition**</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 4310</td>
<td>Developmental Psychopathology**</td>
<td>3</td>
</tr>
</tbody>
</table>

**Human Development and Family Sciences**

This option provides a strong foundation in the areas of human development and family sciences while allowing personalized selection of electives and internship experiences that support specific student interests. The program prepares students to work in a variety of settings, serving individuals and families across the lifespan or to pursue graduate level education.

**Required Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COJO 1030</td>
<td>Interpersonal Communication</td>
<td>3</td>
</tr>
<tr>
<td>SOC 1000</td>
<td>Sociological Principles</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 1000</td>
<td>General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2110</td>
<td>Fundamentals of Aging and Human Development</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2121</td>
<td>Child Development**</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 2131</td>
<td>Family Relations**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2133</td>
<td>Intimate Relationships**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3119</td>
<td>Parent Child Relationships**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3220</td>
<td>Multicultural Influences on Children and Families**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4112</td>
<td>Family Decision Making and Resource Management**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4117</td>
<td>Understanding Community Leadership**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4118</td>
<td>Family Policy**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4138</td>
<td>Family Stress and Coping**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4139</td>
<td>Professional Practices in Family and Community Services**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3122</td>
<td>Adolescence** or</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 4300</td>
<td>The Adolescent**</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 4075</td>
<td>Writing for Non-Profits**</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 4010</td>
<td>Technical Writing in the Professions**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4129</td>
<td>Internship in Family Life Education**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4130</td>
<td>Internship in Child Development** or</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4131</td>
<td>Administrative Internship in Child Development**</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4950</td>
<td>Internship in Human Development and Family Sciences**</td>
<td>3</td>
</tr>
<tr>
<td>AGRI 4520</td>
<td>Field Practicum in Extension**</td>
<td>6-8</td>
</tr>
</tbody>
</table>
USP requirements also apply. Additional courses will be selected by the student in consultation with their adviser. Courses will be selected to allow the student to pursue specific interests in areas of study. Students may choose to pursue a minor outside or design their own area of concentration in consultation with their adviser.

**Textiles and Merchandising**

The objective of the textiles and merchandising option is to prepare professionals for careers in textiles, apparel, design, merchandising, and home-based small business ownership. Unlike most urban-oriented fashion merchandising or interior design curricula, this option emphasizes preparation for management or ownership of small apparel stores and other home-related businesses in Wyoming and rural areas of the west.

**Indicates courses with prerequisites.

<table>
<thead>
<tr>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCSC 1180 Applied Design............................</td>
</tr>
<tr>
<td>FCSC 2170 Clothing in Modern Society**..................</td>
</tr>
<tr>
<td>FCSC 2180 Housing**....................................</td>
</tr>
<tr>
<td>FCSC 2188 Interior Design I**...........................</td>
</tr>
<tr>
<td>FCSC 3110 Personal Finance**............................</td>
</tr>
<tr>
<td>FCSC 3170 Fabric Construction Techniques**..............</td>
</tr>
<tr>
<td>FCSC 3171 Intro Textile Science**.......................</td>
</tr>
<tr>
<td>FCSC 3172 Intro Textile Science Lab.1...................</td>
</tr>
<tr>
<td>FCSC 3173 Visual Merchandising and Promotion**.........</td>
</tr>
<tr>
<td>FCSC 3184 Foundations of Merchandising I**.............</td>
</tr>
<tr>
<td>FCSC 4113 Consumer Issues**............................</td>
</tr>
<tr>
<td>FCSC 4171 Adv. Textiles**..............................</td>
</tr>
<tr>
<td>FCSC 4174 Foundations of Merchandising II**...........</td>
</tr>
<tr>
<td>FCSC 4175 Textile Testing and Product Analysis**......</td>
</tr>
<tr>
<td>FCSC 4176 Historic Clothing............................</td>
</tr>
<tr>
<td>FCSC 4181 Global Textile Marketplace**................</td>
</tr>
<tr>
<td>FCSC 4182 Textile Industry and the Environment**.......</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required Supporting Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1000 Intro. Chemistry or ......................</td>
</tr>
<tr>
<td>CHEM 1020 General Chemistry I.....................</td>
</tr>
<tr>
<td>PSYC 1000 General Psychology.........................</td>
</tr>
<tr>
<td>AGRI 1010 Computers in Ag. or ....................</td>
</tr>
<tr>
<td>COSC 1200 Computer Info. Systems ...................</td>
</tr>
<tr>
<td>ECON 1010 Prin of Macroecon. or ...................</td>
</tr>
<tr>
<td>AGEC 1010 Prin of Macroecon. .......................</td>
</tr>
<tr>
<td>ECON 1020 Prin of Microecon. or ....................</td>
</tr>
<tr>
<td>AGEC 1020 Prin of Microecon. .......................</td>
</tr>
<tr>
<td>SOC 1000 Sociological Principles....................</td>
</tr>
<tr>
<td>MKT 3210 Intro to Marketing**.......................</td>
</tr>
<tr>
<td>MGT 3210 Management and Organization................</td>
</tr>
</tbody>
</table>

Additional electives and USP requirements apply.

**Family and Consumer Sciences Minors: Apparel Design**

A minor in apparel design is sponsored jointly by the departments of Family and Consumer Sciences and Art. It is designed to enable students with career interests in this field to gain experience in the competency areas expected of apparel designers. This minor blends functional, artistic, and fashion considerations in the design of body coverings. Students interested in this minor should consult the sponsoring departments to receive an adviser for the minor.

**Indicates courses with prerequisites.

<table>
<thead>
<tr>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCSC 2175 Fashion Illustration*.......................</td>
</tr>
<tr>
<td>FCSC 3170 Fabric Construction Techniques**............</td>
</tr>
<tr>
<td>FCSC 3171 Intro Textile Science**.....................</td>
</tr>
<tr>
<td>FCSC 3174 Flat Pattern Design**......................</td>
</tr>
<tr>
<td>FCSC 3175 Drafting &amp; Draping**.......................</td>
</tr>
<tr>
<td>FCSC 4178/5178 Fiber Arts**.........................</td>
</tr>
</tbody>
</table>

One of the following:

<table>
<thead>
<tr>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCSC 1180 Applied Design............................</td>
</tr>
<tr>
<td>ART 1120 Foundation: Three Dimension..................</td>
</tr>
</tbody>
</table>

One of the following:

<table>
<thead>
<tr>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCSC 4171 Advanced Textiles*..........................</td>
</tr>
<tr>
<td>ART 1130 Foundation: Color Thry........................</td>
</tr>
</tbody>
</table>

One of the following:

<table>
<thead>
<tr>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCSC 4176/5176 Historic Clothing**...................</td>
</tr>
<tr>
<td>ART 2020 Art History II .........................</td>
</tr>
</tbody>
</table>

**Total 28**

**Human Development and Family Sciences**

A minor in human development and family sciences provides students with a foundation of basic principles and knowledge. The course work can enrich and complement a student’s primary area of study. Students must complete 22 credit hours outlined below:

**Indicates courses with prerequisites.

<table>
<thead>
<tr>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCSC 2121 Child Development**..........................</td>
</tr>
<tr>
<td>FCSC 2131 Family Relationships**......................</td>
</tr>
<tr>
<td>FCSC 2133 Intimate Relationships**....................</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elective Courses: Choose 12 credit hours. (9 credit hours must be 3000-level or above.)</th>
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<tbody>
<tr>
<td>FCSC 2110 Fundamentals of Aging &amp; Human Development**..........................</td>
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<tr>
<td>FCSC 3110 Personal Finance**...........................</td>
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<td>FCSC 3119 Parent Child Relationships**...........................</td>
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<td>FCSC 3122 Adolescence**.............................</td>
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<td>FCSC 3220 Multicultural Influences on Children &amp; Family**................</td>
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<td>FCSC 4104 Field Studies in Family &amp; Consumer Sciences**...............</td>
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<tr>
<td>FCSC 4112 Family Decision Making &amp; Resource Management**................</td>
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<td>FCSC 4113 Consumer Issues**..........................</td>
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<td>FCSC 4117 Understanding Comm. Leadership**................</td>
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<td>FCSC 4124 Families of Young Children with Special Needs**..........................</td>
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<td>FCSC 4127 Directing Preschool and Daycare Programs**..................</td>
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<td>FCSC 4118 Family Policy**............................</td>
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<tr>
<td>FCSC 4138 Family Stress and Coping**................</td>
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</table>

**Total 28**

**Human Nutrition**

A minor in human nutrition strengthens degrees in majors such as kinesiology and health, food science, nursing, and animal science. Students who minor in human nutrition learn how food choices can influence their health and well-being. The course work provides the foundation for making positive life-style changes.

**Indicates courses with prerequisites.

<table>
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<tr>
<th>Required Courses</th>
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<tbody>
<tr>
<td>FCSC 1140 Nutrition or ................................</td>
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<tr>
<td>FCSC 1141 Principles of Nutrition.......................</td>
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</table>

**Total 2-3**
ART 2020 Art History II**
ARE 3030 Hist of Architecture I**
Plus one of the following:

**Indicates courses with prerequisites.

A minor in interior design is sponsored jointly by the Departments of Family and Consumer Sciences and Civil and Architectural Engineering. It is designed to enable students with career interests in this field to gain experience in the competency areas expected of interior designers. Students who hope to use this minor to prepare for professional certification examination following graduation should consult the sponsoring departments to receive an adviser for the minor.

** indicates courses with prerequisites.

Graduate Study

The department of Family and Consumer Sciences offers a program of study leading to the master of science degree in family and consumer sciences with a concentration in human development and family sciences; human nutrition and food; or textiles and merchandising. The department also participates in an interdisciplinary degree in food science and human nutrition. An early childhood director's certificate is also available.

**Certificate**

Early Childhood Program Director's Certificate

The Early Childhood Program Director's Certificate is available to early childhood professionals in the state as well as to students. The certificate program is designed to:

- fit Wyoming's Professional Career Development Competency Wheel and the Professional Development Career Lattic,e,
- fit the National Association for the Education of Young Children's guidelines for the Preparation of Early Childhood Professionals,
- complement the definition of Quality Child Care developed by the Wyoming Governor's Council on Early Childhood Development, and
- allow a variety of paths to certification.

Not only do these courses satisfy certification requirements for director of early childhood programs for many states but they also meet many of the requirements of a bachelor's degree in Family and Consumer Sciences. In addition, they also provide professional development for home providers and daycare professionals.

Those who would benefit from these courses include: Head Start teachers and directors; home providers; Department of Family Services, Adoption, and Social Service workers; public health nurses; school nurses; directors of school-age child care programs; preschool program teachers, and public school teachers.

**Program Specific Degree Requirements**

Master of Science in Family and Consumer Sciences

Plan A (thesis)

Completion of minimum of 30 hours of course credit to include: 14 hours from FCSC (includes one credit of graduate seminar annually), 6 hours from supporting courses, 10 hours of research (includes four thesis hours).

Completion of research project that adheres to a topic and format previously agreed upon by the student's graduate committee and approved by the department head.

Students may be required to take more than the minimum of 30 hours, either because they have to satisfy prerequisites for some courses, or because a student's committee determines that more than 30 hours will be needed for the student to reach his/her professional objective.

No more than nine hours of 4000-level courses will be allowed.

Plan B (non-thesis)

Completion of minimum of 30 hours of course credit to include: 14 hours from FCSC (includes one credit of graduate seminar annually), 6 hours from supporting courses, 10 hours of research.

Completion of research project that adheres to a topic and format previously agreed upon by the student's graduate committee and approved by the department head.

Students may be required to take more than the minimum of 30 hours, either because they have to satisfy prerequisites for some courses, or because a student's committee determines that more than 30 hours will be needed for the student to reach his/her professional objective.

No more than nine hours of 4000-level courses will be allowed.

**Food Science and Human Nutrition Interdisciplinary Degree**

Family and consumer sciences faculty participate in an interdisciplinary program that offers a master of science degree in food science and human nutrition. Please see Food Science and Human Nutrition in this Catalog for more information.
Family and Consumer Sciences (FCSC)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2●QB]).

1010. Perspectives in Family and Consumer Sciences. 2. [none]●1, L Provides experience in on-line education, as well as assessment and goal-setting to achieve expectations for professional competencies of family and consumer sciences professionals. Activities for the five career options and the integrative discipline of Family and Consumer Sciences (mission, history, core concepts). Students begin to develop their foundation portfolio. Prerequisites: declared FCSC major.

1140. Nutrition. 2. Relationship of food to maintenance of health and importance to the individual and society. Recommended for non-majors. (Offered fall semester)

1141. Principles of Nutrition. 3. Studies nutritional requirements as related to metabolism of nutrients in various physiological states. Designed for nutrition majors and interested non-majors. Students cannot receive credit for both FCSC 1140 and 1141. (Offered spring semester)

1150. Scientific Study of Food. 3. Comprehensive introduction to the study of food. Food science theories relative to composition are applied through the laboratory experiences. (Offered fall semester)

1170. Beginning Clothing Construction. 2. Beginning clothing construction for non-family and consumer sciences majors. (Offered spring semester)

1180. Applied Design. 3. [C3●CA] Studies design philosophy. Emphasizes application of creativity to many areas of living. (Offered both semesters)

2050. Safety, Nutrition and Health in Early Childhood Programs. 2. Designed to enrich students' understanding of practices which support children's health development. Issues to be explored include record keeping related to child care health and safety, use of health consultants, accident and injury prevention, immunizations, nutrition and food safety in child care settings. (Offered alternate summers.)

2110. Fundamentals of Aging and Human Development. 3. [C2●(none)] Discusses aging as a lifelong process, involving interrelationships of the individual and his or her environment. Includes future demographic trends, family health care, social policy and mass media. Cross listed with SOC 2120 and NURS 2110. (Offered fall semester)

2121. Child Development. 4. [C2●CS] Incorporates classroom instruction with laboratory application of child development research and theory in physical, intellectual and social/emotional domains. Emphasizes early childhood years. Prerequisite: sophomore standing.

2122. Child Development Lab. 1. Laboratory observation course designed for students with a background in child development theory. Students learn child observation techniques, how to write laboratory reports, and how to apply them to evaluating a child's development in all domains. Prerequisite: PSYC 2300.

2131. Family Relations. 3. [C2●(none)] Provides an overview of current research on family relations, family theory, and family dynamics across the lifespan. An ecological and family systems approach is used, with particular focus paid to the understanding of contextual influences on families. Prerequisites: COJO 1030 or EDEC 1020 or PSYC 1000 or SOC 1000. (Offered fall semester)

2133 [3133]. Intimate Relationships. 3. [C2●(none)] Use of social science theory and research to understand psycho-socio-cultural influences in the development of personal and intimate relationships including human sexuality from development and interpersonal perspectives. Emphasizes application of current research and theory to facilitate positive individual growth, satisfaction, and stability in close relationships. Prerequisites: PSYC 1000 or SOC 1000. (Offered fall semester)

2135. Women and Aging. 3. [C2●(none)] Focuses on women and the aging process with emphasis given to both the problems and promises of aging. Topics to be explored within a multicultural, sociological framework include the definition of self, relationships, community, health and health care, work and service, retirement, economic realities and new perspectives on aging. Cross listed with WMST/SOC/NURS 2135. Prerequisites: ENGL/SOC/WMST 1080 or SOC 1000 or FCSC/NURS/SOC 2120.

2170. Clothing in Modern Society. 3. [C2, W2●WB] Aesthetic, physical economics and socio-psychological elements of clothing selection. (Normally offered spring semester)

2175. Fashion Illustration. 3. Introduces the fashion figure, light and dark contrasts, color, fabric and texture sketching techniques. Computer applications for layout of the design are also covered. Prerequisites: FCSC 1180 or ART 1110. (Offered alternate spring semesters)

2180. Housing. 3. [C1●(none)] Cross-cultural examination of evolution of contemporary housing, both as an artifact of material culture, and as the environmental setting which affect human development and interaction. Prerequisite: WA. (Offered fall semester)

2188. Interior Design I. 3. Beginning interior design course. Helps students use design principles to create workable designs for interior spaces. Prerequisites: FCSC 1180 and sophomore standing. (Offered spring semester)

3110. Personal Finance. 3. Acquaints students with personal budgeting and financial matters and relate these activities to financial institutions involved. Prerequisite: junior standing.

3119 [4119]. Parent-Child Relationships. 3. [C2●(none)] Research and theory related to the processes of the parent-child relationship across the lifespan. Emphasizes developmental and family theory, contexts that influence parent-child relationships and application to professional practice. Prerequisites: FCSC 2121 or PSYC 1000 or EDST 2450; junior standing. (Offered fall semester)

3122 [4122]. Adolescence. 3. [C2●(none)] Studies biological, cognitive, and social/emotional development and adjustment within the adolescent and emerging adulthood years. Emphasis on the importance of theoretically grounded research and the integration of theory, research, and practice during adolescence. Prerequisites: PSYC 2300 or EDST 2450 or FCSC 2110 or FCSC 2121.

3128 [4128]. Practicum in Child Development. 3. Supervised experience in the child development laboratory. Emphasizes developing appropriate curriculum for preschoolers. Prerequisite: FCSC 2121, PSYC 2300. (Offered alternating spring semesters)

3140. Maternal, Infant and Adolescent Nutrition. 3. Addresses factors affecting dietary patterns and practices as well as nutritional requirements prior to and encompassing pregnancy and lactation and continuing through infancy and adolescence. Prerequisites: FCSC 1140 or 1141, LIFE 1010, ZOO 3115.

3145. Sports Nutrition and Metabolism. 3. Discusses roles played by carbohydrate, fat, protein, water, and key vitamins and minerals as they relate to physical exercise. Applies principles of nutrition. Prerequisites: FCSC 1140 or 1141; one semester of Chemistry; ZOO 3115 or KIN 3021.
3147. Community Nutrition. 3. Provides an introduction to the field of community nutrition and develops an appreciation of the importance of nutrition in community health programs at the local, state, and national level. Topics covered include the role of the community nutritionist; the identification of nutrition problems; grant writing, and program planning and evaluation. Prerequisites: FCSC 1141; SOC 1000 or 1100.

3150. Intermediate Foods. 2. Examines food management concepts which include selection and preparation of food to meet physical, psychological, and social needs of individuals and families. Prerequisites: FCSC 1150, FCSC major, sophomore standing. (Offered spring semester)

3152 [4152]. Food Systems Production. 3. Quantity food purchasing and production, along with institutional food service experience. Prerequisites: FCSC 3150 and LIFE 1010. (Offered fall semester)

3153 [4153]. Food Service Management. 3. Studies food service planning and layout, purchase and use of equipment, cost control, sanitation and safety, as well as purchase and preparation of food in quantity. Prerequisite: FCSC 3150, 3152, MGT 3210. (Offered spring semester)

3170. Fabric Construction Techniques. 4. Development of decision-making skills in selection, use and evaluation of materials and techniques for garment construction. Attention to the relationship of the home sewing industry to fashion merchandising. Prerequisites: FCSC 1170 or successful performance on construction competency test and FCSC 3171. (Offered fall semester)

3171 [2171]. Introductory Textile Science. 3. Understanding of textile fibers, their growth or manufacture, properties and their use and care; the major yarn manufacturing systems (cotton, worsted, woolen, and synthetic yarn texturing) and fabric manufacturing systems (weaving, knitting, and non-wovens). Introduces the physical/mechanical properties important in fibers, yarns and fabrics. Prerequisite: completion of University Studies SP requirement. (Offered spring semester)

3172. Textile Science Laboratory. 1. Introduces techniques in fiber, yarn and fabric identification. Examination of physical properties of textile materials. Prerequisite: Concurrent enrollment in FCSC 3171.

3173 [4173]. Visual Merchandising and Promotion. 3. Covers the principles of fashion, consumer behavior as it relates to promotion activities, and non-personal selling techniques to include advertising, display, publicity, fashion shows, and special events. Students will be involved in actual hands-on experiences with many techniques. Prerequisite: FCSC 2188. (Offered fall semester)

3174 [4174]. Flat Pattern Design. 3. Principles and instructions for drafting pattern slopers through standard or individual measurements used to learn techniques of garment design using the flat pattern method are utilized to create three-dimensional designs. Computer applications to garment design are also covered. Prerequisite: FCSC 2175 and 3170. (Offered fall semester)

3175. Apparel Design Through Draping. 3. Draping garment patterns through fabric manipulation, molding, and shaping to create three-dimensional form utilizing couture construction techniques. Prerequisite: FCSC 3174. (Offered spring semester)

3184. Foundations of Merchandising I. 3. Overviews the planning, developing and presentation of product lines in the apparel business. Prerequisite: ACCT 1010 or ECON 1010. (Offered every other fall semester.)

3220. Multicultural Influences on Children and Families. 3. [C2, GI] Designed to enrich students' understanding of cultural contexts of children and families. Issues to be explored will include cultural values, learning styles, acquisition of concepts of race and ethnicity, bi-lingualism, the theory of bicultural/bicognitive development, and effective communication and problem-solving strategies that apply in multiple professional settings. Prerequisites: PSYC 1000, FCSC 2121, PSYC 2300 or FCSC 2131; and junior standing.

4010. Philosophical and Research Perspectives in Family and Consumer Sciences. 2. [W3] Enhancement of professional and personal development of students, development of skills for professional employment, as well as exposure to and development of research skills. Prerequisites: FCSC 1010 and senior standing in family and consumer sciences. (Offered fall semester)

4104. Field Studies in Family and Consumer Sciences. 1-3 (Max. 3). Concentrated on-site study of family and consumer sciences-related businesses, agencies and organizations to better understand challenges and potentials of various career opportunities in family and consumer sciences. Includes examples of business and agencies, such as Denver Merchandise Mart, Denver Fabric Mart, Wyoming Infants and Children’s Program (WIC), Kansas City Fashion and Home Interiors Market and New York fashion-related industries. Prerequisite: junior standing. (Offered based on sufficient demand and resources)

4105. Family and Consumer Sciences Internship. 6-8 (Max. 8). Gives students experience in workplace related to selected family and consumer sciences options (i.e., retail store, social service agency and preschool or day care). Prerequisites: junior standing in family and consumer sciences and consent of instructor. (Offered all semesters)

4106. Special Problems in Family and Consumer Sciences. 1-3 (Max. 8). Provides advanced undergraduate students opportunities to pursue a topic of special interest in a selected family and consumer sciences area, under guidance of a department faculty member. Prerequisites: junior or senior standing and advanced consultation with department head and an instructor in subject matter area. (Offered all semesters)

4112. Family Decision-Making and Resource Management. 3. Utilizes theories to facilitate understanding of problem-solving and resource management in various family structures/contexts across the life span. Emphasizes internal family dynamics, global interdependence, critical thinking, cultural examination, ethical decision-making, and self-reflection. Designed to meet family studies requirement for license in marriage and family therapy at graduate level. Companion web site used. Dual listed with FCSC 5112. Prerequisites: PSYC 1000 or SOC 1000 or COJO 1030 or 1040; junior standing. (Offered spring semester)
4113. Consumer Issues. 3. Provides research/applied understanding of consumer rights/responsibilities, government/business roles, legislation, advocacy, and redress. Emphasizes introductory consumer law/legal research, critical thinking, self-reflection, and cultural examination. Ethical theories and issues examined within an interdependent world. Meets requirements for certification in family and consumer sciences education. Internship opportunities possible upon successful completion. Companion web site used. Prerequisites: ECON 1000 or SOC 1000 or PSYC 1000, junior standing. (Normally offered fall semester)

4117. Understanding Community Leadership. 3. Understanding Community Leadership. Introduces students to the scope and functions of professionals working in rural communities as leaders. Students will explore community dynamics, leadership skills and managing change, and understand the complexities of leadership within communities. Understanding communities and leadership increases the likelihood of success for community based professionals. Dual listed with FCSC 5117. Prerequisites: senior standing and satisfactory completion of a WB course.

4118. Family Policy. 3. Explores the relationships between family functioning and public/private policies. The roles of family professionals in advocacy and education regarding policies will be discussed. Attention will be paid to the policy process at the state level. Dual listed with FCSC 5118. Prerequisites: senior standing.

4124. Families of Young Children With Special Needs. 3. Deals with importance of including family in the process of early intervention with the preschool child with special needs. Prerequisite: junior/senior standing. (Offered fall semester)

4125. Professional Practices in Human Development and Family Sciences. 3. Explores key issues related to professional practice in Human Development and Family Sciences. Particular attention is paid to skills and knowledge needed to work in community-based, prevention focused settings with individuals and families across the lifespan. Prerequisites: FCSC 2131; senior standing.

4127. Directing Preschool and Daycare Programs. 3. [(none)◊WC] Effective methods for establishing and operating preschool and day-care programs for children under six years of age. Includes programming, classroom management, parent involvement and administration of food and nutrition programs. Prerequisites: FCSC 2121, EDEC 1020 or 3210; junior standing. (Offered fall semester)

4130. Internship in Child Development. 6-8 (Max. 8). Provides professional child development and early childhood education majors with an in-depth experience working with children from birth to age five. Students gain experience including planning lessons, teaching, assessing children and conducting parent conferences. Prerequisites: FCSC 2121; EDEC 3000; EDEC 3220 or EDEC 4320; senior standing. (Offered all semesters)

4131. Administration Internship in Child Development. 6-8 (Max. 8). Provides professional child development and early education majors with an in-depth experience working with families and staff. Students gain experience in observing and assessing early childhood programs, planning and presenting staff trainings/professional workshops, staff supervision, writing newsletters, and other professional documents and professional activities. Prerequisites: FCSC 2121; FCSC 4127; EDEC 3220 or EDEC 4320. (Offered all semesters)

4132. Internship in Human Development and Family Sciences. 6-8 (Max. 8). Acquire skills and gain familiarity in direct services, policy development, or program planning in a human services agency/organization. Opportunities to apply theories and knowledge gained in classroom settings to professional practice will be provided. Prerequisites: FCSC 4125; consent of instructor; senior standing. (Offered spring or summer semesters)

4138. Family Stress and Coping. 3. [W3◊(none)] Theoretical and empirical research on family stress, coping and resiliency is emphasized as well as the study of normative stressors and crisis in the lives of individuals and families. Attention is paid to the application of theory and research to professional practice. Dual listed with FCSC 5138. Prerequisites: FCSC 2131; junior standing. (Offered spring semester)

4142. Nutrition and the Elderly. 1. Studies nutrition requirements in elderly as affected by physiological changes with aging; covers special problems and food assistance programs for the elderly. Prerequisites: FCSC 1140 or 1141; LIFE 1010. (Offered fall semester)

4145. Advanced Nutrition. 4. Discusses functions of components of diet in human metabolism. Applies principles of nutrition. Dual listed with FCSC 5145. Prerequisites: FCSC 1140 or 1141; CHEM 2300; senior standing. (Offered fall semester)

4146. Therapeutic Nutrition. 4. [M3◊(none)] Rationale for dietary modifications in pathological conditions; experience in menu planning and diet instruction; as well as dietary and nutrient assessment of the sick individual with discussion of case studies. Dual listed with FCSC 5146. Prerequisite: FCSC 4145; senior standing. (Offered spring semester)

4147. Nutrition and Weight Control. 3. Advanced course in physiological and metabolic determinants of weight control emphasizing pathophysiology, psychodynamics, assessment and treatment of obesity. Dual listed with FCSC 5147. Prerequisites: FCSC 1140 or 1141; ZOO 3115. (Offered spring semester)

4150. Experimental Foods. 3. Studies physical and chemical properties of raw and processed food materials and tests for evaluation of food quality. Students develop ability to use and interpret recent research findings, as well as skills in planning, conducting and reporting food experiments. Prerequisites: FCSC 1150, CHEM 2300, STAT 2020, ENGL 4010, FCSC major. (Offered spring semester)

4171. Advanced Textiles. 3. Introduces color science as related to human perception and practical problems in the textile industry. Studies different types of dyes available, fibers to which they are applied and properties of dyes. Introduces various finishing techniques used for textiles. Prerequisite: CHEM 1000 and FCSC 3171. (Offered fall semester)

4174. Foundations of Merchandising II. 3. [M3◊(none)] Overviews fashion merchandising and retailing. Prerequisite: FCSC 3184 and QA. (Offered alternate fall semesters)

4175. Textile Testing and Product Analysis. 3. Explains meaning of quality control and why it is important. Discusses various tests and standards available to assess the various aspects of textile/apparel quality. Examines performance specifications of textile materials to determine if they are suitable for desired end uses. Dual listed with FCSC 5175. Prerequisite: FCSC 3170 and 4171. (Offered alternate spring semesters)

4176. Historic Clothing. 3. Surveys history of clothing in the Western World. Includes information from approximately 3000 B.C. through the 20th century. Dual listed with FCSC 5176. Prerequisite: FCSC 2170. (Offered spring semester every other year)

4178. Fiber Arts. 3 (Max 6). Development and enhancement of technical and creative apparel construction/design skills culminating in the creation of a distinctive piece of wearable art. Dual listed with FCSC 5178. Prerequisite: FCSC 3174. (Offered spring semesters)
4181. Global Textiles Marketplace. 3. [G1] Discusses global textile industry, how the U.S. fits into the global industry, textiles and apparel trade policy, as well as balancing conflicting interests in the world marketplace. Prerequisite: FCSC 3171. (Offered alternate spring semesters)

4182. Textile Industry and the Environment. 3. [W3] Examines the environment, the impact of the textile industry on the environment, and issues facing the textile industry to provide more environmentally friendly products. Dual listed with FCSC 5182. Prerequisite: completion of USP WB requirement, FCSC 3171. (Offered alternate spring semesters)

4188. Interior Design II. 3. Advanced study of space planning and interior design. Dual listed with FCSC 5188. Prerequisites: FCSC 2180, 2188. (Offered fall semester)

4350. Health Management Issues in Early Education. 3. Provides the student the opportunity to examine the implications of a child's health status on his/her personal, educational, social and cognitive development. Provides personnel working closely with the young child with disabilities and his/her family an understanding of the issues related to health concerns and a framework on concerns specific to the child in a day care, preschool or other school setting. Cross listed with EDEC 4350 and NURS 4350. Prerequisites: junior or senior standing, 6 hours of education and/or the consent of instructor.

4546. Agriculture: Rooted in Diversity. 3. Addresses multiple themes related to diversity in agriculture with the goal of making visible the experiences of minorities and women in agriculture. Involves significant independent research, class discussion, project development, and development of oral and written communication skills. Establishes linkages with supporting disciplines. Cross listed with ENGL/AAST/AIST/CHST/AGRI/AMST/HIST 4546. Prerequisites: Junior class standing or consent of instructor and concurrent enrollment or major in any of the following: ethnic studies, agriculture, American studies, anthropology, English, history, sociology, or women's studies.

4970. Textiles and Merchandising Internship. 6-8 (Max. 8). Provides practical experience in retail, interior design or apparel design settings. Prerequisite: FCSC 3173.

4985. Seminar: Development in Community Leadership. 2-3. Emphasizes basic core components of individual leadership: assessment of leadership skill and style; community-based experiences for understanding of community and resources; group community development projects for students; engagement with others and the community. Upon completion, students understand various leadership styles and philosophies and articulate their personal leadership philosophy. Dual listed with FCSC 5985. Prerequisites: senior or post-graduate equivalent status and consent of instructor.

5101. Special Topics in Family and Consumer Sciences. 1-3 (Max. 6). Intended to accommodate a seminar series and a course offering by visiting faculty whose subject matter is not included in other course offerings.

5102. Special Problems. 1 - 12 (Max. 18). Study in a selected problem area for broader perspective or greater specialization in the student program. Prerequisite: advanced or graduate standing and consultation with department head and instructor in subject matter area.

5103. Graduate Seminar in Family and Consumer Sciences I. 1. Integrative Seminar in Family and Consumer Sciences. Students are exposed to faculty research, discuss common readings and present their own research. Offered S/U only for those taking Graduate Seminar I and students will be taking Graduate Seminar II for a letter grade. Prerequisite: graduate student standing.

5104. Graduate Seminar in Family and Consumer Sciences II. 1. Integrative seminar in Family and Consumer sciences. Students are exposed to faculty research, will discuss common readings, and will present their own research. Graduate Seminar II can only be taken for a letter grade. Prerequisite: FCSC 5103.

5107. Family and Consumer Sciences Extension Practicum. 8. To provide experience in county extension programs. Prerequisites: AGRI 4010, advanced standing and consent of instructor.

5112. Family Decision and Resource Management. 3. Utilizes theories to facilitate understanding of problem-solving and resource management in various family structures/contexts across the life span. Emphasizes internal family dynamics, global interdependence, critical thinking, cultural examination, ethical decision-making, and self-reflection. Designed to meet family studies requirement for license in marriage and family therapy at graduate level. Companion website used. Dual listed with FCSC 4112. Prerequisites: graduate standing.


5114. Lifespan Human Development. 3. An overview of human growth and development throughout the life span, with an emphasis on major theories, conceptual issues, research findings, and practical applications for professionals working in health care, human service and educational environments. Prerequisite: PSYC 1000 or FCSC 2121.

5117. Understanding Community Leadership. 3. Understanding Community Leadership. Introduces students to the scope and functions of professionals working in rural communities as leaders. Students will explore community dynamics, leadership skills and managing change, and understand the complexities of leadership within communities. Understanding communities and leadership increases the likelihood of success for community based professionals. Dual listed with FCSC 4117. Prerequisites: senior status and satisfactory completion of a WB course.

5118. Family Policy. 1-3 (Max. 3). Explores the relationships between family functioning and public/private policies. The roles of family professionals in advocacy and education regarding policies are discussed. Attention is paid to the policy process at the state level. Dual listed with FCSC 4118. Prerequisites: FCSC 2131; junior standing.
5120. Infancy and Toddlerhood. 3. Examines development and behavior, focusing on a broad range of topics which includes: physical development, prenatal influences, sensory processes, biological factors, cognitive development, language development, social interaction and relationship. A broad family and consumer sciences perspective (the family in its environment) are applied. Prerequisite: FCSC 2121 or equivalent course in child development.

5121. Ethics in Research and Professional Practice. 3. Includes ethical theories, responsible conduct of research and professional practice defined by government, professional organizations, journals, and employers. Concepts include plagiarism, fabrication, falsification, conflict of interest, and conflict of commitment, and institutional review boards protecting human subjects. Concepts will be applied to research and professional practice in different settings. Prerequisite: acceptance into a graduate program.

5122. Developmental Contexts Across the Lifespan. 3. A variety of contexts in which children, adults, and families live and develop. Attention is given to the constant interactions that occur between humans and their environments, as well as how different environments may foster or hinder development. Includes discussions of the practical, professional and political implications of contextual research. Prerequisite: graduate standing.

5129. Seminar in Child Development. 3. Advanced study of the cognitive, social-emotional, communicative, moral, and physical/motor development of children and adolescents, with an emphasis on cultural and contextual influences on development. Prerequisite: graduate standing, WC and one of the following: FCSC 2121, PSYC 2300, FCSC 3220, EDST 2450.

5132. Seminar in Family Studies. 3. Provides an in-depth examination of: guiding theories in family studies; the purpose and methods of theory-building; and current research in major topical areas of family science and family and consumer science are compared. Prerequisite: 6 hours of undergraduate family related courses and consent of instructor.

5137. Individual and Family Assessment. 3. An introduction to both quantitative and qualitative methods of assessing children, adults, couples and families; observational approaches to assessing individuals and families; and interpretation of commonly used tests and measures. Prerequisite: STAT 5010.

5138. Family Stress/Coping. 3. Theoretical and empirical research on family stress, coping and resiliency is emphasized as well as the study of normative and nonnormative stressors and crises in the lives of families. Attention is paid to professional practice applications. Dual listed with FCSC 4138. Prerequisites: FCSC 2131; junior standing.

5140. Nutritional Aspects of Proteins and Amino Acids. 3. Advanced study of protein and amino acid metabolism in various physiological conditions. Prerequisites: general biochemistry and FCSC 4145 or equivalent in nutrition.

5141. Carbohydrate and Ethanol Metabolism. 3. Advanced study of carbohydrate and ethanol metabolism in various physiological conditions. Prerequisites: general biochemistry and FCSC 4145 or equivalent in nutrition.

5142. Nutritional Research Techniques. 2. Techniques for nutrient analysis of body fluids and tissues; assessing nutrient status of populations, and methods for animal studies in nutrition instrumentation. Prerequisite: FCSC 4145/5145.

5144. Lipids II. 3. Examines lipoprotein metabolism and how it is influenced by alterations in diet composition. This area is followed by sections on prostaglandin and leukotriene biosynthesis and the regulatory role of these eicosanoids. Prerequisite: FDSC 5770.

5145. Advanced Nutrition. 4. Discusses functions of components of diet in human metabolism. Applies principles of nutrition. Dual listed with FCSC 4145. Prerequisite: FCSC 1140 or 1141; CHEM 2300; senior standing.

5146. Therapeutic Nutrition. 4. Rationale for dietary modifications in pathological conditions; experience in menu planning and diet instruction; dietary and nutrient assessment of the sick individual with discussion of case studies. Dual listed with FCSC 4146. Prerequisite: FCSC 4145 or senior standing.

5147. Nutrition and Weight Control. 3. Advanced course in physiological determinants of weight control emphasizing pathology, psychodynamics, assessment, and treatment of obesity. Dual listed with FCSC 4147. Prerequisites: FCSC 1140 or 1141, ZOO 3115.

5150. Experimental Foods. 3. Studies physical and chemical properties of raw and processed food materials and tests for evaluation of food quality. Students develop ability to use and interpret research findings, as well as skills in planning, conducting, and reporting food experiments. Dual listed with FCSC 4150. Prerequisites: FCSC 1150, CHEM 2300, STAT 2020, ENGL 4010, FCSC major.

5151. Sensory Analysis. 1. Examines the principles and techniques applied to the subjective evaluation of food. Prerequisites: FCSC 4150/5150, STAT 5080 and ENGL 4010.

5172. Advanced Textile Chemistry. 3. A study of the chemistry of amino acids and proteins, especially silk and wool; the photochemistry of dyes and fibers; the physical chemical concepts of dyeing.

5173. Textile Science Seminar. 3. Advanced study of textile science, physical and chemical modification of fibers, developments in dyeing and finishing technology. Environmental aspects of textile technology. Extensive use of current literature is utilized.

5175. Textile Testing and Product Analysis. 3. Explains meaning of quality control and why it is important. Discusses variety of laboratory tests and standards available to assess the various aspects of textile/apparel quality. Examines performance specifications of textile materials to determine if they are suitable for desired end uses. Dual listed with FCSC 4175. Prerequisite: FCSC 3170 and FCSC 4171. (Offered alternate spring semesters)

5176. Historic Clothing. 3. Surveys history of clothing in the Western World. Course content includes information from approximately 3000 BC through the 20th century. Dual listed with FCSC 4176. Prerequisite: FCSC 2170. (Offered alternate spring semesters)

5178. Fiber Arts. 3. Development and enhancement of technical and creative apparel design and construction/design skills culminating in the creation of a distinctive piece of wearable art. Dual listed with FCSC 4178. Prerequisite: FCSC 3174. (Offered spring semester)

5179. Historic Textiles. 3. History of all major textile industries is explored. Processes and technical terms are explained. The role and impact of textiles in western economies and societies are examined. Prerequisite: graduate standing. (Offered alternate fall semesters)

5181. Global Textiles. 3. To gain an understanding of the global textile industry, how the U.S. fits into the global industry, textiles and apparel trade policy and balancing conflicting interests in the world market place. Dual listed with FCSC 4181. Prerequisite: FCSC 1171 or FCSC 2171. (Offered alternate spring semesters)

5182. Textile Industry Environment. 3. Examines the environment, the impact of the textile industry on the environment, and issues facing the textile industry to provide more environmentally friendly products. Dual listed with FCSC 4182. Prerequisites: FCSC 1171, FCSC 4171. (Offered alternate spring semesters)
5188. Interior Design II. 3. Advanced study of space planning and interior design. Dual listed with FCSC 4188. Prerequisite: FCSC 2180 and 2188. (Offered fall semester)

5890. Seminar in Food Science and Nutrition. 1. A seminar course on topics in food science and human nutrition. Cross listed with FDSC 5890. Prerequisite: graduate standing.

5900. Practicum in College Teaching. 1-3. (Max 3). Work in classroom with a major professor. Expected to give some lectures and gain classroom experience. Prerequisite: graduate standing.

5920. Continuing Registration: On Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5940. Continuing Registration: Off Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5959. Enrichment Studies. 1-3 (Max. 99). Designed to provide an enrichment experience in a variety of topics. Note: credit in this course may not be included in a graduate program of study for degree purposes.

5960. Thesis Research. 1-12 (Max 24). Designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrollment in a graduate degree program.

5961. Graduate Projects. 1-4 (Max. 4). Limited to those students enrolled in a Plan B graduate program. Students should be involved in non-course scholarly activities in support of their Plan B project. Prerequisite: must be enrolled in a Plan B program and have departmental approval.

5985. Development of Community Leadership. 2-3 (Max. 98). Emphasizes basic core components of individual leadership: assessment of leadership skill and style; community based experiences for understanding of community and resources; group community development projects for student engagement with others and the community. Upon completion of course, students will understand various leadership styles and philosophies and articulate their personal leadership philosophy. Dual listed with FCSC 4985. Prerequisite: senior or post graduate equivalent status and consent of instructor.

5990. Internship. 1-12. (Max 24). Prerequisite: graduate standing.

Life Sciences Program
138 Aven Nelson Building, 766-4158
FAX: (307)766-2851
Web site: www.uwyo.edu/lifescience
Program Director: Mark E. Lyford
The Life Sciences Program consists of all LIFE prefix courses. These courses support the life science majors and several non-life science majors across campus. The number of LIFE courses taken by life science and other majors is determined by the departments that offer the majors. The curriculum intends to provide life-science majors with both breadth and depth in the basic life sciences, and non-science majors with exposure to key concepts in biology and an understanding of the connections between science and society. The program courses also expose students to the fields of cell and molecular biology, genetics, ecology, and evolution, and they familiarize students with the diversity of life on the planet. Courses within the curriculum address four fundamental goals at a level appropriate for each course: 1) Acquisition, Application and Synthesis of Knowledge, 2) Communication Skills, 3) Critical Thinking and Problem Solving, and 4) Research Skills.

For information on LIFE course offerings, please refer to the Life Sciences Program entry in the College of Arts and Sciences.

Microbiology Program
5004 Agriculture Building 766-6664
FAX: (307) 766-3875
E-mail: kmills@uwyo.edu
Program Director: Kenneth Mills
The bachelor of science degree program in microbiology is organized as an interdisciplinary major involving the collaborative teaching, advising, and research expertise of more than 20 microbiology faculty from the Colleges of Agriculture, Arts and Sciences, and Health Sciences. The program is administered by a program director and a coordinating committee which represent each of the participating colleges. Students may obtain their degree in either the College of Agriculture and Natural Resources or the College of Arts and Sciences. Students interested in obtaining their degree through the College of Arts and Sciences should refer to page 142 for additional information regarding college requirements. Students interested in obtaining their degree through the College of Agriculture and Natural Resources should contact the program director or members of the coordinating committee directly for more information or formal academic advising within the program. Additional information about the microbiology program may be obtained at the following web site address: www.uwyo.edu/agcollege/micro/microhome.htm.

Students pursuing a major in microbiology must be advised by one of the following participating faculty. Members of the Interdepartmental Microbiology Coordinating Faculty are indicated by an asterisk (*).

*GERARD ANDREWS, veterinary sciences
*MARK GOMELSKY, molecular biology
*DALE D. ISAACK, molecular biology
*KURT W. MILLER, molecular biology
*KENNETH W. MILLS, veterinary sciences
*R. SCOTT SEVILLE, zoology/physiology
*PETER D. STAHL, zoology/physiology
*DAVID WALL, molecular biology
*NAOMI L. WARD, molecular biology
*CHAOQUN YAO, veterinary sciences
*RACHEL WATSON, molecular biology
*MEIJUN ZHU, animal sciences

Microbiology is the study of life forms too small to be observed without the aid of magnification; major groups of microbes include the bacteria, fungi (yeasts and molds), protozoa, and algae, as well as the viruses. In addition, related disciplines such as immunology and molecular biology are included because of their historical origins within microbiology.

As such, the science of microbiology is divided into numerous subspecialty areas that reflect not only the individual groups of microbes (e.g., bacteriology, virology, mycology, etc.), but also their significance in applied areas (e.g., medical microbiology/infectious diseases, microbial ecology, food microbiology, industrial microbiology, biotechnology, etc.) or in areas of basic science (e.g., molecular genetics). Throughout its history, microbiology has played a key role in the development of our understanding of basic biochemical and genetic processes, control of infectious diseases, production of increased and improved food supplies, and the production of numerous commercial products. With the development of molecular techniques to construct genetically engineered microbes, microbiologists will continue to make expanding contributions in these and other areas.
Because microbiology is a diverse science, individuals trained as microbiologists find exciting career opportunities in many areas of the basic and applied sciences. Typically, microbiologists are employed in five major sectors: private industry; clinical laboratories; government agencies; universities; and various other settings such as water treatment, food production/inspection facilities, and other public health-related areas. Recent manpower assessment studies at both the national and regional levels have provided evidence for a continuing and expanding need for microbiologists such that successful undergraduate students completing this program may look forward to exciting careers. In addition, undergraduates trained in the microbiological sciences are well prepared for competitive application to graduate school programs and professional programs in human or veterinary medicine, optometry or dentistry.

The microbiology curriculum is organized to provide students with the maximum flexibility in meeting their university studies program requirements. In addition, the curriculum is designed to prepare graduates for the future by combining a firm foundation in the basic sciences with a central core of microbiology classes, followed by the opportunity for students to specialize in areas of microbiology suiting their individual interests via the selection of electives. Prior to graduation, microbiology majors must complete the basic requirements and all microbiology core course requirements as listed below. Finally, to assure breadth of exposure in microbiology, students must complete 6 semester hours of microbiology electives.

**Basic Course Requirements for Microbiology Majors**

Total hours .......................... 128
3000-level or above credits .............. 48 (university requirement)
Completion of University Studies 2003

**Program Requirements**

**Basic sciences and quantitative reasoning**

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<td>STAT</td>
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<td>1010 and 2022 or 2023 8</td>
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<td>LIFE</td>
<td>3050 4</td>
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<tr>
<td>CHEM</td>
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<td>CHEM</td>
<td>2300 or 2420 and 2440 4-8</td>
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<tr>
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<td>3000 4</td>
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<tr>
<td>MOLB</td>
<td>3610 or 4600 and 4610 4-6</td>
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**Microbiology Core Course Requirements**

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<td>PATB 4150</td>
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Select one seminar course from the following:
MOLB 4050, MOLB 4051, MOLB 4052

**Microbiology Electives**

In addition to completing the required microbiology courses listed above, students must complete 6 hours of microbiology electives from the following lists.

**Medical Microbiology**

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<td>PATB 4120</td>
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<td>PATB 4130</td>
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<td>PATB 4140</td>
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**Molecular and Cell Biology**

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**Environmental and Applied Microbiology**

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<td>BOT 5390</td>
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<td>SOIL 4140</td>
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<td>FDSC 4900</td>
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</table>

***Students pursuing the B.S. degree in microbiology who wish to pursue a dual major in both microbiology and molecular biology must satisfy the basic science/math and core/elective requirements in microbiology as well as those specified for the B.S. degree in molecular biology PLUS an additional 9 credits of electives in microbiology and/or molecular biology at the 4000/5000 level

**Microbiology (MICR)**

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2uala]).

2210. General Microbiology. 4. Introduces nature and diversity of microorganisms and their implications for all of biology. Covers comparative properties of eukaryotic and prokaryotic microbes, as well as their roles as disease agents, ecological agents and model systems for understanding of fundamental biological processes at the molecular level. Cross listed with MOLB 2210. Prerequisites: LIFE 1010, CHEM 1000 or equivalent.


2240. Medical Microbiology. 5. Designed primarily for nursing and pre-pharmacy majors, introduces students to microbiology, including the diversity of procaryotic and eucaerotic microbes, their structural and physiological properties, and their applied medical significance; also covers the basic principles of the immune system and emphasizes the communicable diseases of man caused by microbial pathogens. Cross listed with MOLB 2240. Prerequisite: LIFE 1010.

3000. Microbial Diversity and Molecular Phylogeny. 3. Surveys the microbial world from an evolutionary perspective. It is intended for students majoring in zoology, botany, microbiology, biology, molecular biology and related areas that have an ecological emphasis. Cross listed with LIFE 3000. Prerequisite: LIFE 2020 or MOLB 2210 or MOLB/MICR 2240.

4001. Epidemiology (Diseases in Population). 3. Basic epidemiologic concepts and approaches to population problems in medicine, with examples from veterinary and human health. Covers a wide spectrum of topics and introduces practical applications of epidemiology. Dual listed with MICR 5001; cross listed with PATB 4001. Prerequisites: MICR 2240 or PATB 2220 and STAT 2050.

4090. Food Microbiology. 3. Discusses micro-organisms and theory of their growth and survival in relation to spoilage and preservation of foods and health hazards in foods. Cross listed with FDSC 4090. Prerequisite: MOLB 2210.
4100. Food Microbiology Lab. 1. Lab techniques used in food microbiology. Cross listed with FDSC 4100. Prerequisite: FDSC 4090 or 5090, taken concurrently.

4130. Mammalian Pathobiology. 3. Anatomical basis of disease in mammals. Emphasis on concepts of pathogenesis of disease, and the gross, microscopic and clinicopathological changes associated with lesions: cell injury and death; cellular degeneration; disturbances of growth and circulation; neoplasia; inflammation; and recognition of gross and microscopic tissue changes. Background in immunology will be beneficial. Dual listed with MICR 5130; cross listed with PATB 4130. Prerequisite: C or better in LIFE 2022.

4140. Soil Microbiology. 4. Fundamental principles of soil microbiology and how they relate to microbial ecology, environmental contamination, agriculture and forestry. Dual listed with MICR 5140; cross listed with SOIL 4140. Prerequisite: SOIL 2010.

4200. Diagnostic Bacteriology. 1. Practical training with emphasis on diagnostic procedures used in a clinical microbiology laboratory. Students identify bacterial pathogens of animals and humans. Taught in a clinical setting utilizing selected clinical material. Techniques employed in the processing and identification of clinically significant bacteria are used and discussed. Safe laboratory practices for working with biohazards are presented. Cross listed with PATB 4200. Prerequisite: junior standing and a MICR course which included a laboratory.

4220. Molecular Mechanisms of Bacterial Pathogenesis. 3. Intended for students majoring in microbiology or a related field. The class will consist of lectures and small group decisions. Student responsibilities will include note-taking and preparation for discussion by completion of reading assignments consisting of classic and/or recent journal articles addressing the weekly topic. Cross listed with PATB 4220; dual listed with MICR 5220. Prerequisite: PATB/MICR 2220 and statistics (or epidemiology).

4360. Medical Entomology and Parasitology. 4. Emphasis on medically important arthropods, protozoa, and worms; clinical effects of infection epidemiology avoidance/control and identification/diagnosis. PATB/ENTO 4360. Prerequisite: 8 hours of biological science.

4440. Microbial Genetics. 3. Introduction to reading molecular genetics literature. Discusses historical background and current literature. Cross listed with MOLB 4440. Prerequisite: MOLB 2210, MOLB 3610 or 4610, LIFE 3050.

4460. Microbial Physiology. 3. Studies life processes of microbes as mediated by their structures acting in consort, in response to changing environments. Cross listed with MOLB 4460. Prerequisites: MOLB 2010/MICR 2010 and two semesters of biochemistry.

4490. Microbial Gene Expression. 1. Provides theoretical background and hands-on experience in biochemical, spectroscopy, DNA microarray, and bioinformatics techniques used to study bacterial physiology. Measures and analyzes changes in physiological parameters as well as changes in patterns of gene expression in *Rhodobacter sphaeroides* in response to environmental conditions. Cross listed with MOLB 4490. Prerequisites: MOLB 4460/5460 or MICR 3000 plus MOLB 4610/5610 (the latter may be concurrent).

4500. Veterinary Entomology and Parasitology. 3. Biology, importance and control of arthropod, helminth and protozoan parasites of food and companion animals. Diagnosis and identification of live and preserved specimens. Cross listed with ENTO 4500. Cross listed with PATB/ENTO 4500. Prerequisite: 8 hours of biological science.

4510. Introductory Virology. 3. Prokaryotic and eukaryotic viruses as infectious agents and models for modern molecular biology. Examines concepts and principles of pathogenesis, host response and the regulation of virus-host interactions. Genome organization, structure and replication are examined within the context of the co-evolution of virus and host. Cross listed with MOLB 4510. Prerequisites: MOLB 3610 or MOLB 4610 plus MOLB 4610.

4540. Microbial Genetics. 3. Introduction to reading the molecular genetics literature. Discusses historical background and current literature. Dual Listed with MICR 4440. Prerequisite: MOLB 2021, MOLB 3610 or 4610, LIFE 3050.

5001. Epidemiology (Diseases in Population). 3. Basic epidemiologic concepts and approaches to population problems in medicine, with examples from veterinary and human health. Covers a wide spectrum of topics and introduces practical applications of epidemiology. Dual listed with MICR 4001; cross listed with PATB 5001. Prerequisite: MICR 2240 or PATB 2220 and STAT 2050.

5130. Mammalian Pathobiology. 3. Anatomical basis of disease in mammals. Emphasis on concepts of pathogenesis of disease, and the gross, microscopic and clinicopathological changes associated with lesions: cell injury and death; cellular degeneration; disturbances of growth and circulation; neoplasia; inflammation; and recognition of gross and microscopic tissue changes. Background in immunology will be beneficial. Dual listed with MICR 4130; cross listed with PATB 5130. Prerequisite: C or better in LIFE 2022.

5140. Soil Microbiology. 4. Fundamental principles of soil microbiology and how they relate to microbial ecology, environmental contamination, agriculture and forestry. Dual listed with MICR 4140; cross listed with SOIL 5140. Prerequisite: SOIL 2010.

5220. Molecular Mechanisms of Bacterial Pathogenesis. 3. Intended for students majoring in microbiology or a related field. Consists of lectures and small group decisions. Student responsibilities include note-taking and preparation for discussion by completion of reading assignments consisting of classic and/or recent journal articles addressing the weekly topic. Dual listed with MICR 4220; cross listed with PATB 4220/5220. Prerequisites: PATB/MICR 2220 and statistics (or epidemiology).

5440. Microbial Genetics. 3. Introduction to reading the molecular genetics literature. Discusses historical background and current literature. Dual Listed with MICR 4440. Prerequisite: MOLB 2021, MOLB 3610 or 4610, LIFE 3050.
Modern biology is based on a fundamental understanding of molecular processes. Recent advances in molecular biology have led to an explosion of knowledge about gene expression and the role gene products play in cell function. Undergraduate programs in molecular biology offer learning opportunities at the forefront of modern biology.

The molecular biology degree programs are designed to prepare students for the future by combining a foundation in basic sciences and humanities with a broad selection of courses in molecular biology, biochemistry, genetics, and microbiology. Advanced undergraduates attend an outside speaker’s program that includes some of the world’s best-known scientists. Modern, well-equipped teaching and research laboratories contribute significantly to the educational experience of a student. All junior- and senior-level undergraduates are encouraged to participate in research projects with individual faculty members. Involvement in an active research program provides the student with an additional dimension of learning beyond what is assimilated in courses. A student learns to plan experiments, solve technical problems and experience scientific advances first hand. An undergraduate research project also promotes close interaction between the undergraduate and graduate students, postdoctoral researchers, staff and faculty.

Many molecular biology majors continue their education beyond the bachelor’s level by going to graduate school or to medical, dental or veterinary school. Some students choose to use their education to gain employment in biotechnology, clinical or basic research laboratories. Other career choices include teaching, medical technology, law and business.

To obtain a B.S. degree in molecular biology, a student, with the aid of a molecular biology adviser, designs a program of study that includes courses from the Molecular Biology Core Requirements and Electives listed below. Additional course lists are provided as an aid in developing an individualized program of study in key Interest Areas such as Biochemistry, Cell and Molecular Genetics, Computational Molecular Biology, Microbiology, and Preprofessional studies (for those students planning careers in medically related fields). Courses listed under the Interest Areas are optional and the student and adviser will design a unique curriculum suited to the student’s personal interests. Flexibility in course selection also permits students to fulfill the various requirements of postgraduate and professional schools. Completion of a degree in Molecular Biology provides a student with the tools needed to open the door to exciting futures in science, medicine, and agriculture.

Requirements for Molecular Biology Majors

**General Requirements**

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<th>Requirement</th>
<th>Hours</th>
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<td>Total credits (college requirement)</td>
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<tr>
<td>3000-level or above (university requirement)</td>
<td>.......48</td>
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<tr>
<td>Fulfillment of University Studies Program (consult adviser)</td>
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<tr>
<td>Fulfillment of molecular biology core requirements listed below</td>
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**MOLB Core Requirements**

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**Total** 44

*The alternative math courses (MATH 1450 or 1400 and 1405) may be substituted with adviser approval*
MOLB Department Courses
MOLB 1010 .................................................. 1
MICR/MOLB 2021 ................................. 4
MOLB 3000 .................................................. 3
MOLB 4600 and 4610 ...................... 6
MOLB 4170 .................................................. 1
MOLB 4180 .................................................. 1
MOLB 4250 .................................................. 1
MOLB 4485 .................................................. 1
MOLB 4440 or 4450 or 4660 ........... 3
MOLB 4050 and 4051 or 4052 .......... 2

Total 23

MOLB Electives: choose from the following courses to fulfill the 10-credit MOLB elective requirement; note limitations below¹

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<td>1-3</td>
<td></td>
</tr>
<tr>
<td>MOLB 5010</td>
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</tr>
<tr>
<td>MOLB 5520</td>
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</tr>
<tr>
<td>MOLB 5650</td>
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</tr>
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</table>

¹Molecular Biology elective limitations: the credit hours which may be applied toward the 10-credit MOLB elective requirement are limited as follows: MOLB 5010 and MOLB 5520 (max. 3 credits total), MOLB 4850 (max 1 credit total). Additional hours in MOLB 4050/4051/4052 (beyond the core requirement of 2 credits) may not be applied toward the 10-credit MOLB elective requirement. Additional credits in MOLB 4050, 4051, 4052, 4850, 5010 and 5520 may be applied to general university and 3000-level or above credit requirements.

Molecular Biology Interest Areas

After discussing individual interests with a molecular biology adviser, a student should enroll in additional courses that will enhance preparation for a chosen career objective. Listed below are recommended courses that will further develop a student’s skills and understanding in five Interest Areas.

Biochemistry

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>CHEM 2230</td>
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<td></td>
</tr>
<tr>
<td>CHEM 3550 or 4507 and 4508</td>
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<td></td>
</tr>
<tr>
<td>CHEM 4230</td>
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<tr>
<td>CHEM 4560</td>
<td>3</td>
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</tr>
<tr>
<td>COSC 1010 or 1100.</td>
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<td></td>
</tr>
<tr>
<td>MOLB 4460</td>
<td>3</td>
<td></td>
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<tr>
<td>MOLB 5010</td>
<td>3-6</td>
<td></td>
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<tr>
<td>MOLB 5650</td>
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Cell and Molecular Genetics

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</tr>
<tr>
<td>MOLB 4450</td>
<td>3</td>
</tr>
<tr>
<td>MOLB 4660</td>
<td>3-6</td>
</tr>
<tr>
<td>MOLB 5010</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 4340</td>
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<td>ZOO 4670</td>
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Molecular Biology Electives

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<td>IMGT 3400</td>
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<td>MOLB 4495</td>
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<td>MOLB 5010</td>
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<td>BOT 4550</td>
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<td>CHEM 4560</td>
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<td>STAT 5380</td>
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Microbiology

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<tr>
<td>MOLB 4440</td>
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Preprofessional

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<td>MICR 2220</td>
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<td>ZOO 4125</td>
<td>4</td>
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<td>ZOO 4670</td>
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</table>

Recommended Course Sequence

The following course sequence is recommended for MOLB majors. In addition to these courses, electives should be selected each semester to fulfill university studies requirements and to enhance a student’s educational background. Please note that since courses in microbiology and biochemistry are prerequisites for several advanced courses, the student should plan to take MOLB 2021 and 3000 in the sophomore year and MOLB 4600 and 4610 in the junior year.

FRESHMAN YEAR: Fall

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>LIFE 1010</td>
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<td>ENGL 1010</td>
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<td>MATH 2200</td>
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FRESHMAN YEAR: Spring

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<tr>
<td>CHEM 1030</td>
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<tr>
<td>COJO 1010</td>
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Sophomore Year: Fall

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<tr>
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<td>CHEM 2420</td>
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<tr>
<td>PHYS 1110</td>
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Sophomore Year: Spring

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<tr>
<td>CHEM 2440</td>
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<td>MOLB 5000</td>
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<td>PHYS 1120</td>
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Junior Year: Fall

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<td>MOLB 4600</td>
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<td>LIFE 3050</td>
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Junior Year: Spring

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<th>Course</th>
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<tr>
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<td>MOLB 4170</td>
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<td>MOLB 4180</td>
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<td>MOLB 4250</td>
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<td>MOLB 4300</td>
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Senior Year: Fall

<table>
<thead>
<tr>
<th>Course</th>
<th>Hrs.</th>
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<tbody>
<tr>
<td>MOLB 4050 or 4051</td>
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<tr>
<td>MOLB 5010</td>
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<tr>
<td>MOLB Electives</td>
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Senior Year: Spring

<table>
<thead>
<tr>
<th>Course</th>
<th>Hrs.</th>
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</thead>
<tbody>
<tr>
<td>MOLB 4050 or 4051</td>
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</tr>
<tr>
<td>MOLB 5010</td>
<td>3</td>
</tr>
<tr>
<td>MOLB Electives</td>
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</tr>
</tbody>
</table>

Other Electives

Molecular biology also has a graduate program leading to the Master of Science and Doctor of Philosophy degrees. Please write or visit the Graduate Program Chairperson for additional information.
Basic Requirements for Undergraduate Minor in Molecular Biology

Students wishing to minor in molecular biology should discuss their plans with an adviser in the Department of Molecular Biology. Formal declaration of molecular biology as a minor requires 1) submission of a form that must be approved by the Department of Molecular Biology and the College of Agriculture and Natural Resources Dean's Office, 2) appointment of a minor adviser from the Department of Molecular Biology.

To receive a minor in molecular biology, a student must complete courses listed in the following areas:

<table>
<thead>
<tr>
<th>Science Foundation course requirements</th>
<th>Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE 1010</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 2022 or 2023</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1020 and 1030</td>
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</tr>
<tr>
<td>CHEM 2420 and 2440 or 2300</td>
<td>4-8</td>
</tr>
<tr>
<td>MATH 1400 and 1405 or 1450</td>
<td>5-6</td>
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<table>
<thead>
<tr>
<th>MOLB course requirements</th>
<th>Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOLB 3000</td>
<td>3</td>
</tr>
<tr>
<td>Lab courses from MOLB 4170, 4180, 4250 or 5010</td>
<td>3</td>
</tr>
<tr>
<td>MOLB 3610 and 8 additional MOLB credits or MOLB 4600 and 4610 and 6 additional MOLB credits (excluding MOLB 4050, 4051, 4052, 4850, 5010, and 5520)</td>
<td>12</td>
</tr>
</tbody>
</table>

Note: A maximum of 8 out of the 22 credits applied to the MOLB course requirements can simultaneously be applied in fulfillment of the requirements for the student's major.

Graduate Study

Program Specific Admission Requirements

A minimum composite score of 1,000 on the verbal and quantitative sections of the GRE and an analytical writing score of 4.0 is required. ETS only reports GRE scores taken within five years of the date of request.

Candidates for the program must have received a bachelor of science degree in the physical or biological sciences with a B (3.0, A=4) average or higher.

A statement of educational objectives and three letters of recommendation are required, even if a candidate does not wish to be considered for financial assistance.

At the time of application for admission to the master of science, master of arts, or the Molecular Biology doctoral program, the applicant must obtain a letter of support from a departmental faculty member.

Alternative graduate programs can also be designed if a student wishes to engage in interdisciplinary cooperative research programs, which may include biological or physical sciences elsewhere on campus.

Prospective graduate students should visit the departmental Web site for more information.

Program Specific Degree Requirements

Master of Science in Molecular Biology

A program of study for a student must be on file in the Office of the Registrar before the end of the fall semester of the first year. The program of study must include a minimum of 30 semester hours, 26 hours of coursework and 4 hours of thesis research, at the 5000 level from UW or equivalent levels from another approved university.

Seventeen of the thirty hours must be completed as specified below:

- 6 hours total of General Biochemistry MOLB 5600 and MOLB 5610 with grades of B or better. If a student has already taken the MOLB 4600/4610 sequence as an undergraduate or MOLB 5600/5610 as a graduate student and received grades of B or better in each course, the general biochemistry requirement will have been fulfilled and thus only 11 of the 30 hour requirement will be specified.
- 2 hours of seminar presentation courses MOLB 5050 (one CH of MOLB 5050 must be taken the first semester a student enrolls).
- 3 hours of lab rotation credits (MOLB 5520-02) if appropriate.
- 6 hours in the advanced molecular biology courses.
- 4 hours of thesis research (MOLB 5960) are applied to the 30 CH requirement. MOLB 5051 and MOLB 5052 credits: students are also required to register and attend the departmental seminar each semester and in the summer.

Recommendations for fulfilling the 13 remaining credit hours for the 30-hour requirement:

Other advanced molecular biology courses and lab pods.

Please note that credits earned in ENGL 5910 cannot be included in the program of study even if a student is required to take this course.

MOlB 5900 can be included in the program of study.

In addition to general requirements, the Molecular Biology M.S. program requires the following:

Submission of a research proposal based on a literature review and the proposed research for the thesis;

Completion of a thesis that is acceptable to the student's thesis committee; During this period, the candidate will be expected to participate in the usual activities of scientific research such as attending and presenting research seminars and publishing original research papers;

Presentation of thesis research results at a formal public seminar. The seminar will be followed by an oral examination carried out by the student's thesis committee;

Additional requirements specified in the Departmental Policies for the Graduate Programs, available from the Graduate Program Chairperson.

Molecular Biology MA

After consultation with the student's adviser and the graduate program chairperson, and with consideration of academic background and research interests, students will devise a program of study before the end of their first semester in the program. Students are expected to complete a master of arts program in one full year. A student must successfully complete a minimum of 30 hours of credit, 14 of which must be in the student's major field.

Requirements for fulfilling 14 specified hours of the 30-hour requirement:

- 6 hours total of General Biochemistry MOLB 5600 and MOLB 5610 with grades of B or better. If a student has already taken the MOLB 4600/4610 sequence as an undergraduate or MOLB 5600/5610 as a graduate student and received grades of B or better in each course, the general biochemistry requirement will have been fulfilled and thus only 11 of the 30 hour requirement will be specified.
- 2 hours of seminar presentation courses MOLB 5050 (one CH of MOLB 5050 must be taken the first semester a student enrolls).
- 3 hours of Advanced Problems in Molecular Biology (MOLB 5520-01).
- 3 hours of advanced molecular biology core courses.
- MOLB 5051 and MOLB 5052 credits: students are required to register and attend the departmental seminar (MOLB 5051 or MOLB 5052 in the summer) each semester.
Molecular Biology Doctoral Program

A greater amount of course work, original research and a more extensive examination process is required than for master's degree.

It is designed to take about four years of study.

The student’s coursework is arranged to fit the student’s individual needs by mutual consultation among the student, his/her major professor, and graduate committee.

The department does not require any formal certification of language.

The student normally chooses a major professor at the beginning of the first year’s residence. The major professor supervises the student’s original research and provides general guidance during the course of study.

In addition to the general requirements by the university, the molecular biology Ph.D. program requires the following:

Filing a program of study that is acceptable to the student’s thesis or dissertation committee and the university;

Submission of a research proposal based on a literature review and the proposed research for the dissertation;

A preliminary examination consisting of written and oral portions which is taken after four semesters of study;

Completion of a dissertation that is acceptable to the student’s dissertation committee. During this period, the candidate will be expected to participate in the usual activities of scientific research such as attending and presenting research seminars and publishing original research papers;

Presentation of dissertation research results at a formal public seminar. The seminar will be followed by an oral examination carried out by the student’s dissertation committee;

Additional requirements specified in the Department Policies for the Graduate Programs, available from the graduate program chairperson.

Molecular Biology (MOLB)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2▶QB]).

1010. Science and Society. 1. [(none)▶I, I] Topics which involve the interface of molecular biology with societal issues, such as AIDS, genetic screening and recreational drugs, will be presented by faculty from the molecular biology department and other departments. After these presentations, students will discuss the issues in a debate format. Grading will be based on attendance as well as participation in discussions.

2021 [2210]. General Microbiology. 4. Introduces nature and diversity of microorganisms and their implication for all of biology. Covers comparative properties of eukaryotic and prokaryotic microbes, as well as their roles as disease agents, ecological agents, and model systems for understanding of fundamental biological processes at the molecular level. Cross listed with MICR 2021. Prerequisites: A grade of C or better in LIFE 1010 and CHEM 1000 or 1010.

2240. Medical Microbiology. 5. Designed primarily for nursing and pre-pharmacy majors. Introduces microbiology, including the diversity of prokaryotic and eukaryotic microbes, their structural and physiological properties, and their applied medical significance. Covers the basic principles of the immune system and emphasizes the communicable diseases of man caused by microbial pathogens. Cross listed with MICR/PATB 2240. Prerequisites: LIFE 1010.

3000. Introduction to Molecular Biology. 3. Designed for students interested in molecular mechanisms by which cellular processes are controlled in eukaryotic cells. Topics include molecular genetic techniques and genomics, structure of genes and chromosomes, transcriptional and translational control of gene expression, signal transduction pathways and gene regulation, the cell cycle, and abnormal regulatory processes in cancer. Prerequisites: MOLB/MICR 2021 or LIFE 2022 or 2023, and CHEM 2300 or 2420 or concurrent enrollment.

3610. Principles of Biochemistry. 4. A thorough study of biological systems chemistry from a physical and physical organic approach, for students without a background in physical chemistry. Biochemical systems of living organisms are examined in terms of basic chemical concepts. No credit if credit earned in MOLB 4600. Cross listed with CHEM 3610. Prerequisites: LIFE 1000 or 1010, and CHEM 2300 or 2440. (Normally offered fall and summer semesters)

4050. Student Seminar. 1 (Max. 4). Examines selected topics appearing in journal literature with oral presentation and discussion. Exposes undergraduates to current research in molecular biology. S/U only. Prerequisite: molecular biology course. (Offered both semesters)

4051 [4050]. Departmental Seminar. 1 (Max. 15). Required attendance at a series of weekly seminars presented by visiting faculty on a diverse set of research topics. Undergraduates are able to use one credit hour to partially fulfill the seminar requirement. S/U only. Dual listed with MOLB 5051.

4052. [4050]. Summer Seminar. 1 (Max. 5). Consists of one week of lectures, presented by a renowned scientist from either academics or industry. The material presented is taken from the research program of the speaker. S/U Only.

4100 [3980]. Clinical Biochemistry. 3. Discusses biochemical principles underlying human health and disease. Relates molecular mechanisms and the associated chemical and enzymatic alterations to normal and abnormal clinical conditions. Prerequisite: MOLB 3610 or 4610 concurrently. (Normally offered spring semester)

4170. Cloning and DNA Sequencing Laboratory. 1. Introduces cloning and DNA sequencing. Dual listed with MOLB 5170. Prerequisite: MOLB 3610 or 4600. (Offered spring semester)

4180. Protein Isolation and Characterization Laboratory. 1. Protein isolation using HPLC techniques followed by limited chemical characterization. Dual listed with MOLB 5180. Prerequisite: MOLB 3610 or 4600. (Offered variable semesters)

4250. Microbial Genetics Laboratory. 1. Provides hands-on laboratory experience in manipulating the genetics of virus, bacteria and fungi. Both classical and molecular genetic techniques will be used. Dual listed with MOLB 5250. Prerequisites: MOLB 2021, 3610 or 4600 or LIFE 3050. (Offered variable semesters)
4260. Quantitative Microscopy. 1. Acquaints students with principles of light microscopy, use of fluorescent probes and image processing software. Students use phase contrast, fluorescent, and confocal microscopes learning to measure and compare size and intensity of images. Dual listed with MOLB 5260. Prerequisites: MOLB 4600 or LIFE 3600, and PHYS 1120.

4300. Writing in Molecular Biology. 1. [W3↓WC] Writing based on experiments done in the molecular biology lab pods. Assignments include proposals, journal articles, non-technical articles, reports and press releases. Required concurrent enrollment in three spring molecular biology lab pods: MOLB 4170, 4180 and 4250. Prerequisites: completed concurrent enrollment in MOLB 3610 or 4600.

4310. Foundations of Scholarship and Discovery. 1 (Max. 3). An interdisciplinary discussion based exploration of the nature and creation of knowledge, principles underpinning creativity, inquiry, skepticism, critical analysis, the insecurity of discovery on the frontiers of knowledge, and ethical decision-making. Examines the path from novice to expert thinker and creativity at discipline boundaries. Cross listed with HLSC 4310.

Prerequisites: completion of USP WB requirement and junior standing.

4400. Immunology. 4. Biology of immune system; cellular and molecular mechanisms; host resistance to infectious agents; as well as hypersensitivities, autoimmunity, tumor and tissue rejection. Includes laboratory for immunological techniques. Cross listed with PATB 4400. Dual listed with MOLB 5400. Prerequisite: PATB 2220. (Normally offered fall semester)

4440. Microbial Genetics. 3. Introduction to reading molecular genetics literature. Discusses historical background and current literature. Dual listed with MOLB 5440; Cross listed with MICR 4440. Prerequisites: MOLB 2021, 3610 or 4610, LIFE 3050. (Normally offered fall semester)

4450. Cell and Developmental Genetics. 3. Integrates the genetic control of cell regulation and animal development in both vertebrate and invertebrate model systems such as Drosophila, C. elegans and the mouse. Includes studies of eukaryotic signal transduction, gene control, and current transgenic technologies. Prerequisites: MOLB 4600 and 4610 or concurrent enrollment; or MOLB 3000 and 3610.

4460. Microbial Physiology and Metabolism. 3. Studies life processes of microbes as mediated by their structures acting in consort, in response to changing environments. Dual listed with MOLB 5460. Prerequisites: MOLB 2021 and 3610 or 4610. (Normally offered fall semester)

4485. Computers in Biology. 1. Prepares students to use existing internet resources as research tools in biology without the need to write or install software. Topics include literature searching, multiple sequence alignment and phylogenetic tree construction, primer design, protein homology modeling, and the use of model organism databases. Dual listed with MOLB 5485. Prerequisites: MOLB 3000, 3610, or 4610 or LIFE 3600.

4490. Microbial Gene Expression Laboratory. 1. Provides theoretical background and hands-on experience in biochemical, spectroscopy, DNA microarray, and bioinformatics techniques used to study bacterial physiology. Measures and analyzes changes in physiological parameters as well as changes in patterns of gene expression in Rhodobacter sphaeroides in response to environmental conditions. Dual listed with MOLB 5490. Prerequisites: MOLB 4460/5460 or MICR 3000 plus MOLB 4610/5610 (the latter may be concurrent).

4495. Bioinformatics. 3. Course topics range from classic algorithms in bioinformatics like multiple sequence alignment and phylogenetic tree construction to problems of functional analysis, including computational genomics, gene expression, protein structure, and systems biology analyses. Dual listed with MOLB 5495. Prerequisite: MOLB 3000 or 3610 or 4610 (MOLB 3610 or 4610 may be taken concurrently with MOLB 4495).

4510. Introductory Virology. 3. Prokaryotic and eukaryotic viruses as infectious agents and models for modern molecular biology. Examines concepts and principles of pathogenesis, host response and the regulation of virus-host interactions. Genome organization, structure and replication will be examined within the context of the co-evolution of virus and host. Cross listed with PATB 4510. Prerequisites: MOLB 3610 or 4610 plus 4610.

4520. Public Health Issues in Developing Countries. 2. [none] Fundamental principles and practices of public health systems in developing countries will be presented including epidemiology, etiology, integrated management, will be presented within the context of globalization, climate change, and socio-economic, political and cultural constraints. Principles will be illustrated by case studies of major health issues in an interdisciplinary, holistic manner. Cross listed with HLSC 4520. Prerequisite: LIFE 1010, upper division or graduate standing and consent of instructor.

4530. Global Experience in Public Health. 2. A three week inter-semester service learning experience in a developing country. Students will participate, in collaboration with in-country healthcare professionals, in a defined public health education and research program designed to address major public health challenges. Students will gain a global perspective within the cultural context of the developing nation. Cross listed with HLSC 4530.

Prerequisites: HLSC/MOLB 4520 and consent of instructor.

4540. Microbial Diversity and Ecology. 4. Introduces the diversity and ecology of soil microbes through an integrated lecture and laboratory course. Emphasis on molecular approaches to analyzing microbial diversity and evolution, and student-directed experimental design. Provides a continuum of realistic research experiences in molecular microbial ecology, from field work to evolutionary analysis of DNA sequence data. Cross listed with MICR 4540; Dual listed with MOLB 5540. Prerequisite: MOLB 2210.

4600. General Biochemistry I. 3. First course of comprehensive two-semester sequence for all biological and physical science majors. Students wishing to acquire laboratory experience in biochemistry should enroll in MOLB laboratory pods. Dual listed with MOLB 5600. Prerequisite: CHEM 2300 or 2440. (Normally offered fall semester)

4610. General Biochemistry II. 3. Second course of comprehensive two-semester series for molecular biology majors. Dual listed with MOLB 5610. Prerequisite: MOLB 4600. (Normally offered spring semester)

4660. Maintenance and Flow of Genetic Information: A Molecular Perspective. 3. Current research in the maintenance and flow of genetic information- replication, recombination, repair, transcription, and translation – is discussed. Students are exposed to new knowledge of DNA and protein structure and function, organization of the genome, gene expression, and principles of contemporary experimental methods. Dual listed with MOLB 5660. Prerequisite: MOLB 3000 or 4610.

4850. Undergraduate Teaching Internship. 1 (Max. 3). Supervised participation of undergraduates in the teaching of courses offered by the molecular biology department. S/U Only. Prerequisite: junior standing and consent of supervising instructor.

4990 Topics In:___ 1-3 (Max. 10). Lectures, literature reviews and discussion of selected current topics in different areas of molecular biology. Please check class schedule for current offerings each semester. Prerequisites: MOLB 3610 or 4610.
5010. Problems in Molecular Biology. 1-3 (Max. 6). Introduces the graduate and undergraduate student to biochemical literature, scientific reports, and introductory research. Introduces graduate molecular biology students to the teaching process. Prerequisite: courses in molecular biology and related areas necessary to pursue problems selected; consent of instructor.

5050. Student Seminar. 1 (Max. 4). Examines selected topics appearing in journal literature with oral presentation and discussion. Exposes undergraduate students to current research in molecular biology. Dual listed with MOLB 4050. Prerequisite: molecular biology course.

5051. Department Seminar. 1 (Max. 15). Students are required to attend a series of weekly seminars presented by faculty from other universities on a diverse set of research topics. Undergraduates will be able to use one credit hour of this course to partially fulfill the seminar requirement. Dual listed with MOLB 4051.

5052. Summer Seminar. 1-5 (Max. 5). Consists of one week of lectures, presented by a renowned scientist from either academics or industry. The material presented is taken from the research program of the speaker. Dual listed with MOLB 4052.

5170. Cloning and DNA Sequencing Laboratory. 1. An introduction to cloning and DNA sequencing. Dual listed with MOLB 4170. Prerequisite: MOLB 3610 or 4600.

5180. Protein Isolation and Characterization Laboratory. 1. Protein isolation using HPLC techniques followed by limited chemical characterization. Dual listed with MOLB 4180. Prerequisite: MOLB 3610 or 4600.

5220. Anaerobic Microbiology Techniques. 1. A laboratory course concerning methods for cultivation identification and study of the obligately anaerobic bacteria. Prerequisites: MOLB 2210 or equivalent, 1 semester of biochemistry.

5250. Microbial Genetics Laboratory. 1. Provides hands-on laboratory experience in manipulating the genetics of virus, bacteria and fungi. Both classical and molecular genetic techniques will be used. Dual listed with 4250. Prerequisite: MOLB 2021, 3610 or 4600 or LIFE 4000.

5260. Quantitative Microscopy. 1. Acquaints students with principles of light microscopy, use of fluorescent probes and image processing software. Students use phase contrast, fluorescent, and confocal microscopes learning to measure and compare size and intensity of images. Dual listed with MOLB 4260. Prerequisite: MOLB 4600 or LIFE 4600, and PHYS 1120.

5400. Immunology. 4. Biology of the immune system; cellular and molecular mechanisms; host resistance to infectious agents; as well as hypersensitivities, autoimmunity, tumor and tissue rejection. Includes laboratory for immunotechnical techniques. Dual listed with MOLB 4440. Prerequisite: MOLB/MICR 2220.

5440. Microbial Genetics. 3. Introduction to reading the molecular genetics literature. Discusses historical background and current literature. Dual listed with MOLB 4440. Prerequisite: MOLB 2021, 3610, or LIFE 4000.

5450. Cell Development and Genetics. 3. Integrates the genetic control of cell regulation and animal development in both vertebrate and invertebrate model systems such as Drosophila, C elegans and the mouse. Includes studies of eukaryotic signal transduction, gene control, and current transgenic technologies. Dual listed with MOLB 4450. Prerequisite: MOLB 3000 and MOLB 4610 or concurrent enrollment; or MOLB 300 and MOLB 3610.

5460. Microbial Physiology and Metabolism I. 3. Studies life processes of microbes as mediated by their structures acting in consort, in response to changing environments. Dual listed with MOLB 4460. Prerequisite: MOLB/MICR 2210 and two semesters of biochemistry.

5470. Microbial Physiology and Metabolism II. 3. A continuation of Microbial Physiology and Metabolism I and places special emphasis on microbes as models for understanding of fundamental biological and biochemical phenomena as well as the practical implications of microbial physiology and metabolism. Prerequisite: Microbial Physiology I or equivalent.

5485. Computers in Biology. 1. Prepares students to use existing internet resources as research tools in biology without the need to write or install software. Topics include literature searching, multiple sequence alignment and phylogenetic tree construction, primer design, protein homology modeling, and the use of model organism databases. Dual listed with MOLB 4485. Prerequisites: MOLB 3000 and 3610 or 4610 or LIFE 3600.

5490. Microbial Gene Expression Laboratory. 1. Provides theoretical background and hands-on experience in biochemical, spectroscopy, DNA microarray, and bioinformatics techniques used to study bacterial physiology. Will measure and analyze changes in physiological parameters as well as changes in patterns of gene expression in rhodobacter sphaeroides in response to environmental conditions. Dual listed with MOLB 4490. Prerequisites: MOLB 4460/5460 or MICR 3000 and MOLB 4610/5610 (the latter may be concurrent).

5495. Bioinformatics. 3. Topics range from classic algorithms in bioinformatics like multiple sequence alignment and phylogenetic tree construction to problems of functional analysis, including computational genomics, gene expression, protein structure, and systems biology analyses. Dual listed with MOLB 4495. Prerequisite: graduate standing.

5510. Introduction to Virology. 3. Prokaryotic and eukaryotic viruses as infectious agents and models for modern molecular biology. Examines concepts and principles of pathogenesis, host response and the regulation of virus-host interactions. Genome organization, structure and replication will be examined within the context of the co-evolution of virus and host. Dual listed with MOLB 4510. Prerequisites: MOLB 3610 or 4600 plus 4610.

5520. Advanced Problems in Molecular Biology. 1-3 (Max. 10). Prerequisite: 6 semester hours above MOLB 4610 and consent of instructor.

5530. Techniques in Molecular Microbiology. 4. Prerequisite: graduate standing.

5540. Microbial Diversity and Ecology. 4. Introduces the diversity and ecology of soil microbes through an integrated lecture and laboratory course. Emphasis on molecular approaches to analyzing microbial diversity and evolution, and student-directed experimental design. Provides a continuum of realistic research experiences in molecular microbial ecology, from field work to evolutionary analysis of DNA sequence data. Cross listed with ECOL 5540; Dual listed with MOLB 4540. Prerequisite: MOLB 2210.

5600. General Biochemistry I. 3. The first semester of a comprehensive two-semester course for biochemistry majors and all biological and physical science majors. Students wishing to acquire laboratory experience in biochemistry should enroll in Molecular Biology laboratory pods. Dual listed with MOLB 4600. Prerequisite: CHEM 2300 or CHEM 2340 or 2440.

5620. Membranes and Hormones. 3. An advanced seminar in the structure, function, and dynamics of biological membranes. Prerequisite: MOLB 4610.

5630. Advanced Topics in Molecular Biology. 1-3 (Max. 15). Lectures, literature reviews and discussion of selected current topics in different areas of microbiology. Please check class schedule for current offerings each semester. Prerequisite: 9 hours of molecular biology and consent of instructor.

5650. Protein Structure and Function. 3. Designed to provide an in-depth look at proteins and their structure. Topics will include protein purification, structure analysis, folding, modification, interactions with other molecules, enzyme mechanism, and other current topics. Prerequisite: MOLB 4610.

5660. Maintenance and Flow of Genetic Information: A Molecular Perspective. 3. Current research in the maintenance and flow of genetic information - replication, recombination, repair, transcription, and translation - are discussed. Students will be exposed to new knowledge of DNA and protein structure and function, organization of the genome, gene expression, and principles of contemporary experimental methods. Dual listed with MOLB 4660. Prerequisite: MOLB 3000 or MOLB 4610.

5670. Development and Molecular Cell Biology. 3. An advanced course dealing with molecular aspects of intracellular protein localization, organelle biogenesis, and cellular architecture. Molecular aspects of development are also addressed. Current literature sources are used. Prerequisite: MOLB 4610.

5900. Practicum in College Teaching. 1-3 (Max. 3). Work in classroom with a major professor. Expected to give some lectures and gain classroom experience. Prerequisite: graduate standing.

5920. Continuing Registration: On Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5940. Continuing Registration: Off Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5959. Enrichment Studies. 1-3 (Max. 99). Designed to provide an enrichment experience in a variety of topics. Note: credit in this course may not be included in a graduate program of study for degree purposes.

5960. Thesis Research. 1 - 12. (Max 24). Designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrollment in a graduate degree program.

5980. Dissertation Research. 1-12 (Max. 48). Designed for students who are involved in research for their dissertation project. Also used for students whose coursework is complete and are writing their dissertation. Prerequisite: enrollment in a graduate degree program.

5990. Internship. 1 - 12 (Max. 24). Prerequisite: graduate standing.

Department of Plant Sciences
50 Agriculture Building, 766-3103
FAX: (307) 766-5549
Web site: www.uwyo.edu/plantsciences
Department Head: Stephen K. Herbert

Professors:

Associate Professors:
STEPHEN K. HERBERT, B.S. Seattle Pacific University 1980; M.S. University of Washington 1984; Ph.D. 1988; Associate Professor of Plant Physiology and Biochemistry 1999.
VALTCHO D. JELIAZKOV, M.S. Higher Institute of Agriculture, Bulgaria 1983; Ph.D. 1987; Ph.D. University of Massachusetts 2001; Associate Professor of Horticulture and Specialty

Assistant Professors:
M. ANOWARUL ISLAM, B.S. Bangladesh Agricultural University 1990; M.S. Institute of Postgraduate Studies in Agriculture, Bangladesh 1996; Ph.D. University of Sydney, Australia 2003; Assistant Professor of Forage Agronomy 2008.

ANDREW R. KNISS, B.S. University of Wyoming 2001; M.S. University of Nebraska-Lincoln 2003; Ph.D. University of Wyoming 2006; Assistant Professor of Weed Ecology and Management in Cropping Systems 2007.
BRIAN MEALOR, B.S. North Georgia College and State University 1999; M.S. University of Wyoming 2003; Ph.D. 2006; Assistant Professor of Invasive Plant Ecology and Management in Rangeland 2009.
URSZULA NORTON, B.S. Warsaw Agricultural University 1998; M.S. 1990; M.S. Iowa State University 1995; Ph.D. University of Montana 2000; Assistant Professor of Agroecology and Soil Science 2009.

Academic Professionals:
KAREN PANTER, B.S. Colorado State University 1979; M.S. University of Nebraska 1981; Ph.D. Colorado State University 1985; Extension Horticulture Specialist 1998.

Adjunct Professors:
Terry Booth, Stephen Enloe, Linda Hanson, Drew Lyon, Lee Panella, Dale Shaner, Robert Wilson, Dale Woods

Professors Emeriti:
Rollin H. Abernethy, Ron Delaney, David Koch, Alan Gray, Stephen D. Miller, Thomas D. Whitson, David Wilson

The Department of Plant Sciences offers a Bachelor of Science degree in Agroecology jointly with the Department of Renewable Resources and three several minors. Minors offered by Plant Sciences include Agroecology, Horticulture, and Plant Protection. The minor in horticulture includes courses in landscape design, plant materials and their propagation, organic food production, turfgrass science, and greenhouse design and management. The minor in Plant Protection includes courses in agronomy, plant genetics, plant pathology, and weed science. These minors allow students within many bachelors programs to obtain an added emphasis in areas that enjoy strong employment opportunities.
Agroecology Program
Rooms 50/2013 Agriculture Building
Phone: (307) 766-3103/766-2263

Departments of Plant Sciences and Renewable Resources

The Bachelor of Science degree program in agroecology is an interdepartmental major involving faculty in the Departments of Plant Sciences and Renewable Resources. An agroecology minor is also available.

The goal of the Agroecology undergraduate program is to promote the adoption of more sustainable agricultural practices in the United States and abroad. The program is intended to provide students with the following knowledge and skills.

- Possession of writing, oral communication, and math skills sufficient for success as an agricultural professional or for admission to graduate study to a related graduate degree program.
- Sufficient knowledge of physics, chemistry, geology, cell biology, physiology, genetics, evolution, and ecology for participation in modern agriculture.
- Practical knowledge and skills that include the use of computer technology for writing and analysis of data, the use of geographical information systems, chemical and biological analyses of soil and water, diagnosis of plant health problems, identification of plants and insects, and the general practice of horticulture and agronomy.

Professors:
Gary D. Franc, plant sciences
Ann L. Hild, renewable resources
James M. Krall, plant sciences
David E. Legg, renewable resources
K.J. Reddy, renewable resources
Scott R. Shaw, renewable resources
Michael A. Smith, renewable resources
Thomas L. Thurrow, renewable resources
George F. Vance, renewable resources
Stephen E. Williams, renewable resources

Associate Professors:
Timothy Collier, renewable resources
Robin W. Groose, plant sciences
Stephen K. Herbert, plant sciences
Scott Miller, renewable resources
Daniel J. Rodgers, renewable resources
Peter D. Stahl, renewable resources
Valleco D. Jeliazkov, plant sciences
James W. Waggoner, renewable resources
Dave Williams, renewable resources

Assistant Professors:
Axel Garcia y Garcia, plant sciences
Anowarul Islam, plant sciences
Andrew R. Kniss, plant sciences
Brian A. Mealer, plant sciences
Ursula Norton, plant sciences

Academic Professionals:
Augustine Obour, plant sciences
Mark Ferrell, plant sciences
Abdel Mesbah, plant sciences
Karen Panter, plant sciences

Agroecology Major

A B.S. degree in agroecology, the study of sustainable agricultural systems, prepares students for various careers in agriculture, natural resources, environmental and life sciences and for advanced graduate studies in specific subdisciplines within these areas. It is a broad, interdisciplinary, undergraduate curriculum that combines and integrates courses in the crop, horticulture, disease, soil, and insect sciences and is supported by a sound science-based curriculum and general education. Flexibility is built into the agroecology curriculum to readily accommodate students seeking to pursue an emphasis or obtain a minor in a specific discipline and thereby balance the breadth of the curriculum with greater depth in areas such as biology, chemistry, crop science, entomology, environmental studies, natural resource management, soil science, plant pathology, weed science, horticulture, turf management, pre-veterinary medicine, rangeland ecology and watershed management, animal science, microbiology, and molecular biology. A liberal number of electives permits design of a program that best meets individual career and educational objectives. The agroecology program is well suited for students of urban or rural backgrounds who possess an aptitude for science and interest in agriculture, the environment, life sciences, or natural resources.

The agroecology core curriculum is comprised of freshman through senior level courses that illustrate dynamic and complex interactions of plants, soils, and plant pests (diseases, insects, weeds) with the environment. Academic training is enhanced with experiential learning through research apprenticeships, internships, field studies, and special agroecology capstone courses. Special emphasis is given to development of critical thinking and communication skills, problem solving and application of science. It is a richly interdisciplinary program to prepare productive citizens for “real world” situations and life-long learning.

Agroecology B.S. degree recipients are prepared for careers with private and public institutions and agencies in such areas as: agricultural consulting, production or sales, research, product development, education, extension education, international programs, and scientific and technological support; and with professional titles such as: soil scientist, conservationist, entomologist, consultant, plant scientist, integrated pest management specialist, ecologist, research associate or technician, agronomist, biotechnician, and agroecologist. Degree recipients are also prepared for graduate education in biological and environmental sciences.

Course Requirements for Agroecology Majors Hrs.

<table>
<thead>
<tr>
<th>Course</th>
<th>Agroecology</th>
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<tbody>
<tr>
<td>AECL 1000, 3030, 4990, SOIL 2010, 4140, and 4 hrs from a combination of AECL 4920, 4930 or 4960</td>
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<tr>
<td>Supporting Science Biology/Genetics...21-22</td>
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<tr>
<td>ENTO 1000 or 1001 or REWM 3020 or ANSC 1010, and AGEC 1010 or 1020</td>
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<td>and LIFE 1010, 2023, 3400, and CHEM 1000, 2300</td>
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<td>Math/Statistics</td>
<td>7</td>
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<tr>
<td>MATH 1400, STAT 2050</td>
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<tr>
<td>Communications</td>
<td>3</td>
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<tr>
<td>COJO 1010</td>
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<tr>
<td>Agriculture Science Electives</td>
<td>9</td>
</tr>
<tr>
<td>Select 9 hours upper division from one of the following: animal science, botany, crop science/horticulture/plant pathology (PLNT), entomology, microbiology/molecular biology, pest science, rangeland ecology and watershed management, or soil science.</td>
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</tbody>
</table>

The agroecology core curriculum is comprised of freshman through senior level courses that illustrate dynamic and complex interactions of plants, soils, and plant pests (diseases, insects, weeds) with the environment. Academic training is enhanced with experiential learning through research apprenticeships, internships, field studies, and special agroecology capstone courses. Special emphasis is given to development of critical thinking and communication skills, problem solving and application of science. It is a richly interdisciplinary program to prepare productive citizens for “real world” situations and life-long learning.

Agroecology B.S. degree recipients are prepared for careers with private and public institutions and agencies in such areas as: agricultural consulting, production or sales, research, product development, education, extension education, international programs, and scientific and technological support; and with professional titles such as: soil scientist, conservationist, entomologist, consultant, plant scientist, integrated pest management specialist, ecologist, research associate or technician, agronomist, biotechnician, and agroecologist. Degree recipients are also prepared for graduate education in biological and environmental sciences.
Agroecology/Environment and Natural Resources Program

(ENR, Plant Sciences, and Renewable Resources)

Students with an especially strong interest in the environment and natural resources may choose to pursue the B.S. in agroecology/ENR. This degree is offered in conjunction with the School of Environment and Natural Resources. See the ENR Information and Advising Guide for details.

Agroecology Minor

(Plant Sciences & Renewable Resources)

Minimum requirements..........................20-21
AECL 1000; two of the following: SOIL 2010, LIFE 2023, AECL 3030, and 9 additional upper division hours from the following: ENTO, PLNT, and/or SOIL.

Plant Protection Minor

(Plant Sciences)

Minimum requirements..........................17
AECL 1000, AECL 3030, and 10 additional hours from the following: PLNT 3220, 4000, 4070, and 4120, 4130, and 4400.

Horticultural Minor

(Plant Sciences)

Minimum requirements..........................16
PLNT 2025 and 2026, and 12 additional hours from the following: PLNT 3300, 3400, 4120, 4140, 4150, 4160, 4180, 4200, 4975.

Insect Biology Minor

(Renewable Resources)

Minimum requirements..........................13
From the following: ENTO 1000 or 1001; ENTO 4360, 4500, 4665, 4678, 4682, 4684, 4685, 4686, 4687, 4360, 4884, 5601 or 5602, and RNEW 3000.

Soil Science Minor

(Renewable Resources)

Minimum requirements..........................18
From the following: SOIL/AECL 2010, plus 11 credits of upper-division soil sciences courses.

Graduate Study

The Department of Plant Sciences offers curricula leading to the master of science and doctor of philosophy degrees in Agronomy. Courses within the department are offered in crop science, horticulture, plant pathology, weed science, and agroecology. Interdisciplinary coursework and research projects are common for agronomy graduate students.

Program Specific Admission Requirements

In addition to university minimum requirements, a majority of the department faculty and department must approve the admission. A faculty member must agree to advise the student.

Program Specific Graduate Assistantship Information

M.S. assistantships include an $11,349.00 stipend, plus tuition and fee waiver, and health insurance. Ph.D. assistantships include a $15,795.00 stipend, plus tuition and fee waiver, and health benefits. These assistantships are for the 9 month academic year, but summer support is typically available.

Program Specific Degree Requirements

Master of Science in Agronomy

Plan A (thesis)

Requirements for the master of science degree include 26 hours of coursework numbered 4000 or above, 4 hours of thesis research, a research proposal, original research, and oral defense of the thesis.

The M.S. degree is typically completed in two years. The student's coursework is selected to fit the student's individual needs by mutual consultation among the student, his/her major professor and graduate committee.

Plan B (project)

The requirements for the master of science degree include 18 hours of coursework numbered 4000 or above, 4 hours of project research, and an oral defense of the project.

Doctoral Program

The requirements for the doctor of philosophy degree include 60 hours of coursework numbered 4000 or above, 12 hours of dissertation research, a research proposal, original research, written and oral preliminary exams to be taken when most or all coursework is completed, and an oral defense of the dissertation.

Dissertations may be in a modified journal article format but must meet university formatting requirements.

The Ph.D. degree is typically completed in four years. The student's coursework is selected to fit the student's individual needs by mutual consultation among the student, his/her major professor and graduate committee.

The department does not require language certification.

The student is expected to participate in the usual activities of scientific research such as attending and presenting at research seminars and professional meetings and publishing his/her research.

Agroecology (AECL)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2 ][QB ]).

1000 [CROP/BOT 2000]. Agroecology. 4. [S1 ][SB, G] Introduces ecological interactions that affect food producing (agricultural) systems. Lectures and laboratory exercises study the various biological components and the science of sustainable agricultural production. Features differences between developed and developing countries. Explores crises and challenges facing agriculture and global society.

2025. Horticultural Science. 3. [(none) ][SB ] Propagation, growth, development and utilization of horticultural plants. Students gain an understanding of plant classification, anatomy, interactions with the environment, production and utilization. Taught on-line only through Outreach. Cross listed with PLNT 2025. Prerequisites: AECL 1000 or LIFE 1010. (Offered fall semester)

2026. Horticultural Sciences Laboratory. 1. [(none) ][SB ] Offers hands-on experience in many areas of horticulture. Students learn basic horticultural plant structures and functions, propagation methods, growing media and fertilizers, landscaping, pruning, etc. Cross listed with PLNT 2026. Prerequisites: AECL 1000 or LIFE 1010. (Offered fall semester)

3030 [2030]. Ecological Web: Ecology of Plant Protection. 3. Introduces students to concurrent evolution of crop cultivation and organisms, both plant and animal, that attack them. Provides basic skills necessary to understand ecology and management of economic crop pests. Prerequisites: LIFE 1010 and AECL 1000. (Offered fall semester)
4120. Organic Food Production. 3. A complete review of the federal organic production guidelines, methods and applications for organic production facilities, alternative marketing principles, concepts of organic fertilizer use, organic pest control and concepts for using environmentally friendly methods to reduce chemical, petroleum and synthetic inputs for more sustainable crop and livestock agricultural systems. Prerequisite: 8 hours of LIFE and/or CHEM. (Normally offered fall semester of odd-numbered years.)

4130. Applied Remote Sensing for Agricultural Management. 3. Addresses specific applications of remote sensing to cropland and rangeland management. Provides an overview of remote sensing, specific applications for crops, shrubs and range vegetation. The course foundation will be agriculture-specific remote sensing of green plants. Cross listed with RNEW/BOT 4130. Prerequisites: QA course and 9 credit hours in student’s major field and junior/senior standing.

4400. Invasive Plant Ecology. 3. Ecological Impacts of invasive, non-indigenous plant species, the ecological, genetic and evolutionary hypotheses for invasiveness, as well as management strategies for invasive plant species. Dual listed with AECL 5400; cross listed with RNEW 4400. Prerequisite: LIFE 3400.

4920 [CROP 4600]. Topics in Agroecology: Research Apprenticeship. 1-2 (Max. 4). Laboratory and/or field research apprenticeship. Emphasizes individual student-faculty interactions on current topics in agroecology. Prerequisite: AECL core courses.

4930 [CROP/ENTO/SOIL 4903]. Internship in Agroecology. 1-3 (Max. 6). Provides students with realistic views of crop science, entomology or soil science through practical, as well as work-related, experiences. Provides positive educational experience to supplement formal academic course work. Prerequisites: sophomore standing or higher; 2.5 GPA.

4960 [PLPA 4000]. Agroecology Field Studies. 2. Various facets of the agroecosystem are covered by visits to agricultural research stations, agri-businesses, private farms, national monuments, historical sites and Federal Parks. Students are exposed to ongoing sustainable research projects and innovative sustainable farming operations where a variety of cropping systems are utilized. Students are usually exposed to archaeological remains of ancient American Indian farming systems. An 8 day trip. Prerequisite: AECL 1000. ( Normally offered first week after commencement of odd-numbered years)

4990. Agroecology Seminar. 3. [W3/WC] Capstone agroecology course for final integration of agroecology courses (AECL 2010, 3030, and LIFE 2023). Provides overall synthesis of these academic subjects following completion of a prescribed senior experience courses (AECL 4920 or 4930). (Offered spring semester)

5400. Invasive Plant Ecology. 3. Ecological Impacts of invasive, non-indigenous plant species, the ecological, genetic and evolutionary hypotheses for invasiveness, as well as management strategies for invasive plant species. Dual listed with AECL 4400; cross listed with RNEW 5400. Prerequisite: LIFE 3400.

Plant Sciences (PLNT)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2<QB]).

1150 [CROP 1150]. Pesticide Safety and Application. 1. Introduces various types and safe methods of pesticides application. Subsequent to completion, students may take the certification test administered by the Wyoming Department of Agriculture. Cross listed with ENTO 1150. Offered S/U only. (Normally offered during finals week of the fall semester)

2025. Horticultural Science. 3. [(none)SB] Propagation, growth, development and utilization of horticultural plants. Students gain an understanding of plant classification, anatomy, interactions with the environment, production and utilization. Taught on-line only through Outreach. Cross listed with AECL 2025. Prerequisite: AECL 1000 or LIFE 1010.

2026. Horticultural Sciences Laboratory. 1. [(none)SB] Offers hands-on experience in many areas of horticulture. Students learn basic horticultural plant structures and functions, propagation methods, growing media and fertilizers, landscaping, pruning, etc. Cross listed with AECL 2026. Prerequisite: AECL 1000 or LIFE 1010. (Offered fall semester)


3200 [CROP 2200, 3200]. Forage Crop Science. 3. Major aspects of forage crop production and biology. Cultural practices, adaptation, sustainable agriculture use, seed production, harvest, livestock utilization and storage of forages. Emphasizes characteristics of important grasses and legumes. Prerequisite: AECL 1000 or LIFE 1000. (Offered fall semester)

3220 [PLPA 3220]. Plant Pathology. 3. Study of plant diseases, their causes, nature and control, as well as pathogen biology. Study of diseases caused by fungi, bacteria, viruses, nematodes, mycoplasma-like organisms, higher plants and abiotic factors on field and vegetable crops, as well as on landscape plants. Gives students insight into the impact plant diseases have on humans. Prerequisite: AECL 1000 or LIFE 1010. (Offered fall semester of odd-numbered years)

3300. Horticultural Plant Propagation. 3. Emphasis on sexual and asexual propagation of various plants including herbaceous and woody crops. Seed propagation discussions include anatomy, physiology, dormancy, and enhancing seed viability and germination. Asexual propagation discussions center on anatomy and physiology of cuttings, adventitious root formation, budding, grafting, and tissue culture. Prerequisite: AECL or PLNT 2025. ( Normally offered spring semester of even-numbered years)

3400. Horticultural Plant Materials. 3. Examines horticultural tree, shrub, vine, and ground cover varieties, cultivars and native species of horticultural use. It includes herbaceous, woody, deciduous, evergreen, annual, biennial and perennial species. Common and specific names as well as pertinent facts on each species are correlated to field identification. Prerequisite: AECL/PLNT 2025 or LIFE 2023. (Offered fall semester of even-numbered years)

4000 [PLPA 4000]. Plant Disease Control. 3. Advanced study of plant diseases. Important diseases of field, forage and horticultural crops will be studied. Includes history and current distribution and uses of crops. Emphasis will be placed on pathogen biology and development of integrated disease management. Current and classic research papers on plant disease control will be discussed. Dual listed with PLNT 5000. Prerequisite: PLNT 3220. ( Normally offered fall semester of even-numbered years)
4020. Sustainable Agriculture. 3. Focuses on the sustainability of agroecosystems and the human communities that maintain them in the context of regional, national, and global food and fiber requirements. Topics include the scale of agriculture, low-input systems, current energy and transportation challenges, markets, and integrated crop and livestock production. Dual listed with PLNT 5020. Prerequisite: 8 hours of biology. (Offered spring semester of even-numbered years)

4070 [CROP 4070]. Weed Science and Technology. 4. Management and physiological principles involved in control of economically important farm and range weeds. Dual listed with PLNT 5070. Prerequisite: AECL 1000, LIFE 1010. (Normally offered fall semester)

4120. Organic Food Production. 3. A complete review of the federal organic production guidelines, methods and applications for organic production facilities, alternative marketing principles, concepts of organic fertilizer use, organic pest control and concepts for using environmentally friendly methods to reduce chemical, petroleum and synthetic inputs for more sustainable crop and livestock agricultural systems. Cross listed with AECL 4120. Prerequisite: 8 hours of LIFE and/ or CHEM. (Normally offered fall semester of odd-numbered years)

4140. Turfgrass Science. 3. Turfgrass management practices from a plant biology perspective. Adaptability and maintenance of turfgrass species that are used in landscape and sports turf. Includes common, low maintenance, and intensively managed special sports turf species; sports turf construction techniques; establishment; fertility and integrated pest management. Prerequisite: AECL/PLNT 2025 or LIFE 2023. (Normally offered spring semester of odd-numbered years)

4150. Arboriculture. 4. Focuses on the biology and management of trees. The objective is to understand how biological processes determine tree growth, architecture, maintenance, and management in the landscape. The emphasis is on trees in urban settings, though much of the material is applicable to wildland tree management. Prerequisites: AECL 2025 and 2026 or concurrent enrollment. (Normally offered fall semester of odd-numbered years)

4160. Western Landscape Design. 4. Designed for the challenges and limitations of high altitude landscaping with an emphasis on water use efficiency. Primary course concepts include construction using hard materials, xeriscaping principles, decreased water consumption using specialized irrigation systems and selection of native, adapted species, as well as basic landscape design principles. Prerequisite: PLNT 3400. (Normally offered spring semester of odd-numbered years)

4180. Horticultural Herbaceous Plant Production. 4. Production methods for a wide range of herbaceous plants including bedding plants, perennials, vegetables, flowering potted plants, and foliage plants. Emphasis is placed on current production techniques in controlled environments and in the field. Dual listed with PLNT 5180. Prerequisite: PLNT 3300. (Normally offered spring semester of odd-numbered years)

4200. Greenhouse Design and Management. 4. Emphasis on greenhouse structural and functional design concepts of economy, efficiency and energy conservation. Primary emphasis is on the limitations and advantages of greenhouses in the Rocky Mountain region, including alternative energy concepts. The management and operational concerns associated with private, commercial, educational and public greenhouses will be included. Dual listed with PLNT 5200. Prerequisites: AECL/PLNT 2025 or LIFE 2023 and a USP QA course. (Normally offered spring semester of even-numbered years)

4470 [CROP 4470]. Seed Science and Technology. 3. Presents aspects of seed biology and processing including development, physiology, ecology, germination, viability, dormancy, production, conditioning, storage, certification and marketing. Dual listed with PLNT 5470. Prerequisite: 8 hours of plant biology. (Normally offered fall semester of even years)

4520 [CROP 4520]. Plant Breeding. 3. [M34 (none)] Principles and methods for genetic improvement of all kinds of plants including agronomic, horticultural, forest and range species. Emphasizes fundamental concepts of quantitative genetics and integration of classical plant breeding with emergent biotechnology. Prerequisites: MATH 1000 or statistics course; LIFE 4000. (Normally offered fall semester of odd-numbered years)

4790 [CROP 4700, 4790]. Topics: ____. 1-4 (Max. 10). Dual listed with PLNT 5790. Prerequisite: senior standing. (Offered based on sufficient demand and resources)

4900. Undergraduate Teaching Practicum. 1-2 (Max. 4). Supervised participation of undergraduates in the teaching of laboratory sections offered by the Department of Plant Sciences. Provides opportunity for students to gain teaching experience in agroecology, horticulture, or life science. Prerequisites: AECL 1000 and junior or senior standing.

4975. Problems in Plant Science. 1-2 (Max. 4). Provides an opportunity for students to conduct supervised research on specific topics of interest and importance in crop breeding, genetics, physiology, pathology, ecology and pest management. Prerequisites: junior/senior standing with at least 10 hours of agroecology core requirements.

5000. Plant Disease Control. 3. Advanced study of plant diseases. Important diseases of field, forage and horticultural crops are studied. Includes history and current distribution of crops. Emphasis is placed on pathogen biology and development of integrated disease management. Current and classic research papers on plant disease control are discussed. Dual listed with PLNT 4000. Prerequisite: PLNT 3220.

5020. Sustainable Agriculture. 3. Focuses on the sustainability of agroecosystems and the human communities that maintain them in the context of regional, national and global food and fiber requirements. Topics include: the scale of agriculture, low-input systems, current energy and transportation challenges, markets, and integrated crop and livestock production. Dual listed with PLNT 4020. Prerequisite: 8 hours of Life Sciences.

5070. Weed Science and Technology. 4. Management and physiological principles involved in control of economically important farm and range weeds. Dual listed with PLNT 4070. Prerequisite: AECL 1000, LIFE 1010

5180. Horticultural Herbaceous Plant Production. 4. Production methods for a wide range of herbaceous plants including bedding plants, perennials, vegetables, flowering potted plants, and foliage plants. Emphasis is placed on current production techniques in controlled environments and in the field. Dual listed with PLNT 4180. Prerequisite: PLNT 3300.
5200. Greenhouse Design and Management. 4. Emphasis on greenhouse structural and functional design concepts of economy, efficiency and energy conservation. Primary emphasis is on the limitations and advantages of greenhouses in the Rocky Mountain region, including alternative energy concepts. The management and operational concerns associated with private, commercial, educational and public greenhouses are included. Prerequisite: AECL/PLNT 2025 or LIFE 2023 and a QA course.

5380. Crop and Weed Ecology. 4. Focuses on agroecosystems and the ecology of weeds. Main objective is to understand how ecological processes determine agroecosystem function and weed invasions. Some of the processes to be covered include: competition, succession, disturbance, nutrient cycling, diversity and evolution. Prerequisites: basic ecology course, senior standing with permission of instructor.

5410. Advanced Crop Physiology and Management. 3. Review and interpretation of current crop management and physiology literature. Prerequisite: 6 hours of biochemistry or plant physiology.

5470. Seed Science and Technology. 3. Presents aspects of seed biology and processing including development, physiology, ecology, germination, viability, dormancy, production, conditioning, storage, certification and marketing. Prerequisite: 8 hours of plant biology.

5500. Clinical Plant Pathology. 2. Designed to give students practical experience in disease diagnosis. Students are exposed to a variety of current techniques used in the diagnosis and control of plant problems caused by abiotic and biotic factors. Primary emphasis is on the identification of biotic agents; including fungi, bacteria, nematodes and viruses. Students should gain experience and insight in the practical aspects of plant pathology. Prerequisite: PLNT 4000.

5600. Research in Crops. 1-4 (Max. 10). Investigation of research problems to include a written and oral presentation of results. Prerequisite: basic training in the field of problem selected.

5720. Plant Disease Problems. 1-3 (Max. 10). Biology, epidemiology, and control of specific crop, field and forage diseases. Prerequisite: PLNT 3220.

5790. Topics in Plant Sciences. 1-10 (Max. 10). Dual listed with PLNT 4790. Prerequisite: senior standing.

5820. Graduate Seminar. 1 (Max. 6). Discussion in production, physiology, breeding and weed science. Prerequisite: basic training in plant sciences.

5900. Practicum in College Teaching. 1-3 (Max. 3). Work in classroom with a major professor. Expected to give some lectures and gain classroom experience. Prerequisite: graduate standing.

5920. Continuing Registration: On Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5940. Continuing Registration: Off Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5950. Enrichment Studies. 1-3 (Max. 99). Designed to provide an enrichment experience in a variety of topics. Note: credit in this course may not be included in a graduate program of study for degree purposes.

5960. Thesis Research. 1-12 (Max. 24). Designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrollment in a graduate degree program.

5980. Dissertation Research. 1-12 (Max. 48). Designed for students who are involved in research for their dissertation project. Also used for students whose coursework is complete and are writing their dissertation. Prerequisite: enrollment in a graduate level degree program.

### Department of Renewable Resources

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PAX: (307) 766-6403
Web site: uwyo.edu/renewableresources
Department Head: John A. Tanska

Professors:


**DAVID E. LEGG,** B.S. University of Missouri 1978; M.S. 1980; Ph.D. University of Minnesota 1983; Professor of Entomology 2003, 1988.

**LARRY C. MUNN,** B.S. Ohio State University 1972; M.S. 1974; Ph.D. Montana State University 1977; Professor of Soil Science 1992, 1981.

**KATTA J. REDDY,** B.S. A.P. Agricultural University (India) 1978; M.S. 1980; Ph.D. Colorado State University 1986; Professor of Water Quality 2006, 2000.


**PETER D. STAHL,** B.S. Oklahoma State University 1978; M.S. University of Wyoming 1982; Ph.D. 1989; Professor of Restoration Ecology 2009, 2000; Director, Wyoming Reclamation and Restoration Center.

**JOHN A. TANAKA,** B.S. Oregon State University 1978; M.S. 1982; Ph.D. Utah State University 1986; Professor of Rangeland Ecology and Watershed Management 2009.

**THOMAS L. THUROW,** B.S. University of Idaho 1977; M.S. Brigham Young University 1979; Ph.D. Texas A&M University 1985; Professor of Rangeland Ecology and Watershed Management 1999.


**JAMES K. WANGBERG,** B.A. Humboldt State College 1969; M.A. California State University-Humboldt 1973; Ph.D. University of Idaho 1976; Professor of Entomology 1986; Associate Dean 1999.


**STEPHEN E. WILLIAMS,** B.S. New Mexico State University 1970; M.S. 1972; Ph.D. North Carolina State University 1977; Professor of Soil Biology and Biochemistry 1987, 1976.

Associate Professors:

**TIMOTHY R. COLLIER,** B.S. University of California—Riverside 1987; Ph.D. University of California—Santa Barbara 1994; Associate Professor of Entomology 2008, 2002.

**ALEXANDRE V. LATCHININSKY,** B.S. St. Petersburg State University (Russia) 1979; M.S. 1980; Ph.D. University of Wyoming 2001; Associate Professor of Entomology 2008, 2003.


**JAMES K. WANGBERG,** B.A. Humboldt State College 1969; M.A. California State University-Humboldt 1973; Ph.D. University of Idaho 1976; Professor of Entomology 1986; Associate Dean 1999.


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**ALEXANDRE V. LATCHININSKY,** B.S. St. Petersburg State University (Russia) 1979; M.S. 1980; Ph.D. University of Wyoming 2001; Associate Professor of Entomology 2008, 2003.


The Department of Renewable Resources offers two programs leading to a Bachelor of Science degree. These are Rangeland Ecology and Watershed Management and Agroecology (an interdepartmental program offered through the Department of Renewable Resources and the Department of Plant Sciences). The coursework requirements necessary for obtaining an agroecology degree are described in the Department of Plant Sciences section of this publication. Either degree can also be obtained as an affiliate degree in conjunction with the School of Environment and Natural Resources. Seven minor degree programs are offered through the department: Insect Biology, Agricultural Entomology, Rangeland Ecology and Watershed Management, Soil Science, Agroecology, Forest Resources, and Reclamation and Restoration Ecology. Obtaining a minor to compliment a B.S. major degree program provides credentials and knowledge that can expand career opportunities.

The degree programs reflect the department’s diverse expertise in natural resource and agriculture sciences. Students completing degrees offered through the department are well prepared for careers in natural resource management and sustainable agriculture (e.g., range management, watershed management, restoration ecology/reclamation of degraded land, wildlife habitat management, biocontrol/integrated pest management, soil science and various types of environmental consulting) or other science careers.

Minor in Forest Resources

The primary goal of the Forest Resources minor degree program is to develop a working knowledge of the processes that influence the provision of the key products derived from forest lands. Courses taken in fulfillment of a major degree program will also be able to be applied to a minor degree program.

Minimum Requirements ........................................ 20
  RNEW 2100, SOIL 4150, RNEW 4775, and REWM 4540. Choose one from REWM 3100, REWM 4285, REWM 4700, or GEOG 4420; choose one from GEOG 2550 or REWM 4103; choose one from REWM 2000, ZOO 2450, RNEW 3000, or GEOG 4470.

Minor in Reclamation and Restoration Ecology

This program covers the use of basic and applied ecological concepts to rehabilitate and restore processes and functions to disturbed ecosystems.

Graduate Study

The Department of Renewable Resources is an interdisciplinary department made up of five disciplinary areas: entomology, rangeland ecology, soil sciences, agroecology, and watershed management. The department offers the master of science and doctor of philosophy degrees in entomology, rangeland ecology and watershed management, and soil science. A water resources dual major may be obtained in conjunction with each of these master’s degrees. For the rangeland ecology and watershed management degrees, thesis and dissertation problems may be developed in aspects of range ecology, wildlife habitat, reclamation of disturbed lands, watershed management, utilization and improvement of rangelands, and many other facets of range and forest ecology management. For the entomology degrees, thesis and dissertation problems may be developed in many areas of basic and applied aspects of insect ecology. For the soil degrees, thesis and dissertation problems may be developed in many basic and applied aspects of soil science. The degree programs reflect the department’s diverse expertise in natural resource and agriculture sciences. Students completing degrees offered through the department are well prepared for careers in natural resource management and sustainable agriculture (e.g., range management, watershed management, restoration ecology/reclamation of degraded land, wildlife habitat management, biocontrol/integrated pest management, soil science and various types of environmental consulting) or other science careers.
A graduate certificate in reclamation and restoration ecology may be obtained after completion of a B.S. degree or in conjunction with an M.S. or Ph.D. degree.

At present, no program for graduate degrees in agroecology is offered; however, some courses at the graduate level are available. Responsibility for this program is shared with the Department of Plant Sciences.

Program Specific Admission Requirements

Admission is contingent upon a faculty member being willing to assume responsibility for working with the student as an adviser.

Applicants are encouraged to initiate correspondence with faculty who share similar research interests as part of the process of securing faculty advising commitment.

In special circumstances, and with the faculty adviser’s support, a student may be admitted in a provisional status with continued enrollment dependent upon meeting performance requirements specified at the time of admission.

Program Specific Graduate Assistantship Information

Current graduate assistantship availability, subject of study, and remuneration can be determined by checking: www.uwyo.edu/uwrenewable. Prospective students are also encouraged to directly correspond about future opportunities for graduate assistantships with faculty that share similar research interests.

Program Specific Degree Requirements

Master of Science in Entomology

Plan A (thesis)

The master of science degree normally is offered under Plan A which requires at least the university minimum degree requirements and an oral examination.

An oral defense of the thesis is required.

Plan B (non-thesis)

Plan B is available under special circumstances and requires 30 hours of graduate coursework.

Plan B candidates must also prepare one professional paper (i.e., content and form compatible with publication in a scientific journal) or, if the adviser requests, two professional papers in selected topic areas.

An oral defense of the paper(s) is required.

Master of Science in Rangeland Ecology and Watershed Management

Plan A (thesis)

The master of science degree normally is offered under Plan A which requires at least the university minimum degree requirements and an oral examination.

An oral defense of the thesis is required.

Plan B (non-thesis)

Plan B is available under special circumstances and requires 30 hours of graduate coursework.

An oral defense of the paper(s) is required.

Master of Science in Soil Science

Plan A (thesis)

Plan A requires the university minimum degree requirements and an oral final examination.

Plan B (non-thesis)

Plan B is available and requires 30 hours of graduate coursework.

An oral defense of the paper(s) is required.

Master of Science in Water Resources

Please refer to the Water Resources section of this Catalog for degree requirements.

Master of Science in Entomology/Water Resources

Please refer to the Water Resources section of this Catalog for degree requirements.

Doctor of Philosophy Program in Hydrology

Water Resources/Environmental Science and Engineering (WRESE) is an interdisciplinary Ph.D. program that fulfills an important need by organizing a rigorous Ph.D.-level curriculum, with sufficient numbers of relevant, frequently-offered courses to serve the needs of Ph.D. students affiliated with program faculty.

The program’s Ph.D.-level coursework is essential and forward-looking in areas such as aquatic chemistry, transport in natural systems, hydrometeorology, land-atmosphere interactions, eco-hydrology, hydrogeology, vadose zone hydrology, hydrologic applications of stable isotopes, limnology, hydrologic modeling, hydrological and water quality effects on aquatic organisms, hydroclimatology, hydrologic remote sensing and watershed hydrology.

Doctor of Philosophy in Rangeland Ecology and Watershed Management

Candidates must complete the minimum requirements for the doctor of philosophy degree, plus a preliminary examination (written and oral) covering knowledge related to the discipline (taken after most coursework complete) and an oral final examination.

Doctor of Philosophy in Soil Science

Candidates must complete the minimum requirements for the doctor of philosophy degree, plus a preliminary examination (written and oral) covering knowledge related to the discipline (taken after most coursework complete) and an oral final examination.

Graduate Certificate Program

Reclamation/Restoration Ecology Graduate Certificate

The Reclamation/Restoration Ecology (RRE) graduate certificate prepares the student to use basic and applied ecological concepts to reclaim and/or restore processes and functions to disturbed ecosystems. Reclamation and/or restoration of disturbed ecosystems requires an understanding of the edaphic, biotic, hydrologic, geologic, and topographic factors comprising these ecosystems, including the complex interrelationships that support and perpetuate ecosystem function. The graduate certificate will be granted to students who have completed a B.S. in an appropriate science-oriented discipline or are currently enrolled in an M.S. or Ph.D. program.
The graduate certificate will also be available to professionals working in reclamation/restoration oriented fields seeking to upgrade their training in reclamation and restoration ecology. Those interested in the graduate certificate will be required to complete the course work listed below as well as write a synopsis paper with a formal presentation advertised as an open forum seminar.

**Required Certificate Courses:**
Reclamation and restoration ecology courses
REWM 4200, REWM 5580 ............... 6 hours
Reclamation problems
SOIL 5565 or REWM 5640 .............. 4 hours

Reclamation process course (choose one)
BOT 5700, BOT 5730, BOT 5780, PLNT 5070, PLNT 5470, GEOL 5444, GEOL 5570, REWM 5280, REWM 5710, RNEW 5540, SOIL 5100, SOIL/MATH 5110, SOIL 5120, SOIL 5130, SOIL 5140, SOIL 5150, ZOO 5550 ......................... 3 hours

Planning/policy courses (choose one)
ENR 4900, ENR 5900 ...................... 3 hours

Minimum total credits needed: 16 hours

Courses of instruction in the department are offered in agroecology, entomology, rangeland ecology and watershed management, renewable resources, and soil science.

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**Renewable Resources (RNEW)**

**USP Codes** are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M24]QB).

2100 [BOT 2100]. Forest Management. 3. Principles of forest management. Topics include the laws affecting forest management, methods of harvesting wood from forests, fire and insect management, the effects of disturbances on stream flow and nutrient cycling, and the challenges of developing management plans for forests. **Prerequisite:** LIFE 1001 or 1010.

2345. Natural Resource Ethics. 3. [none]CH, D] Introduction to ethics in the context of natural resource extraction, use, conservation, preservation, and distribution. Ethical frameworks include teleological and deontological theories primarily applied to human needs and wants. Concepts and applications of environmental justice are addressed, including private property, sustainability, and obligations to future generations. Cross listed with PHIL 2340. **Prerequisite:** none.

3000. Tropical Ecology. 3. Examines the characteristics of tropical ecosystems, how they evolved, their value to humans, their present status, and current issues relating to biodiversity, deforestation, extinction, and conservation. **Prerequisite:** LIFE 1001 or 1010.

4130. Applied Remote Sensing for Agricultural Management. 3. Addresses specific applications of remote sensing to cropland and rangeland management. Covers an overview of remote sensing, specific applications of remote sensing for crops and specific applications of remote sensing to range management. Foundation is agriculture-specific remote sensing of green plants. Dual listed with RNEW 4130; cross listed with BOT 5130. **Prerequisites:** QA and 9 hours in student’s major field and junior/senior standing.

5200. Spatial Analysis of Watersheds and Ecosystems. 3. Covers topics related to analysis of spatial and temporal processes at watershed and ecosystem scales using Geographic Information Systems (GIS). Topics include land classification and suitability analysis, interpolation techniques, terrain analysis, model integration, and visualization. Sources of potential error and ramifications are examined. **Prerequisite:** GEOG 4210 or equivalent.

5400. Invasive Plant Ecology. 3. Ecological impacts of invasive, non-indigenous plant species, the ecological, genetic and evolutionary hypotheses for invasiveness, as well as management strategies for invasive plant species. Dual listed with RNEW 5400; cross listed with AECL 4400. **Prerequisite:** LIFE 3400.

4730. Plant Physiological Ecology. 4. Acquaints advanced students with environmental factors which affect the establishment and growth of plants. Emphasizes adaptive mechanisms. Dual listed with RNEW 5730. Cross listed with BOT 4730. **Prerequisite:** one course in physiology and one course in ecology. (Normally offered spring semester)

4775. Forest Ecology. 4. Integrative study of the structure, function, and ecological diversity of forested ecosystems, and the physical factors that influence this diversity, including emergent properties of energy flow and nutrient cycling. Special emphasis is given to understanding forest disturbances and succession, and implications for impacts of management and sustainability are discussed throughout. Cross listed with BOT 4775. **Prerequisite:** LIFE 3400.

4990. Topics in: ______ 1-4 (Max. 8). Special topics pertaining to renewable natural resource management. Intended to accommodate instruction in various specialized subjects not offered on a regular basis. Students may enroll in more than one section of this course provided topics are different. Dual listed with RNEW 5990. **Prerequisite:** consent of the instructor to pursue study of the topic.

5130. Applied Remote Sensing for Agricultural Management. 3. Addresses specific applications of remote sensing to cropland and rangeland management. Covers an overview of remote sensing, specific applications of remote sensing for crops and specific applications of remote sensing to range management. Foundation is agriculture-specific remote sensing of green plants. Dual listed with RNEW 4130; cross listed with BOT 5130. **Prerequisites:** QA and 9 hours in student’s major field and junior/senior standing.

5500. Stable Isotope Ecology. 3. Application of stable isotope measurements to organismal and systems ecology. Lectures address the theory underlying the use of stable isotopes at natural abundance levels as tracers and integrators of important physiological and ecological processes. Laboratory exercises provide hands-on experience with stable isotope ratio measurements. **Prerequisite:** graduate classification in a natural science or agriculture discipline.

5540. Shrubland Ecology. 3. Ecology of shrub-dominated lands and shrub species in grasslands. Location, importance and environmental constraints of shrub distributions. Topics include herbivory, woody plant invasions, competitive interactions, monitoring and population dynamics. Emphasizes familiarity with scientific literature. **Prerequisite:** REWM 3000, 4800, BOT 4700.

5545. Shrub Ecology Trip. 2. Field study in North American shrublands of western US ecosystems. Participants learn from researchers, managers, field activities, required readings and written assignments. Participants will be camping and a fee is required. **Prerequisite:** RNEW 5540.
Acquaints advanced students with environmental factors which affect the establishment and growth of plants. Emphasizes adaptive mechanisms. Lecture with inclusive hands-on laboratory. Dual listed with RNEW 4730; cross listed with BOT 4730/5730. Prerequisite: one course in physiology and one course in ecology.

Integrative study of the structure, function, and ecological diversity of forested ecosystems, and the physical factors that influence this diversity, including emergent properties of energy flow and nutrient cycling. Prerequisite is given to understanding forest disturbances and succession, and implications for impacts of management and sustainability are discussed throughout. Dual listed with RNEW 4775; cross listed with BOT 5775 and ECOL 5775. Prerequisite: LIFE 3400.

5959. Enrichment Studies. 1-3 (Max. 3).
Designed to provide an enrichment experience in a variety of topics. Note: credit in this course may not be included in a graduate program of study for degree purposes.

5985. Seminar. 1-3 (Max. 3).
Current issues relevant to renewable resources research and management. Offered S/U only. Prerequisite: graduate standing.

5990. Topics In Renewable Resources. 1-4 (Max. 8).
Special topics pertaining to renewable natural resource management. Intended to accommodate instruction in various specialized subjects not offered on a regular basis. Students may enroll in more than one section of this course provided topics are different. Dual listed with RNEW 4990. Prerequisite: none.

Environment and Natural Resources Affiulated Degrees

Bachelor of Science degrees in either the Agroecology or the Rangeland Ecology and Watershed Management offered through the Renewable Resources Department may also be obtained as affiliate degrees with the School of Environment and Natural Resources (i.e., the degree titles would be Environment and Natural Resources/Rangeland Ecology and Watershed Management or Environment and Natural Resources/Agroecology). The additional coursework requirements necessary for obtaining an affiliate degree are described in the School of Environment and Natural Resources section of this publication.

Entomology Minors Programs

Because of the pervasiveness of insects, the entomology minors programs provide a vital link among the life and environmental sciences at the University of Wyoming. Students will be prepared to serve society not just through the vital industry of agriculture, but through contributions to basic biology, human and animal health, ecosystem management, wildlife conservation and a myriad of other ways.

Minor in Insect Biology

This minor is intended for students who have an interest in insects as organisms, including their basic biology, ecology and evolution. As insects dominate biological diversity, they are essential to most ecological systems, and have unique physiological systems. Students majoring in zoology, botany, molecular biology, biology or similar fields will find the study of these organisms a rewarding and valuable (if not essential) element of the life sciences.

In terms of biological diversity, at least 75 percent of all species are insects, with over 800,000 known species and another 10-50 million yet to be described. Insects are increasingly used as bioindicators of environmental health. Many industries now recognize that insects may be the world’s richest, untapped natural resource, with billions of dollars of unexploited goods and services. Accessing these resources requires trained entomologists. Such training demands an academic setting, such as the University of Wyoming, where collections are maintained, productive faculty are involved in quality research and teaching, the latest methodologies are available and taught, the necessary scientific literature is readily accessible and a curriculum allows the student to pursue this field.

Minimum requirements..........................13
Choose one from ENTO 1000 or 1001,
then choose from ENTO 4678, 4682,
4684, 4686, 4687, and 4884 to meet the minimum 13 credit hour requirement.

Insect Biology/Entomology Graduate Study

The department offers graduate work leading to the Master of Science and Doctor of Philosophy in entomology and an affiliated graduate option in water resources. Department faculty have active programs in insect ecology (biological control, population biology and plant-insect interactions), systematics (taxonomy, phylogeny and evolution) and pest management (biological control, biometrics and sampling, and pest management on humans, livestock, crops and rangeland).

Entomology (ENTO)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2♣QB]).

1000. Insect Biology. 3. [(none)♣ SB]
Introduces insects and related arthropods. Introduces aspects of insect biology, behavior, life history and diversity, as well as many ways that insects affect humans.

1001. Insect Biology. 4. [S1♣SB] Covers same lecture material as ENTO 1000, but includes a laboratory.

1150. Pesticide Safety and Application. 1.
Introduces various types and safe methods of pesticides application. Subsequent to completion, students may take the certification test administered by the Wyoming Department of Agriculture. Cross listed with CROP 1150. Offered S/U only. (Normally offered the week prior to spring semester)

4100. Senior Thesis: Proposal Preparation. 1-3 (Max. 6).
Individualized preparation of a research proposal for a senior thesis project. Offered S/U only. Prerequisite: senior standing.

4200. Senior Thesis: Research Project. 1-3 (Max. 6).
Individualized research project based on the senior thesis proposal. Offered S/U only. Prerequisite: ENTO 4100.

4300. Applied Insect Ecology. 3.
Examines concepts of insect ecology and their application to the management of agricultural and rangeland insect pests. Control of rangeland weeds using insects in also examined. Covers population dynamics, predator-prey and insect-plant interactions, biological control and integrated pest management. Prerequisite: ENTO 1000 or 9 hours of biology or ecology-related coursework.
4678. Aquatic Entomology. 3. Emphasizes biology, ecology, distribution and taxonomy of aquatic insects. Includes aquatic insects as indicators of pollution. Students must make and identify a collection of immature aquatic insects. Dual listed with ENTO 5678. Prerequisite: ENTO 1000, 1001. (Normally offered fall semester of even-numbered years)

4682. Insect Anatomy and Physiology. 5. [W3:] (none) Studies structure and function of the insect body, particularly emphasizing the relationship between anatomical features and their cellular/biochemical functions. Dual listed with ENTO 5682. Prerequisite: ENTO 1000. (Normally offered spring semester of even-numbered years)

4684. Classification of Insects. 4. Studies insect orders, families and taxonomic treatises. Requires collection of adult insects representing 100 families, or equivalent museum project, for completion of course requirements. Dual listed with ENTO 5684. Prerequisite: ENTO 1000. (Normally offered fall semester of odd-numbered years)

4686. Problems in Entomology. 1-3 (Max. 6). Individual library, laboratory or field study of insects. Prerequisites: 4 hours of biological science and 3 hours of entomology. (Offered fall, spring and summer semesters)

4687. Insect Evolution. 3. Examines major events of insect evolution including origins, fossils, wings and flight, metamorphosis, extinct orders, diversification patterns of modern orders, climate change, plate tectonics, coevolution with plants, parasitism, social behavior and origin of modern faunas. Dual listed with ENTO 5687. Prerequisite: ENTO 4684 required; ENTO 4670, 4682 recommended.

4852. Senior/Graduate Seminar. 1 (Max. toward B.S. 2; Max. toward M.S. 2; Max. toward Ph.D. 6). Presentation of results and interpretation of the senior thesis research. Dual listed with ENTO 5852.

4884. Insect Behavior. 3. Examines the behavior of insects, including foraging, mating and social behavior. The course focuses on the applied as well as the fundamental aspects of behaviors, and both the strategic and physiological bases of behavior. Dual listed with ENTO 5884. Prerequisite: ENTO 1000.

5080. Statistical Methods for the Agricultural and Natural Resource Sciences. 3. Brief review of statistical principles. Use of SAS programming. Numerous analysis of variance techniques along with commonly used experimental designs. Multiple mean comparisons, linear contrasts, power of F test, simple linear regression, polynomial regression, analysis of covariance, and some categorical data techniques for student in the agriculture and natural resources sciences. Credit cannot be earned in more that one of the following courses: STAT 2100, 3050, 5050, 5060, 5070, 5080. Cross listed with STAT 5080. Prerequisite: STAT 2050 or equivalent.

5300. Applied Insect Ecology. 3. Examines concepts of insect ecology and their application to the management of agricultural and rangeland insect pests. Control of rangeland weeds using insects is also examined. Covers population dynamics, predator-prey and insect-plant interactions, biological control and integrated pest management. Dual listed with ENTO 4300. Prerequisite: ENTO 1000 or 9 hours of biology or ecology related coursework.

5601. Insects for Teachers: Collection and Identification of Insects. 1. Designed for school teachers K-12. Basic concepts such as insect classification, insect habitats, insect metamorphosis, and destructive and beneficial insects are discussed with emphasis on the presentation of these concepts in the school classroom. Half of the class is devoted to field trips, laboratories, workshop activities, and films. Each student will make an insect collection, and learn how to preserve, mount, and identify specimens to order level. Course may be taken independently of ENTO 5602. Identical to NASC 4790. Prerequisite: junior standing. Offered summer term only.

5602. Insects in the Classroom: Insects and Their Ways. 1. Designed for school teachers K-12. Basic concepts of insect structure and function (insect morphology, insect physiology, insect ecology, and insect behavior) are discussed with emphasis on the presentation of these concepts using living insects in the classroom. Half of the class is devoted to field trips, laboratories, workshop activities, and films. Each student will design, conduct, and write-up an experiment with insects. Course may be taken independently of ENTO 5601. Identical to NASC 4790. Prerequisite: junior standing. Offered summer term.

5678. Aquatic Entomology. 3. Biology, ecology, distribution and taxonomy of aquatic insects will be emphasized. Additional material covered will include aquatic insects as indicators of pollution. Students must make and identify a collection of immature aquatic insects. Dual listed with ENTO 4678. Prerequisite: one year of basic biology.

5682. Insect Physiology. 5. Structure and function of the insect body, with particular emphasis on the relationship between anatomical features and their cellular/biochemical functions. Dual listed with ENTO 4682. Prerequisite: ENTO 1000.

5684. Classification of Insects. 4. A study of insect orders, families and taxonomic treatises. Collection of adult insects representing 100 families, or equivalent museum project, is required for completion of course requirements. Dual listed with ENTO 4684. Prerequisite: ENTO 1000; ENTO 4670 is recommended.

5686. Problems in Entomology. 1-3 (Max. 6). Individual library, laboratory or field study of insects. Dual listed with ENTO 4686. Prerequisite: 4 hours of biological science and 3 hours of entomology.

5687. Insect Evolution. 3. Examines major events of insect evolution including origins, fossils, wings and flight, metamorphosis, extinct orders, diversification patterns of modern orders, climate change, plate tectonics, coevolution with plants, parasitism, social behavior, and origin of modern faunas. Dual listed with ENTO 4687. Prerequisite: ENTO 4684/5684 required. Recommended: ENTO 4670/5670, ENTO 4682/5682.

5689. Topics in Entomology. 1-4 (Max. 6). Current topics in entomology taught by entomology faculty, adjunct faculty or visiting faculty. Please check class schedule for current title.

5850. Research in Entomology. 1-3 (Max. 8). Individual investigations of particular problems. Prerequisite: graduate standing.

5852. Senior/Graduate Seminar. 1 (Max. 6). Discussion of important contributions to entomology. Dual listed with ENTO 4852. Prerequisite: graduate standing.

5884. Insect Behavior. 3. Fundamentals of insect behavior and an analysis of behavioral patterns. Dual listed with ENTO 4884. Prerequisite: one year of basic biology or equivalent; ENTO 5682 is recommended.
Rangeland Ecology and Watershed Management Major

Rangeland occupies 47% of the Earth's land area. The 50 million acres of rangeland in Wyoming provide diverse opportunities for the multiple uses of livestock and wildlife grazing, recreation, water production and natural beauty. Students are taught to understand and manage complex rangeland ecosystems.

The rangeland ecology and watershed management curriculum is designed for students choosing to study ecology, utilization and management of rangelands and wildland watersheds and related resources of forestry, recreation, wildlife management, soil science, botany and zoology. Degrees include Bachelor of Science, Master of Science and Doctor of Philosophy.

The undergraduate course of study helps students become well prepared for careers in natural resource management (e.g., range management, watershed management, restoration ecology/reclamation of degraded land, wildlife habitat management, ranch management, various types of environmental consulting), or other natural science careers. The curriculum fully meets the Office of Personnel Management (OPM) requirements for Range Conservationist. By appropriate course selection within the elective hours, students will also meet OPM requirements for additional professional work, such as soil conservationist or hydrologist.

Rangeland Ecology and Watershed Management Graduate Study

Areas of graduate study leading to a M.S. or Ph.D. in rangeland ecology and watershed management include range ecology, animal nutrition, watershed management, wildlife habitat management, restoration ecology and reclamation of disturbed lands. A graduate certificate in reclamation and restoration ecology and a graduate option in water resources are offered in affiliation with the rangeland ecology and watershed management graduate degree.

Course Requirements for a Major in Rangeland Ecology and Watershed Management (B.S.)

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>REWM</td>
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<tr>
<td>2000, 2500, 3020, 3500, 4330, 4530, 4700, 4830, 4850, 4900</td>
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<tr>
<td>Resource management</td>
<td>15-16</td>
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<tr>
<td>SOIL 2010, SOIL 4120, AGEC 4700, and choose one from BOT 4111, or RNEW 4130, BOT 3150 or GEOG 4200, USP general education requirements</td>
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<tr>
<td>Biological sciences</td>
<td>14-15</td>
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<tr>
<td>LIFE 1010 and 2023, or MICR 2021, LIFE 3400, and BOT 4680 or</td>
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<tr>
<td>CHEM 1000</td>
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<tr>
<td>Communication skills</td>
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<td>USP WA and WB writing courses, COJO 1010</td>
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<td>Mathematics and quantitative reasoning</td>
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<td>USP Quantitative Reasoning course, MATH 1400, STAT 2050</td>
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<td>Humanities and social sciences</td>
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<td>USP general education requirements, AGEC 1020</td>
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<td>Physical education</td>
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<tr>
<td>Electives</td>
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Concentrations

Rangeland ecology and watershed management are inherently broad fields and are becoming more diverse. Eight informal disciplinary concentrations are offered to expand educational experiences and enhance career opportunities. All require completion of basic core curriculum and additional course selections to fill unrestricted elective hours.


Rangeland Habitat Management. Manipulation of habitat of range animals, especially wildlife, for production, damage control, increased benefits of grazing impacts or increased recreational use.

Rangeland Ecology. The inherently multidisciplinary nature of range science, including interactions of natural vegetation, domestic livestock, wildlife, soils and management.

Natural Resources. Broad background in all aspects of natural resource management as required by federal and state management agencies.
Rangeland Improvements. Principles and practices to enhance rangeland values and uses through applied manipulations of both biotic and abiotic components of rangelands.

Rangeland Reclamation. Reclamation of drastically disturbed rangelands, including remediation of rangeland ecosystems impacted by such activities as surface mining, oil/gas development, wildfire and others.

Wildland Watershed Management and Range Hydrology. These two options provide a broad ecological basis for managing water resources, preparing students for participating in multidisciplinary decision-making processes affiliated with managing wildland watersheds.

Rangeland Business Management. The business of range animal management and production or recreational use of rangeland.

In addition, the department offers an approved ENR concentration in the School of Environment and Natural Resources.

Minor

A minor in rangeland ecology and watershed management is available for students in other majors interested in increasing their knowledge of the field. The number of hours required is 22. The required courses for the minor are: LIFE 1010 (4 hrs) and 3400 (3); and REWM 2000 (3), 2500 (2), 4330 (3), 4530 (1) and 6 hrs. selected from other REWM upper-division (3000 or 4000 level) courses.

Rangeland Ecology and Watershed Management (REWM)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2•QB]).

2000. Principles of Rangeland Management. 3. Basic principles of range management as they apply to various regions and vegetative types. Relationship of range management practices to livestock production, wildlife management, forestry, hydrology and other land uses. Introductory course for majors and non-majors. Prerequisite: LIFE 1001 or 1010. (Normally offered fall and spring semesters)


3020. Nutritional Management of Grazing Ungulates. 3. Characterization of grazing animal nutritional needs and foraging behavior; rangeland forages and supplements. Management of animals and forages/feeds to optimize nutrient intake. Prerequisite: approved University Studies biological sciences course. (Normally offered fall semester)

3100. Principles of Wildland Water Quality. 3. Basic principles of aquatic chemistry and water quality as they relate to watershed management practices including livestock production, agronomic production, mineral and natural gas extraction and other land uses. Prerequisite: CHEM 1000. (Normally offered fall semester)

3390. Range Judging. 2. Identification of important range plants based upon specialized morphological characteristics. UW Range Judging Team is selected from this course. Prerequisite: REWM 2000, 2500, and 3020. (Normally offered spring semester)

3500. Rangeland Plant Ecophysiology. 3. Examines plant physiological processes that have application to ecological and land management issues. Topics include carbon assimilation, water relations, mineral nutrition as applied to plant distributions, plant and system responses to grazing, as well as plant tolerance of extreme conditions including drought, excessive temperatures and changes in climate. Prerequisite: LIFE 2022 or 2023. (Normally offered fall semester)

4000. Poisonous Plants and Plant Toxins. 3. Plants poisonous to livestock in Wyoming and the Mountain West; identification, ecology, toxic principles, physiologic responses of animals, situations leading to poisoning, control and management to prevent losses. Prerequisite: 12 hours of biological and chemical sciences. (Normally offered spring semester)

4051. Environmental Politics. 3. [C2, W3•WC] Analyzes environmentalism as a political phenomenon. Provides students with a basic understanding of how to analyze political issues by: (1) examining the historical and contemporary issues that produce controversy over environmental matters; and (2) surveying the impacts of these issues on the formulation and implementation of laws, policies, and regulations. Cross listed with AMST, ENR, GEOG and POLS 4051. Prerequisite: POLS 1000.

4052. Federal Land Politics. 3. Examines the political forces that have shaped and continue to shape federal land policy and management. Explores the interactions between democratic decision making and science in the management of federal lands. Surveys the sources of controversy over federal land management and methods for harmonizing public demands with technical expertise. Cross listed with POLS/ENR/GEOG/AMST 4052. Prerequisite: POLS 1000.

4103 [3103]. Range and Ranch Recreation. 3. [C2•(none)] Understanding of public demands for leisure use of public and private rangelands; potential impacts on rangeland resources, ranch practices and families and other rangeland users. Students prepare public range or private ranch recreation operations plan. Graduate students assist in preparation and presentation of lecture. Dual listed with REWM 5103. Prerequisites: REWM 2000 and CS course. (Normally offered spring semester)

4150 [3150]. Behavior Modification for Production of Grazing Herbivores. 3. Strategies for manipulation of behavior and management of the grazing herbivore will be developed from scientific and practical information. Designed to equip the student to manage animal and natural resource production. Dual listed with REWM 5150. Prerequisites: REWM 2000 and REWM 3020 or ANSC 3100. (Normally offered spring semester)

4200. Reclamation of Drastically Disturbed Lands. 3. Overviews reclamation of drastically disturbed lands in the west, emphasizing surface mined lands. Includes principles of ecology, agronomy, soils and other relevant disciplines as applied to mitigate adverse environmental impacts of land disturbance. Prerequisite: LIFE 3400, AECL 2100. (Normally offered fall semester)

4210. Land Reclamation Seminar. 1 (Max. 2). Discusses pertinent topics within the reclamation field of disturbed lands. Prerequisite: REWM 4200 or concurrent registration. (Normally offered fall semester)

4285. Wildland Hydrology. 3. Teaches essential and unique characteristics of hydrologic cycle as occurred on range and forest lands, concentrating on quantification of these processes and storages. Dual listed with REWM 5285. Prerequisite: QA (Normally offered fall semester of even-numbered years)

4300 [3320]. Grass Taxonomy. 3. Identification of grasses and their place in range management and world agriculture. Dual listed with REWM 5300. Prerequisite: REWM 2500 or LIFE 2023. (Normally offered spring semester)
4330. Rangeland Ecosystem Assessment and Monitoring. 3. [M3\(\text{none}\)] Inventory and analysis of rangeland resources; vegetation; as well as concepts and techniques for utilization, condition, trend and suitability determination. **Prerequisites:** REWM 2000 and STAT 2050 or 2070. (Normally offered fall semester)

4340. Reclamation Techniques Field Trip. 2. Provides increased comprehension of current land reclamation problems and solutions by means of a field trip to sites in region where land reclamation is occurring. **Prerequisite:** REWM 4200. (Normally offered fall semester)

4530. Seminar. 1 (Max. 2). Discusses pertinent range management problems. **Prerequisite:** REWM 2000.

4540. Problems. 1-4 (Max. 6). Experimental work or intensive reading and discussion on range management problems. Includes problems offered in the following areas of range management: natural resources ecology, livestock habitat, business, improvements, watershed, reclamation, extension and international development. **Prerequisite:** basic training in field of problem selected and consent of instructor. (Offered fall, spring and summer)

4550. Internship in ____. 1 (Max. 4). Supervised field experience in range management or disturbed land reclamation. No more than 4 credits. **Prerequisites:** basic course work in subject selected and consent of instructor. (Offered fall, spring and summer)

4580. Rangeland Restoration Ecology. 3. Detailed analysis of various disturbed ecosystems unique to western rangelands. Primary emphasis on plant community restoration following degradation from edaphic, biotic, hydrologic, and topographic influences on degradation and strategies for vegetative rehabilitation. Strong focus on current research to formulate restoration strategies. Dual listed with REWM 5580. **Prerequisites:** REWM 4200 or LIFE 3400.

4700. Wildland Watershed Management. 3. Studies hydrological cycle with specific emphasis on the role of vegetation in hydrologic processes such as interception, surface detention storage, infiltration, percolation, run-off and water quality. Utilization of watersheds and vegetation manipulation practices to modify these hydrologic processes. **Prerequisite:** LIFE 1001 or 1010. (Normally offered spring semester)

4710 [4180]. Watershed Water Quality Management. 3. Studies watershed processes controlling water quality. Examines impacts of land use activities such as agriculture production, livestock grazing and mineral and natural gas extraction on surface water and ground water quality. Emphasis will be placed on water quality modeling and management. Dual listed with REWM 5710. **Prerequisites:** CHEM 1000. (Normally offered spring semester)

4750. Wildlife Habitat Restoration Ecology. 3. Emphasis on fundamental and applied aspects of restoration ecology for terrestrial wildlife habitats following anthropogenic and natural disturbances. Although the course overviews theoretical concepts applicable to many systems, there is a focus on applications for wildlife habitats in western North America. Dual listed with REWM 5750. **Prerequisites:** REWM 4330 and 4850.

4830. Ecological Applications for Wildland Management. 3. Emphasis on applying understanding of interactions among components of rangelands to facilitate sustainable provision of ecosystem services. The influences of stochasticity and disturbances on ecosystem structure and function will be the focus of discussion and technical writing exercises. **Prerequisites:** WA, REWM 2000, LIFE 3400 (the latter may be concurrent). (Normally offered fall semester)

4850. Rangeland Vegetation Management Techniques. 3. Uses applied ecological principles in restoration of degraded rangeland ecosystems to introduce methods for manipulating rangeland vegetation that satisfy land management objectives. Provides ecologically-sound practices to maintain optimal and sustained yield of rangeland products. **Prerequisites:** REWM 2000 and SB. (Normally offered spring semester)

4900. Rangeland Management Planning. 3. **[W3\(\text{WC}\)]** Applies planning processes that integrate soil, vegetation, water, livestock, wildlife and environmental regulatory considerations within the context of satisfying ecologically sustainable rangeland management objectives. **Prerequisites:** REWM/ANSC 3020, REWM 4330, AGEC 1020, and SOIL 4120. (Normally offered spring semester)

4990. Undergraduate Teaching Practicum. 1 (Max 2). Teaching experience in classroom or laboratory assisting faculty instructor. (Offered based on sufficient demand and resources)

5000. Range Resource Management. 3. Basic concepts and theories of rangeland resource management; trends in rangeland classification, grazing management and improvement practices. **Prerequisite:** graduate classification in agriculture or related natural resource subject matter areas.

5050. Range Forage Quality. 3. Effects of environments, grazing and management factors on preference and forage values of native range plants for domestic and wild grazing animals. **Prerequisite:** graduate or senior standing and REWM 2000 and ANSC 2020 or 3100.

5103. Range and Ranch Recreation. 3. Understanding of public demands for leisure use of and private rangelands; potential impacts on rangeland resources, ranch practices and families and other rangeland users. Preparation of public range or private ranch recreation operations plan. Graduate students assist in preparation and presentation of lecture. Dual listed with REWM 4103. **Prerequisites:** REWM 2000 and CS course.

5150. Behavior Modification for Production of Grazing Herbivores. 3. Strategies for manipulation of behavior and management of the grazing herbivore are developed from scientific and practical information. Designed to equip the student to manage for animal and natural resource production. Dual listed with REWM 4150. **Prerequisite:** REWM 2000 and ANSC/REWM 3020 or ANSC 3100.

5250. Water Resources Seminar. 1. Objective is to develop interaction among students from the various water resource disciplines to enhance their perspectives on how water problems are addressed within an interdisciplinary environment. **Prerequisite:** graduate status.

5285. Wildland Hydrology. 3. Teaches essential and unique characteristics of hydrologic cycle as occurs on range and forest lands, concentrating on quantification of these processes and storages. Dual listed with REWM 4285. **Prerequisite:** graduate standing and University Studies QA.

5300. Grass Taxonomy. 3. Identification of grasses and their place in range management and world agriculture. Dual listed with REWM 4300. **Prerequisite:** REWM 2500 or LIFE 2023.

5520. Ecology and Management of Grasslands. 3. Ecological nature, management strategies, and management problems of North American and world grassland ecosystems. **Prerequisites:** REWM 4300, 5300 and BOT 4700.
5580. Rangeland Restoration Ecology. 3. Detailed analysis of various ecosystems unique to western rangelands. Primary emphasis on plant community restoration following degradation from edaphic, biotic, hydrologic, and topographic factors. Application of ecological principles to rehabilitate vegetation and restore ecosystem function. Strong emphasis on current research to formulate restoration strategies. Prerequisites: REWM 4200 or LIFE 3400.

5610. Quantitative Modeling in Landscape Ecology. 3. Emphasis on quantitative, spatial analysis of landscapes and application of these quantitative tools to making sound management decisions. Work with real data, acquire high-level quantitative skills, develop problem-solving skills, and discuss management application of model results. Analysis will encompass abiotic, biotic (plant and animal), and human use of ecological systems in a spatial context. Cross listed with ECOL 5610. Prerequisites: upper division stats course (e.g., STAT 4015 or STAT 4025) and graduate standing.

5620. Graduate Seminar. 1-2 (Max. 6). Presentation and discussion of recent range management research. Prerequisite: graduate standing.

5640. Investigation. 1-4 (Max. 10). Research on specialized problems in range management. Investigations offered in the following areas of range management, habitat management, business management, range improvements and monitoring, watershed management, extension and international development. Prerequisite: graduate standing.

5710. Watershed Water Quality Management. 3. Studies watershed processes controlling water quality. Examines impacts of land use activities such as agriculture production, livestock grazing and mineral and natural gas extraction on surface water and ground water quality. Emphasis is placed on water quality modeling and management. Dual listed with REWM 4710. Prerequisites: CHEM 1000.

5750. Wildlife Habitat Restoration Ecology. 3. Emphasis on fundamental and applied aspects of restoration for terrestrial wildlife habitats following anthropogenic and natural disturbances. Although the course overviews theoretical concepts applicable to many systems, there is a focus on applications for wildlife habitats in western North America. Dual listed with REWM 4750. Prerequisites: REWM 4330 and 4850.

5800. Experiments in Restoration. 2. Emphasis on the current status of restoration science and the application of ecological theory in restoration ecology. Focus on concepts of population genetics, metapopulation biology and ecosystem science, food webs, biodiversity and invasion, conceptual models, experimental design and climate change. Address topics in experimental, ecological restoration. Prerequisites: graduate standing, STAT 2050, LIFE 3400.

5830. Wildlife Habitat Ecology. 2. For students in animal ecology, wildlife science, or rangeland ecology emphasizing the relationships between wildlife populations and their habitats. Emphasis on concepts forming the basis of wildlife habitat ecology including habitat and niche, carrying capacity, habitat measurements, resource selection, habitat-relationships modeling, habitat management, and habitat restoration. Prerequisites: STAT 2050 (or equivalent) and graduate standing.

5900. Practicum in College Teaching. 1-3 (Max. 3). Work in classroom with a major professor. Expected to give some lectures and gain classroom experience. Prerequisite: graduate status.

5920. Continuing Registration: On Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5940. Continuing Registration: Off Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5960. Thesis Research. 1-12 (Max. 24). Designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrollment in a graduate degree program.

5980. Dissertation Research. 1-12 (Max. 48). Designed for students who are involved in research for their dissertation project. Also used for students whose coursework is complete and are writing their dissertation. Prerequisite: enrollment in a graduate level degree program.

Earth System Science with a Concentration in Soil Science

The new Earth's Systems Science (ESS) undergraduate program integrates several disciplines across the UW campus, providing greater opportunities for students to learn about the importance of different components of the Earth. Soil Science is an integrating subject that unifies interactions among the atmosphere, hydrosphere, lithosphere and biosphere. An ESS degree with a concentration in Soil Science enhances educational opportunities for students by offering unique learning experiences because of UW's location, resources and faculty.

FRESHMAN YEAR: Fall Hrs.

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<td>MATH 1450</td>
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<td>LIFE 1010</td>
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FRESHMAN YEAR: Spring Hrs.

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SOPHOMORE YEAR: Fall Hrs.

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<td>MATH 2200</td>
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<td>USP Cultural Context and Diversity</td>
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SOPHOMORE YEAR: Spring Hrs.

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<td>USP Oral Communication</td>
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JUNIOR YEAR: Spring Hrs.

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JUNIOR YEAR: Summer (optional) Hrs.

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College of Agriculture
Minor in Soil Science

This program is designed to enhance soil expertise for students majoring in agricultural, natural resources, and environmental sciences degree programs. Undergraduate students minoring in Soil Science will enhance their job prospects with federal land management or conservation agencies (e.g., Forest Service, Bureau of Land Management, Natural Resources Conservation Society), state and federal regulatory agencies (e.g., Wyoming Department of Environmental Quality), mining and oil companies, environmental consulting companies, or scientific research organizations.

Course requirements (15 credit hours) for a Soil Science minor are: SOIL 2010, plus 11 credits of upper-division soil science courses for a total of 15 credits.

Soil Science Graduate Study

The department offers graduate work leading to the Master of Science and Doctor of Philosophy degrees in soil science, an affiliated graduate certificate in reclamation and restoration ecology and an affiliated graduate option in water resources. Our faculty have active programs in soil-plant fertility and nutrition, soil morphology, genesis and classification, soil and water quality, environmental soil microbiology, soil and environmental chemistry, and soil and water physics.

Soil Science (SOIL)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g., [M2•QB]).


3130. Environmental Quality. 3. Introduction to environmental quality issues and events. Course emphasizes impacts to soil, water, atmospheric, and vegetative ecosystems due to different nutrients and contaminants, including nitrogen, phosphorous, sulfur, trace elements, and organic chemicals. Current information pertaining to environmental quality is discussed and a field trip to the Union Pacific Tie Plant. Prerequisite: complete at least 1 University Studies Science course SB, SP or SE. (Offered fall semester)

4100. Soil Physics. 3. [M3•(none)] Examines forms and interrelations of matter and energy in the soil environment. Primarily addresses fluxes and transformations of soil water and solutes, as well as physical properties that influence soil productivity. Dual listed with SOIL 5100. Prerequisite: SOIL 2010 or equivalent introductory soils course. (Offered spring semester)

4105. Soil Physics Laboratory. 2. Teaches students the methodology and use of equipment to measure soil physical properties in the laboratory and field. Experiments include particle size analysis, soil surface area, soil-water measurement with neutron probe and TDR, field infiltration rate, soil-water retention curve, soil pore size distribution saturated and unsaturated conductivities, soil water potential and solute breakthrough curve. Dual listed with SOIL 5105. Prerequisite: SOIL 2010.
4535. Soil Biogeochemistry. 3. Focuses on fundamental considerations of organic substances, microbiological systems, and chemical processes in soils, sediments and waters. Examination of the nature and origin of organic matter and the role of microorganisms in organic nutrient transformations, reactions, and interactions in different ecosystems. Dual listed with SOIL 5535. Prerequisites: SOIL 2010, completion of courses in introductory college chemistry and biology, and consent of instructor(s).

4565. Research: Soil Science. 1-4 (Max. 6). Library, laboratory, and/or greenhouse investigations on select research topics. Graduate students will be required to give a presentation to the soil science group on their final product/report. Dual listed with SOIL 5565. Prerequisite: basic training in soil science research.

5100. Soil Physics. 3. Examines the forms and interrelations of matter and energy in the soil environment. Fluxes and transformations of soil water and solutes are addressed primarily, as well as physical properties which influence soil productivity. Dual listed with SOIL 4100. Prerequisite: MATH 2310.

5105. Soil Physics Laboratory. 2. Students learn methodology and use of equipment to measure soil physical properties in the laboratory and field. Experiments include particle size analysis, soil surface area, soil-water measurement with neutron probe and TDR, field infiltration rate, soil-water retention curve, soil pore size distribution, saturated and unsaturated conductivity, soil water potential and solute breakthrough curve. Dual listed with SOIL 4105. Prerequisite: AECL 2010.

5110. Modeling Water and Chemical Transport in Vasoe Zone and Groundwater Systems. 4. Mathematical models will be formulated and applied to simulate water flow and chemical transport in soil and groundwater systems. Soil spatial variability and heterogeneity will be considered in the modeling processes. Using and comparing models, students will obtain the capability to transfer a physical problem to a mathematical model, to use numerical methods, such as the finite element method, to solve the mathematical problem, and to correctly interpret the numerical outputs. Students will develop and program numerical solutions for select problems and will utilize existing codes for modeling a variety of comprehensive problems. Cross listed with MATH 5110.


5130. Chemistry of the Soil Environment. 3. Evaluation of the chemical and physical properties and reactions that occur in the soil environment. Fundamental principles of soil mineralogy, organic matter, and equilibrium chemistry as they relate to soil chemical reactions, plant nutrient availability, and pedogenetic processes will be emphasized. Dual listed with SOIL 4130. Prerequisite: MATH 1400, CHEM 1030 or CHEM 1060 and AECL 2010.

5135. Soil Chemistry Laboratory. 2. Laboratory techniques and methods of analysis are used to examine soils, sediments, and water chemical characteristics and reactions. Experiments include data analysis, computer models, nutrient and contaminant characteristics, mineral properties, soil/sediment oxidation-reduction reactions as well as others. Students are required to develop a soil chemistry experiment in their area of interest. Dual listed with SOIL 4135. Prerequisite: completion or concurrent enrollment in SOIL 4130/5130 or GEOL 4777/5777.

5140. Soil Microbiology. 4. Fundamental principles of soil microbiology and how they relate to microbial ecology, environmental contamination, agriculture and forestry. Dual listed with SOIL 4140; cross listed with MICR 5140. Prerequisite: SOIL 2010.

5150. Forest and Range Soils. 3. Characteristics and management of forest and range soils primarily in arid environments. Examines pedagogical units representative of forest and ranges and soil properties, such as nutrient availability and water relations, which influence plant growth. Dual listed with SOIL 4150. Prerequisite: SOIL 2010 and LIFE 2020.


5180. Chemistry and Remediation of Environmental Contaminants. 3. Trains students in predicting the fate of environmental contaminants (e.g., cadmium, lead, selenium, arsenic and molybdenum) in coal mine spoils and coal combustion solid wastes. Emphasis is placed on chemical speciation, adsorption/desorption, and precipitation/dissolution processes. Mobility of contaminants is predicted using chemical models (MINTEQA2, GEOCHEM, WATEQFC). New approaches for remediation of environmental contaminants are presented. Prerequisites: CHEM 1020 and MATH 2200.

5430. Applied Geostatistics. 3. Designed to provide general geostatistical analyses and their applications for spatial random variables and functions. Topics covered include variogram, cross validation, kriging, cokriging, sampling strategies, and both non-conditional and conditional simulations. Several geostatistics packages are used to analyze real field data and students are encouraged to use their own data for practicing geostatistical applications. Examples are taken from geohydrology, soil science, crop science, mining, and various environmental studies. Cross listed with GEOL/STAT 5430. Prerequisite: STAT 4020.

5510. Advanced Soil Genesis and Classification. 3. In-depth evaluation of the science of pedology, the philosophy and implementation of soil classification in the U.S. and world, and the formation of soils in different environments. Prerequisite: SOIL 5120 and graduate standing.

5535. Soil Biogeochemistry. 3. Focuses on fundamental considerations of organic substances, microbiological systems, and chemical processes in soils, sediments and waters. Examination of the nature and origin of organic matter and the role microorganisms in organic nutrient transformations, reactions, and interactions in different ecosystems. Dual listed with SOIL 4535. Prerequisite: SOIL 2010 and consent of instructor.

5565. Research in Soil Science. 1-4 (Max. 6). Library, laboratory, and/or greenhouse investigations on select research topics. Graduate students will be required to give a presentation to the soil science group on their final product/report. Dual listed with SOIL 4465. Prerequisite: Basic training in soil science research. SOIL 5565 reserved for graduate students.
5590. Special Topics in Soil Science. 1-3 (Max. 6). Special topics in soil science. Offered as an individual or small group basis as appropriate. Intended to accommodate various specialized subjects not offered on a regular basis. Students may enroll in more than one section of this course. Dual listed with SOIL 4590. Prerequisite: consent of instructor.

5720. Graduate Seminar. 1 (Max. 6). Review and discussion of recent soil research. Prerequisite: basic training in the field of problem selected and consent of instructor.

5900. Practicum in College Teaching. 1-3 (Max. 3). Work in classroom with a major professor. Expected to give some lectures and gain classroom experience. Prerequisite: graduate standing.

5920. Continuing Registration: On Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5940. Continuing Registration: Off Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5959. Enrichment Studies. 1-3 (Max. 99). Designed to provide an enrichment experience in a variety of topics. Note: credit in this course may not be included in a graduate program of study for degree purposes.

5960. Thesis Research. 1-12 (Max. 24). Designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrollment in a graduate degree program.

5980. Dissertation Research. 1-12 (Max. 48). Graduate level course designed for students who are involved in research for their dissertation project. Also used for students whose coursework is complete and are writing their dissertation. Prerequisite: enrollment in a graduate level degree program.

Department of Veterinary Sciences
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Department Head: Don Montgomery

Professors:
FRANCIS D. GALEY, B.S. Colorado State University 1981; D.V.M. 1983; Ph.D. University of Illinois, Urbana-Champaign 1988; Head of the Department of Veterinary Sciences and Director of the Wyoming State Veterinary Laboratory 1999; Dean, College of Agriculture and Natural Resources, 2001.


HERMANN SCHÄTZL, M.D. Max von Pettenkofer for Microbiology and Hygiene, Germany 1991; Wyoming Excellence Chair - Prion Biology 2010; Professor of Veterinary Sciences 2010.

Associate Professors:
TODD E. CORNISH, B.S. University of California-Davis 1990; D.V.M. 1994; Ph.D. University of Georgia 1999; Associate Professor of Veterinary Sciences 2005, 1999.

JONATHAN H. FOX, B.Sc., B.V.Sc. University of Liverpool, UK 1993; Ph.D. Virginia Tech 2002; Associate Professor of Veterinary Sciences 2008.

Assistant Professors:
GERARD P. ANDREWS, M.S. University of New Hampshire 1983; Ph.D. Uniformed Services University of Health Science 1993; Assistant Professor of Veterinary Sciences 2004.

MYRNA M. MILLER, D.V.M. Colorado State University 1984; Ph.D. Cornell University 2005; Assistant Professor of Veterinary Sciences 2010.

BRANT A. SCHUMAKER, D.V.M. University of California, Davis 2005; Ph.D. 2010; Assistant Professor of Veterinary Sciences 2010.

CHAOQUN YAO, M.D. Tongji Medical University, China 1986; Ph.D. University of Georgia 1995; Assistant Professor of Veterinary Sciences 2008.

Adjunct Professors:
BARBARA S. DROLET, B.S. University of Wyoming 1986; M.S. 1989; Ph.D. Oregon State University 1994; Adjunct Professor of Veterinary Sciences 2002.

ROBERT P. ELLIS, B.S. University of Wyoming 1966; M.S. Purdue University 1969; Ph.D. 1972; Adjunct Professor of Veterinary Sciences 2003.

GEOFFREY J. LETCHWORTH, B.S. Trinity College 1965; D.V.M. New York State College of Veterinary Medicine 1972; Ph.D. Cornell University 1980; Adjunct Professor of Veterinary Sciences 2001.

LESLIE W. WOODS, B.A. University of San Diego 1977; D.V.M. University of California-Davis 1982; Ph.D. University of California 1996; Adjunct Associate Professor of Veterinary Sciences 2007.

Adjunct Associate Professor:
MIKE MILLER, B.S. Colorado State University 1980; D.V.M. 1985; Ph.D. 1989; Adjunct Associate Professor of Veterinary Sciences 2005.

Adjunct Assistant Professor:
WALTER E. COOK, B.S. California Polytechnic State University 1989; D.V.M. University of California 1994; Ph.D. University of Wyoming 1999; Adjunct Assistant Professor of Veterinary Sciences 2003.

R. SCOTT SEVILLE, B.S. San Diego State University 1981; M.S. University of Wyoming 1987; Ph.D. 1992; Adjunct Assistant Professor of Veterinary Sciences 1998.

CYNTHIA M. TATE, B.S. Virginia Polytechnic and State University 1995; D.V.M. Virginia-Maryland Regional College of Veterinary Medicine 2000; Ph.D. University of Georgia 2005; Adjunct Assistant Professor of Veterinary Sciences 2006.
The Department of Veterinary Sciences and the Department of Animal Science have combined their efforts to offer B.S., M.S., and Ph.D. degrees in animal and veterinary science (see listing under this title). Several options within the major are available including preveterinary medicine and animal biology. Undergraduate course offerings of the Department of Veterinary Sciences are listed under the title of pathobiology. They were designed to familiarize students with the principles of animal disease and the basic biological and biomedical sciences.

The department operates the Wyoming State Veterinary Laboratory, an animal disease diagnostic laboratory (wyovet.uwyo.edu). This laboratory provides valuable hands-on experience for students interested in laboratory animal care, laboratory procedures, and research. Excellent faculty advisers are available for students interested in preveterinary medicine, microbiology, and animal biology.

**Graduate Study**

The Department of Veterinary Sciences offers advanced study leading to the master of science and doctor of philosophy in animal and veterinary science. Areas of emphasis include: pathology, molecular diagnostics, bacteriology, virology, parasitology, epidemiology, immunology, and toxicology of wild and domestic animals.

**Program Specific Admission Requirements**

Open to students with a bachelor of science degree who meet the requirements set forth in this Catalog.

Recommended prerequisites include: chemistry, biochemistry, animal anatomy and physiology, biology, microbiology, and introductory statistics.

**Program Specific Degree Requirements**

**Master of Science**

Only offered as Plan A

A minimum of 30 credit hours including 4 thesis hours must be earned in 4000-5999 level courses.

Seminar (PATB 5515) and STAT (5050) or their equivalents are required.

The program of study is arranged with the student's graduate committee.

**Doctoral Program**

It is a 72 hour program.

Students must meet the university minimum requirements.

**Pathobiology (PATB)**

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M24•QB]).

1001. Discovering Careers in Veterinary Medicine. 1. [none] Prerequisite: junior standing. (Normally offered spring semester)

4001. Epidemiology (Diseases in Population). 3. Basic epidemiologic concepts and approaches to population problems in medicine, with examples from veterinary and human health. Covers a wide spectrum of topics and introduces practical applications of epidemiology. Dual listed with PATB 5001; cross listed with MICR 4001. Prerequisite: MICR 2240 or PATB 2220 and STAT 2050.

4050. Problems in Animal Disease. 1-4 (Max. 6). Offers opportunity for supervised investigation of animal disease problems involving techniques of bacteriology, mycology, virology, gross pathology, histopathology and/or toxicology. Prerequisite: 12 semester hours of biological science and consent of instructor; MOLB 2210 is recommended for most students.

4100. Laboratory Animal Care and Management. 2. Informs junior, senior and graduate students of basic principles of care and management of the common laboratory animals used for research or as animal models of human disease. Prerequisite: 8 semester hours of biological science.

4110. Diseases of Food Animals and Horses. 3. Acquaints students with general principles of animal disease. Systematically discusses specific diseases of cattle, sheep, swine and horses. Dual listed with PATB 5110. Prerequisite: junior standing. (Normally offered fall semester)

4111. Equine Health and Disease. 2. To familiarize students with identification, prevention and treatment of diseases in horses through proper health management techniques. Cross listed with ANSC 4111. Prerequisite: ANSC 1030, ANSC 3150.

4130. Mammalian Pathobiology. 3. Anatomical basis of disease in mammals. Emphasis on concepts of pathogenesis of disease, and the gross, microscopic and clinicopathological changes associated with lesions: cell injury and death; cellular degeneration; disturbances of growth and circulation; neoplasia; inflammation; and recognition of gross and microscopic tissue changes. Background in immunology will be beneficial. Dual listed with PATB 5130; cross listed with MICR 4130. Prerequisite: C or better in LIFE 2022. (Normally offered spring semester)

4140. Principles of Toxicology. 3. Toxicology is the study of poisons, their mechanisms of action and their effects on various organisms including man and domestic animals. Designed to provide students in the life and environmental sciences with an understanding of the principles of toxicology as they apply to animal and human health, food safety and environmental studies. Dual listed with PATB 5140. Prerequisite: 9 hours of biological science (e.g., physiology), 4 hours chemistry, 3 hours biochemistry. (Normally offered fall semester of even-numbered years)

4150. Seminar. 1 (Max. 4). Preparation and oral presentation of papers on veterinary science topics. S/U Only. Prerequisite: 8 hours of biology and consent of instructor.

4170 [4120]. Diseases of Wildlife. 3. Introduction to wildlife diseases of the Rocky Mountain region and North America. Emphasis on infectious, parasitic, traumatic, toxic, and other disease agents with coverage of mechanisms of disease, epidemiology, and disease impacts on wildlife populations and species. Significant discussion of zoonotic diseases and diseases at the wildlife/domestic animal interface. Dual listed with PATB 5170. Prerequisite: 12 hours of biological or zoological sciences. (Offered spring semester of even-numbered years)
4200. Diagnostic Bacteriology. 1. Practical training with emphasis on diagnostic procedures used in a clinical microbiology laboratory. Students will identify bacterial pathogens of animals and humans. Taught in a clinical setting utilizing selected clinical material. Techniques employed in the processing and identification of clinically significant bacteria will be used and discussed. Safe laboratory practices for working with biohazards will be presented. Cross listed with MICR 4200. Prerequisites: junior standing and a microbiology course which included a laboratory.

4220. Molecular Mechanisms of Bacterial Pathogenesis. 3. Intended for students majoring in microbiology or a related field. The class will consist of lectures and small group decisions. Student responsibilities will include note-taking and preparation for discussion by completion of reading assignments consisting of classic and/or recent journal articles addressing the weekly topic. Cross listed with MICR 4220; dual listed with PATB 5220. Prerequisites: PATB/MICR 2220 and statistics (or epidemiology).

4310. Introduction to Veterinary Parasitology. 3. For animal science, zoology, biology or preveterinary majors. Discusses parasites of food producing and companion animals and uses preserved parasites in lecture and laboratory. Prerequisite: 8 hours of biological science. (Normally offered fall semester)

4320. Problems in Parasitology. 1-3 (Max. 5). Individual laboratory, library or field study of parasites and their host relations. Prerequisites: 8 semester hours of biological sciences or 3 semester hours of parasitology and consent of instructor.

4360. Medical Entomology and Parasitology. 4. Emphasis is on medically important arthropods, protozoa, and worms; clinical effects of infection, epidemiology, avoidance/control and identification/diagnosis. Cross listed with ENTO 4360; dual listed with PATB 5360. Prerequisite: 8 hours of biological science. (Normally offered fall semester)

4500. Veterinary Parasitology. 4. [S1◊(none)] Biology, importance, diagnosis and control of helminth and protozoan parasites of wild and domestic animals. Arthropod vectors and/or intermediate hosts of helminth & protozoan parasites are included. Diagnostic procedures and identification familiarity with agents are emphasized in lab. Prerequisite: 8 hours of biological science. (Offered fall semester of even-numbered years)

4710. Medical Virology. 3. Human and animal viruses as biological entities. Methods of study, classification, replication strategies, diagnostic approaches, epidemiology and significance as disease agents. Dual listed with PATB 5710. Cross listed with MICR 4710. Prerequisite: MOLB 2220 or MOLB 2240. (Normally offered fall semester)

5001. Epidemiology (Diseases in Population). 3. Basic epidemiologic concepts and approaches to population problems in medicine, with examples from veterinary and human health. Covers a wide spectrum of topics and introduces practical applications of epidemiology. Dual listed with PATB 4001; cross listed with MICR 5001. Prerequisites: MICR 2240 or PATB 2220 and STAT 2050.

5100. Diseases of Food Animals and Horses. 3. Acquaints students with general principles of animal disease. Systematically discusses specific diseases of cattle, sheep, swine and horses. Dual listed with PATB 4110. Prerequisite: junior standing or graduate student.

5120. Topics in Pathobiology. 1-4 (Max. 8). Lectures in current pathobiology topics derived from the expertise of the lecturer. Prerequisite: 12 hours of biological sciences and consent of instructor.

5130. Mammalian Pathobiology. 3. Anatomical basis of disease in mammals. Emphasis on concepts of pathogenesis of disease, and the gross, microscopic and clinicopathological changes associated with lesions; cell injury and death; cellular degeneration; disturbances of growth and circulation; neoplasia; inflammation; and recognition of gross and microscopic tissue changes. Background in immunology will be beneficial. Dual listed with PATB 4130. Prerequisite: C or better in LIFE 2022.

5140. Principles of Toxicology. 3. Toxicology is the study of poisons, their mechanisms of action, and their effects on various organisms including man and domestic animals. Designed to provide students in the life and environmental sciences with an understanding of the principles of toxicology as they apply to animal and human health, food safety and environmental studies. Dual listed with PATB 4140. Prerequisite: 9 hrs. biological science (eg. physiology), 4 hrs. chemistry, 3 hrs. biochemistry.

5160. Degeneration and Regeneration in the Nervous System. 2. Important neurodegenerative diseases of man and animals are discussed in terms of: impact on society, clinical findings, pathology, disease mechanisms and potential preventive and treatment strategies. There will be lectures, class discussions and a written project. Cross listed with NEUR 5160. Prerequisites: graduate standing. (Normally offered fall semester of odd-numbered years)

5170. Diseases of Wildlife. 3. Introduction to wildlife diseases of the Rocky Mountain region and North America. Emphasis on infectious, parasitic, traumatic, toxic, and other disease agents with coverage of mechanisms of disease, epidemiology, and disease impacts on wildlife populations and species. Significant discussion of zoonotic diseases and diseases at the wildlife/domestic animal interface. Dual listed with PATB 4170. Prerequisites: 12 hours of biological or zoological sciences.

5220. Molecular Mechanisms of Bacterial Pathogenesis. 3. Intended for students majoring in microbiology or a related field. The class consists of lectures and small group discussions. Student responsibilities will include note-taking and preparation for discussion by completion of reading assignments consisting of classic and/or recent journal articles addressing the weekly topic. Dual listed with PATB 4220; cross listed with MICR 5220. Prerequisites: PATB/MICR 2220 and statistics (or epidemiology).

5360. Medical Entomology/Parasitology. 4. Emphasis is on medically important arthropods, protozoa and worms; clinical effects of infection, epidemiology, avoidance/control and identification/diagnosis. Dual listed with PATB 4360. Prerequisite: 8 hours of biological science.
5400. Immunology. 4. Biology of the immune system; cellular and molecular mechanisms; host resistance to infectious agents; as well as hypersensitivities, autoimmunity, tumor and tissue rejection. Includes laboratory for immunological techniques. Students are required to complete a term paper and make a presentation. Dual listed with PATB 4400; cross listed with MOLB 5400. Prerequisite: MOLB 2220.

5500. Veterinary Parasitology. 4. Biology, importance, diagnosis and control of helminth and protozoan parasites of wild and domestic animals. Arthropod vectors and/or intermediate hosts of helminth & protozoan parasites are included. Diagnostic procedures and identification of agents are emphasized in lab. Prerequisite: 8 hours of Biological Science.

5505. Investigations in Pathobiology. 1-4 (Max. 8). Research involvement in pathobiology to learn laboratory methods, scientific literature, research design and data analysis and presentation. Prerequisite: graduate standing and/or consent of instructor and 16 hours of biological sciences.

5510. Introductory Virology. 3. Prokaryotic and eukaryotic viruses as infectious agents and models for modern molecular biology. Examines concepts and principles of pathogenesis, host response and the regulation of virus-host interactions. Genome organization, structure and replication will be examined within the context of the co-evolution of virus and host. Cross listed with MOLB 5510. Prerequisite: MOLB 3610 or 4600 plus 4610.

5515. Advanced Seminar in Pathobiology. 1 (Max. 4). Preparation and presentation of research topics in pathobiology with participation in discussions. Prerequisite: graduate standing and/or consent of instructor and 16 hours of biological sciences.

5710. Medical Virology. 3. Human and animal viruses as biological entities. Methods of study, classification, replication strategies, diagnostic approaches, epidemiology and significance as disease agents. Dual listed with PATB 4710. Prerequisite: MOLB 2220.

5900. Practicum in College Teaching. 1-3 (Max. 3). Work in classroom with a major professor. Expected to give some lectures and gain classroom experience. Prerequisite: graduate status.

5920. Continuing Registration: On Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5940. Continuing Registration: Off Campus. 1-2 (Max. 16). Prerequisite: advanced degree candidacy.

5959. Enrichment Studies. 1-3 (Max. 99). Designed to provide an enrichment experience in a variety of topics. Note: credit in this course may not be included in a graduate program of study for degree purposes.

5960. Thesis Research. 1-12 (Max. 24). Designed for students who are involved in research for their thesis project. Also used for students whose coursework is complete and are writing their thesis. Prerequisite: enrollment in a graduate degree program.

5980. Dissertation Research. 1-12 (Max. 48). Designed for students who are involved in research for their dissertation project. Also used for students whose coursework is complete and are writing their dissertation. Prerequisite: enrollment in a graduate level degree program.