The College of Agriculture and Natural Resources offers a wide variety of course work in agriculture, 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 types of agriculture found in the Rocky Mountain region.

Laboratory work is stressed in all programs because of its importance in agricultural 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 science
Microbiology
Molecular Biology
Rangeland ecology and watershed management

Bachelor of Science in Family and Consumer Sciences

Bachelor of Applied Science

Graduate Degrees
Master of Science

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

Agriculture College Basic Education Core

All undergraduates in College of Agriculture and Natural Resources 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

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 and Natural Resources Include:

- 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, broadcasting 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 back-grounds of the subject matter. Courses in broadcasting and journalism develop proficiencies demanded by employers of communication professionals.

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Studies Program requirements</td>
<td>30-36</td>
</tr>
<tr>
<td>Communications/journalism core</td>
<td>24</td>
</tr>
<tr>
<td>COJO 1000, 1010, 1040, 2100</td>
<td></td>
</tr>
<tr>
<td>and minimum of 12 hours of communication/journalism elective</td>
<td></td>
</tr>
<tr>
<td>Agriculture core requirements</td>
<td>42</td>
</tr>
<tr>
<td>At least 18 hours must be lower division</td>
<td></td>
</tr>
<tr>
<td>(Ag 1000-2000) elective courses, and at</td>
<td></td>
</tr>
<tr>
<td>least 24 hours must be upper division</td>
<td></td>
</tr>
<tr>
<td>(Ag 3000-4000) elective courses and</td>
<td></td>
</tr>
<tr>
<td>include AGRI 4975. Supporting course</td>
<td>4</td>
</tr>
<tr>
<td>requirement</td>
<td></td>
</tr>
<tr>
<td>STAT 2050 or 2070</td>
<td></td>
</tr>
<tr>
<td>Additional hours for major and</td>
<td></td>
</tr>
<tr>
<td>electives</td>
<td>18-24</td>
</tr>
</tbody>
</table>

Total Hrs: 120

Students wishing to pursue an area of emphasis in the agricultural communications option are encouraged to also select a minor. The college currently offers 22 minors, and any of these can help to better prepare students for employment or graduate work. (see above)

Agricultural communication majors also may complete an internship in their field. A variety of opportunities are available and students can work with the Associate Dean to determine an appropriate internship for their area of emphasis.

Agriculture Education with Concurrent Major in Agricultural Communications

This program consists of a minimum of 127 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 the College of Agriculture and Natural Resources and Natural Resources. Refer to the College of Education for specific curriculum requirements.

Agriculture (AGRI)

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

101. 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. [none]<\I, L] 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.

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.
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:
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.
CHRISTOPHER T. BASTIAN, B.S. University of Wyoming 1987; M.S. 1990; Ph.D. Colorado State University 2004; Assistant Professor of Agricultural and Applied Economics 2005.
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
Agricultural 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 (WA), WB-writing course,</td>
<td></td>
</tr>
<tr>
<td>AGEC 4950 and 4960, or 4965 (WC)</td>
<td></td>
</tr>
<tr>
<td>Quantitative (required for major)</td>
<td>6-7</td>
</tr>
<tr>
<td>MATH 1400; 2350</td>
<td></td>
</tr>
<tr>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010</td>
<td></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></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></td>
</tr>
<tr>
<td>Physical Education</td>
<td>1</td>
</tr>
<tr>
<td>Agricultural Economics</td>
<td>21</td>
</tr>
</tbody>
</table>

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**

9 (other than Agricultural economics)

**Statistics**

4

**Computers**

2-3

**Supporting Economics**

6

**ECON 3010 and 3020**

15

**Business**

ACCT 1010 and 1020; and 9 hours of 3000-4000 level business courses

**Electives**

15-16

**Total Hours**

121

---

### 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 (WA), WB-writing course,</td>
<td></td>
</tr>
<tr>
<td>AGEC 4950 and 4960, or 4965 (WC)</td>
<td></td>
</tr>
<tr>
<td>Quantitative (required for major)</td>
<td>6-7</td>
</tr>
<tr>
<td>MATH 1400; 2350</td>
<td></td>
</tr>
<tr>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010</td>
<td></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></td>
</tr>
<tr>
<td>Humanities, Arts, Culture</td>
<td>6</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></td>
</tr>
<tr>
<td>Physical Education</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1000 or 1020 or 1050</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 1010</td>
<td></td>
</tr>
<tr>
<td>Humanities, Arts, Culture</td>
<td>6</td>
</tr>
</tbody>
</table>

US Constitution                           | 3    |
Diversity                                  | 3    |
Global Awareness                           | 3    |
AGEC 3860 or 4880                          |      |
Physical Education                         | 4    |
SOC 1000 or POLS 1200                      |      |
US Constitution                           | 3    |
Diversity                                  | 3    |

### 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 (WA), WB-writing course,</td>
<td></td>
</tr>
<tr>
<td>AGEC 4950 and 4960, or 4965 (WC)</td>
<td></td>
</tr>
<tr>
<td>Quantitative (required for major)</td>
<td>6-7</td>
</tr>
<tr>
<td>MATH 1400; 2350</td>
<td></td>
</tr>
<tr>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010</td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>8</td>
</tr>
<tr>
<td>Social Science</td>
<td>3</td>
</tr>
<tr>
<td>AGEC 3860 or 4880</td>
<td></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></td>
</tr>
<tr>
<td>AGEC 1010</td>
<td></td>
</tr>
<tr>
<td>Humanities, Arts, Culture</td>
<td>6</td>
</tr>
</tbody>
</table>

US Constitution                           | 3    |
Diversity                                  | 3    |
Global Awareness                           | 3    |
AGEC 3860 or 4880                          |      |
Physical Education                         | 4    |
SOC 1000 or POLS 1200                      |      |
US Constitution                           | 3    |
Diversity                                  | 3    |
Global Awareness ...........................................1
AGEC 3860
Physical Education ...........................................1
Agricultural Economics ......................................21*
1010, 1020, 4060 or 4450, 4600 or 4660,
4880, and 6 hours of AGEC electives
Supporting Agriculture .......................................6
Other than agricultural economics
Statistics ............................................................4
Computers ..........................................................2-3
Supporting Business ..............................12
BUSN/INST 2000, ECON 3010,
3020 and 4740
Supporting International*** .........................15
POLS 2310 or 3220 or 3230 or 3270 or
4240 or 4250 or 4330 or 3220; GEOG
1020 or 1030 or 3030 or 3050 or 3550;
SOC/INST 4110 or 4300 or SOC 4600;
AGEC 4930, BUSN 4540, MKT/INST
4540 and other pre-approved courses
Foreign Language ..............................................12
1010, 1020, 2030
Electives .........................................................1-2
Total Hrs. .........................................................121

1All majors are required to take MATH 1400 and MATH
2350.
*At least 18 of these hours must be in upper-level (3000 or
above) courses. A maximum of three hours of AGEC
4910 and 4930 may be used to satisfy the agricultural
economics credit hour requirement.
**Majors are subject to university studies requirements
and must have a minimum of 48 hours of upper-level
(3000 and 4000) course work.
***One course in each of political science, sociology and
geography and recreation is required plus a minimum of
two additional courses. A maximum of 3 hours of AGEC
4930 can be applied to this requirement. Six hours of
international social science, business and economics can
be waived if the student minors in a foreign language.

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 busi-
ness should be directed to the Department of
Agricultural and Applied Economics.

Minors Program
The department also offers five minor pro-
grams. 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 cur-
ricula 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 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, 4860 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
4550.

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 agri-
culture 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 profes-
sional careers in the business sector. Students
in the agricultural business option may concen-
trate their coursework and writing in manage-
ment, 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 eco-
nomics or economics is not required.

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

Specifically, students who have not com-
pleted at least one course in calculus, statisti-
cals, 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/Water Resources; Plan A (thesis):

Students must complete the 26 credit hour agricultural and applied economics including M.S. core requirements plus 4 thesis hours and 10 credit hours in water resources approved courses.

Please refer to Water Resources Degree program in this Bulletin 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 business analysis 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.

Agricultural Economics (AGEC)

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

1000. Agricultural and Applied Economics Orientation. 2. [F1I, L] Directs students through a series of short writing and research exercises designed to improve the academic skills of new or prospective agribusiness majors. Also explores cultural diversity, career opportunities and degree requirements for majors, and strategies for using campus resources. Offered S/U only. (Normally offered fall semester)

1010. Principles of Macroeconomics I. 3. [C2CS] A beginning study of how economic society is organized and uses scarce resources to provide for its material wants. National income analysis; business cycles; the banking system; monetary and fiscal policy. Inflation and unemployment. Cross listed with ECON 1010.

1020. Principles of Microeconomics. 3. [C2CS] A basic study of value and price theory, monopoly and public policy; markets for productive goods and services; alternative forms of economic organization; international trade. Cross listed with ECON 1020.

2020. Farm and Ranch Business Management. 4. Discusses economic principles, business methods and science applied to organization and operation. Includes measurements of size of business; rate and efficiency of production. (Normally offered fall semester)

3400 [4400]. Agricultural Law. 3. [C2WB] Surveys legal issues and principles of practical concern to agriculture and examines legal institutions authorized to carry out laws affecting agriculture. Prerequisite: WA and junior standing. (Normally offered fall semester)

3860 [4860]. Economics of World Food and Agriculture. 3. [C2, G1G] Explores global food and agricultural issues with a focus on hunger, chronic malnutrition, and diets of people in developing countries. Introduces basic economic concepts pertinent to understanding and analyzing global food markets and prices and to evaluating government policies designed to reduce food insecurity, enhance diets, and promote agricultural development. Cross listed with INST 3860. Prerequisite: An economics principles course. (Normally offered spring semester)
4050. Agribusiness Marketing. 3. Students develop a strategic marketing plan for an agricultural and food product. Content includes study of aspects of the global food industry influencing consumer demand; contemporary topics in food marketing and policy; agricultural supply marketing; marketing research methods; marketing profitability measures; pricing; new product introduction; branding, and industry competitive analysis. Prerequisites: AGEC 1020 or ECON 1020 and MATH 1400. (Normally offered spring semester)

4060. Agribusiness Management. 3. [M3◊ (none)] Applies quantitative, economic, financial and managerial analysis to agribusiness sector. Prerequisites: AGEC 1020 and MATH 1400. (Normally offered fall semester)

4070. Agricultural Sales. 3. Applies transactional analysis for understanding human behavior in agribusiness sales. Introduces experimental learning and fundamentals of agribusiness sales. Prerequisites: AGEC 1020 and COJO 1010. (Normally offered spring semester)

4230. Intermediate Econometric Theory. 3. Covers simple and multiple regression models, problems of estimation, hypothesis and diagnostic testing, dummy variable, 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. Cross Listed with ECON 4230; dual listed with AGEC 5230. Prerequisites: ECON 3020, STAT 2050 and MATH 2350. (Normally offered spring semester)

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 ways 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◊ (none)] Applies economic theory to an analysis of economic organization and operation of agricultural markets, including price behavior. Prerequisite: MATH 1400 and ECON 3020. (Offered spring semester of odd-numbered years)

4880. International Agricultural Trade, Markets and Policy. 3. [C2, G1◊ 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. Prerequisite: 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. Prerequisite: 10 hours of AGEC and approval of faculty supervisor.

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


4965. Agribusiness Strategy and Ethics Capstone. 3. [none]\[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. Prerequisite: 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. Prerequisite: 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 ways 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 lectures, lectures, guest lectures, field trips and community analysis projects. Dual listed with AGEC 4660. Prerequisite: AGEC/ECON 4020 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 cost 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. Prerequisites: 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.

5960. Thesis Research. 1-12 (Max. 24). 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.
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.
Animal and veterinary science          37
Required courses: ANSC 1010, 3010, 3100, 4100, 4120, 4540 and two courses selected from 3150, 4220 or 4230; PATB 4110.
Agricultural sciences                   10
Required courses: FDSC 2040 and 3060
Biological sciences                    11
Required courses: LIFE 1010, 2022, 3050
Physical sciences                      7-8
Required courses: CHEM 1000; CHEM 2300 or ANSC 2010
Quantitative reasoning, statistics or computer science 8
Required courses: MATH 1400 or 1450; plus at least one course in statistics or computer science (including AGRI 1010)
Written and Oral Communication Skills 12
Required courses: WA, WB; ANSC 4630 (WC) 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: AGEC 2020, 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, 4220, 4230 or 3150, 4150; PATB 4110.
Range livestock option

This option emphasizes range livestock management. Students interested in the management of livestock and range resources should enroll in this option.

Animal and veterinary science          32
Required courses: ANSC 1010, 3010, 3100, 2020 or 4100, 4120, 4540, 4220, 4230 or 3150, 4150; PATB 4110.
Rangeland ecology and watershed management 17
Required courses: REWM 2000, 2500, 3500, 4000, 4330, 4900
Biological sciences                     11
Required courses: LIFE 1010, 2022, and 3050
Agricultural sciences                   11
Required courses: AGEC 2020; FDSC 2040, 3060
Physical sciences                       7-8
Required courses: CHEM 1000; CHEM 2300 or ANSC 2010
Quantitative reasoning, statistics or computer science 8
Required courses: MATH 1400 or 1450; plus at least one course in statistics or computer science (including AGRI 1010)
Written and Oral Communication Skills 12
Required courses: WA, WB; ANSC 4630 (WC) 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: AECL 2010; REWM 4530, 4850; AGEC 4640

Communication Option

Students in this option obtain a basic education in animal and veterinary science and also acquire in-depth communication skills. Students interested in careers in agriculture communications with emphasis on the livestock industry should enroll in this option.
Animal and veterinary science          32
Required courses: ANSC 1010, 3010, 3100, 2040 or 4100, 4120, 4540 and two courses selected from 3150, 4220 or 4230; PATB 4110
Agricultural sciences                   18
Required courses: FDSC 3060
Biological sciences                     11
Required courses: LIFE 1010, 2022, 3050
Physical sciences                       7-8
Required courses: CHEM 1000; CHEM 2300 or ANSC 2010
Quantitative reasoning, statistics or computer science 8
Required courses: MATH 1400 or 1450; plus at least one course in statistics or computer science (including AGRI 1010)
Written and Oral Communication Skills 26
Required courses: WA, WB; ANSC 4630 (WC) and COJO 1010 plus 14 additional credit hours in COJO.
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: AECL 2010; REWM 4530, 4850; AGEC 4640

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 .................. 30
Required courses: ANSC 1010, 3010, 3100, 4120; PATB 4400; Suggested courses: ANSC 4100, 4540, 4260; PATB 4110, 4500, 4140, 4710

Agricultural sciences .......................... 4
FDSC 3060

Biological sciences .......................... 18-19
Required courses: LIFE 1010, 2022, 3050; MICR 2240 or MOLB 2210; PSYC 3600; Suggested courses: LIFE 3600; ZOO 4140, 4340

Physical and chemical sciences .................. 28-34
Required courses: CHEM 1020, 1030, 2300 (or 2420, 2440); PHYS 1110, 1120; MOLB 3610 and 4100/4105 or MOLB 4600/4610

Quantitative reasoning, statistics and computer science .......................... 13-14
Required courses: MATH 1400/1405 or 1450, 2220; STAT 2050; students lacking basic skills with personal computers are encouraged to enroll in COSC 1200 or AGRI 1010

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

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 .................. 14
Required courses: ANSC 1010, 3010, 3100 or FCSC 4145; PATB 4110

Food science .......................... 28
FDSC 1410, 2040, 3060, 4060, 4090, 4100, 4720, 4760, 4800, 4810

Agricultural Economics/Business .......................... 12
Required course: AGEC 3860

Biological sciences .......................... 12-13
Required courses: LIFE 1010, 2022; MOLB 2210 or MOLB 2420

Physical sciences .......................... 7-8
Required courses: CHEM 1000; CHEM 2300 or ANSC 2010

Quantitative reasoning, statistics, computer science .......................... 7
Required courses: MATH 1400; STAT 2050

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

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 pre-veterinary 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 MOLB 2420

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 Family 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 coursework. 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 following 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 available in agricultural economics, biochemistry, microbiology, range management, genetics, statistics, and other areas of interest to the individual. In certain cases it is possible to develop 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 extension centers in the state. Research laboratories are located on campus and include a semi commercial wool scouring and processing laboratory 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 coursework-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 coursework 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. [M2(Q)B]).

1000. Intellectual Community in Animal and Veterinary Sciences. 1. [(none)(1, L]
Introduction to the field of animal and veterinary 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 industry, management of beef cattle, sheep, dairy cattle, horses, swine and poultry. Introduces breeding and genetics, reproduction and nutrition 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(none)](none) Teaches comparative anatomy and physiology of digestion, circulation, production, reproduction and environment of farm animals. Prerequisites: LIFE 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)

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.
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 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 Management. 3. Integrates animal breeding, nutrition and reproductive physiology in swine production management schemes. Prerequisites: ANSC 3100, 4120, 4540. (Normally offered fall 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. Prerequisites: 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 development. 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‡WC] 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.

5061. 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.

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)
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 feedstuffs 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.

5520. Animal Nutrition. 3. Topics in Range Nutrition. 3. Lectures on current range nutrition topics with study 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. Prerequisite: 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.

5880. Advanced Topics. 1-3 (Max. 6). Special topics will be offered based on interest of students and faculty. Credit hours are variable 1-3 and are repeatable. Prerequisite: graduate standing.

5890. Advanced Seminar. 1-2 (Max. 6). Preparation, presentation, and discussion of assigned reports. Invitational lectures by visiting guests.

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). Prerequisite: enrolled in a graduate degree program.

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. [M2•QB]).

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, degenerate diseases and general health. Students become familiar with foods and food industry. (Normally offered spring semester)

1490. Safety of Our Food. 4. [S1•(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)

3060. 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. Prerequisites: CHEM 1000 and LIFE 1010.

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 cured 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. Prerequisite: 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 5090; cross listed with MICR 4090. Prerequisite: MOLB 2210. (Normally offered spring semester)

4771. 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.

4772. 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.

4773. 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.

4774. 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. Prerequisites: 6 hours in FDSC, 6 hours in chemistry and consent of instructor. (Offered fall, spring and summer)

4900. Food Safety. 3. Issue-oriented lecture/discussion course. Includes topics such as what is safe food, what makes food unsafe and how safety of a food is determined. Presents laws and regulations on food safety. In addition to a text, area experts are invited to discuss important issues. Prerequisite: 6 hours of biological science. (Offered fall semester of odd-numbered years)

5090. 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. Prerequisite: MOLB 2210.

5100. Food Microbiology Laboratory. 1. Laboratory techniques used in food microbiology. Dual listed with FDSC 4100. Prerequisite: FDSC 4090 or 5090, taken concurrently.

5170. 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 ANSC 5170. Prerequisite: six credits in chemistry or biochemistry.

5220. Techniques of Food Science. 3. A laboratory course designed to introduce undergraduate and graduate students to sophisticated techniques used in food science research. Prerequisites: one semester of graduate study and consent of instructors.

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.

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.

5771. Muscle Structure and Function. 1. Explores properties of skeletal muscle with emphasis on cellular and extracellular proteins, ultrastructure and function. Dual listed with FDSC 4771. Prerequisite: FDSC 3060 or equivalent.

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.

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.

The Department of Veterinary Sciences section, including Pathobiology course offerings begins on page 128.

Earth System Science Program
6072 Engineering Building, 755-4955
FAX: (307) 766-2635
Web site: www.uwyo.edu/ESS
Director: Robert D. Kelly

Earth System Science (ESS) is an interdisciplinary, science-oriented, undergraduate program focusing on the interactions between the various components composing the Earth system: the biosphere, geosphere, lithosphere, hydrosphere, atmosphere, and anthroposphere. Students earning a BS degree in ESS are required to declare a Concentration in one of the participating programs, which include Anthropology, Atmospheric Science, Biology, Botany, Geography, Geology and Geophysics, Secondary Education, and Soil Science. This list will expand as the program grows. ESS is administered under a committee of Deans, and the program Departments reside in the Colleges of Agriculture, Arts and Sciences, Education, and Engineering. The program is currently administered in Atmospheric Science. See page 384 for more information.

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 and Food 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:
Mark Bittner, Suzanne Pelican, Treva Sprout

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 child development or family and community services to positions in apparel 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, professional child development, family and community services, or textiles and merchandising. Minors in apparel design, child and family studies, food and 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 majors in the Professional Child Development or Family and Community Services option are required to complete a security screening upon declaring their major. The student is responsible for the cost of this screening. Failure to do so will result in the student being dropped from 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 our electronic portfolio student assessment system. Failure to successfully complete this course within the required time frame could result in a student being dropped from the program. The family and consumer sciences core consists of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FCSC 1010 Perspect. in FCSC</td>
<td>2</td>
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<tr>
<td>FCSC 1140 Nutrition</td>
<td></td>
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<tr>
<td>FCSC 1141 Principles of Nutrition</td>
<td></td>
</tr>
<tr>
<td>FCSC 1150 Scientific Study of Food</td>
<td>2-3</td>
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<tr>
<td>FCSC 2121 Child Development</td>
<td></td>
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<tr>
<td>FCSC 2131 Family Relationships</td>
<td>3-4</td>
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<tr>
<td>FCSC 2170 Clothing in Modern Soc.</td>
<td></td>
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<td>FCSC 2180 Housing</td>
<td></td>
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<tr>
<td>FCSC 3171 Intro. Textile Science</td>
<td>3</td>
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<tr>
<td>FCSC 4112 Family Decision Making</td>
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<td>FCSC 3110 Personal Finance</td>
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<td>FCSC 4113 Consumer Issues</td>
<td></td>
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<tr>
<td>FCSC 4010 Philosophical &amp; Research Perspectives in FCSC</td>
<td>2</td>
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</tbody>
</table>

Total 15-17

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>Credits</th>
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<tbody>
<tr>
<td>LIFE 1010 General Biology</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1400 College Algebra</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1020 General Chemistry I</td>
<td>4</td>
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<tr>
<td>CHEM 1030 General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 2300 Intro to Organic Chem</td>
<td>4</td>
</tr>
<tr>
<td>MOLB 2021 General Microbiology</td>
<td>4</td>
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</table>

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>SOC 1000 Sociological Principles</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 1000 General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>ECON 1010 Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>COJO 1010 Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>STAT 2050 Fund of Statistics</td>
<td>4</td>
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</table>

**FCSC Department**

<table>
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<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FCSC 1010 Perspectives in FCSC</td>
<td>2</td>
</tr>
<tr>
<td>FCSC 1141 Principles of Nutrition</td>
<td>3</td>
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<tr>
<td>FCSC 1150 Scientific Study of Food</td>
<td>3</td>
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At least one FCSC Elective

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>STAT 2050 Fund of Statistics</td>
<td>4</td>
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USP Courses (Not already listed in the above categories)

**Human Nutrition and Food**

Students who graduate from the human nutrition and food option will be prepared to pursue careers in human nutrition, the food industry, or to pursue graduate degrees.

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FCSC 1150 Scientific Study of Food</td>
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<tr>
<td>MATH 1400 <strong>College Algebra</strong></td>
<td>3</td>
</tr>
<tr>
<td>LIFE 1010 General Biology</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 1141 Principles of Nutrition</td>
<td>3</td>
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<tr>
<td>ECON 1010 Principles of Macroecon</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1020 <strong>Gen. Chemistry I</strong></td>
<td>4</td>
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<tr>
<td>CHEM 1030 <strong>Gen. Chemistry II</strong></td>
<td>4</td>
</tr>
<tr>
<td>COJO 1010 Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 1000 General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>SOC 1000 Sociological Principles</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3140 Maternal, Infant, and Adolescent Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4142 Nutrition &amp; the Elderly</td>
<td>1</td>
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<tr>
<td>CHEM 2300 Intro Organic Chem</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 4145 <strong>Adv. Nutrition</strong></td>
<td>4</td>
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<tr>
<td>FCSC 4146 Therapeutic Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 4150 Experimental Foods</td>
<td>3</td>
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</tbody>
</table>

**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>Credits</th>
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<tbody>
<tr>
<td>POLS 1000 American &amp; Wyo Gov’t</td>
<td>3</td>
</tr>
<tr>
<td>ZOO 3115 Human Systems Phys</td>
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<tr>
<td>FCSC 3150 Intermediate Foods</td>
<td>2</td>
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<tr>
<td>FCSC 3140 Maternal, Infant, and Adolescent Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4142 Nutrition &amp; the Elderly</td>
<td>1</td>
</tr>
<tr>
<td>MOLB 3610 Princ of Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 3147 Community Nutrition</td>
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<tr>
<td>FCSC 4147 Nutrition and Weight Control</td>
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<tr>
<td>ENGL 4010 Technical Writing in the Professions</td>
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<tr>
<td>MOLB 4100 Clinical Biochemistry</td>
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<tr>
<td>FCSC 4145 Adv Nutrition</td>
<td>4</td>
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<tr>
<td>MGT 3210 Mgt and Organization</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3152 Food Systems Prod</td>
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</tr>
<tr>
<td>FCSC 4146 Therapeutic Nutrition</td>
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</tr>
<tr>
<td>FCSC 4106 Therapeutic Nutr Lab</td>
<td>1</td>
</tr>
<tr>
<td>FCSC 4104 Clinical Pract in Diet</td>
<td>1</td>
</tr>
<tr>
<td>FCSC 4150 Experimental Foods</td>
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</table>

**GPA of 2.85**

**Indicates courses with prerequisites**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
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<tr>
<td>LIFE 1010 General Biology</td>
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<tr>
<td>FCSC 1141 Principles of Nutrition</td>
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<tr>
<td>ECON 1010 Principles of Macroecon</td>
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<tr>
<td>CHEM 1020 <strong>Gen. Chemistry I</strong></td>
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<td>COJO 1010 Public Speaking</td>
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<tr>
<td>PSYC 1000 General Psychology</td>
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<tr>
<td>SOC 1000 Sociological Principles</td>
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<tr>
<td>CHEM 2300 Intro Organic Chem</td>
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<td>FCSC 4145 <strong>Adv. Nutrition</strong></td>
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<tr>
<td>FCSC 4150 Experimental Foods</td>
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</table>

**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>Credits</th>
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<tr>
<td>FCSC 4142 Nutrition &amp; the Elderly</td>
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<tr>
<td>MOLB 3610 Princ of Biochemistry</td>
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<tr>
<td>FCSC 3147 Community Nutrition</td>
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<tr>
<td>FCSC 4147 Nutrition and Weight Control</td>
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<tr>
<td>ENGL 4010 Technical Writing in the Professions</td>
<td>3</td>
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<tr>
<td>MOLB 4100 Clinical Biochemistry</td>
<td>3</td>
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<tr>
<td>FCSC 4145 Adv Nutrition</td>
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<tr>
<td>MGT 3210 Mgt and Organization</td>
<td>3</td>
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<tr>
<td>FCSC 3152 Food Systems Prod</td>
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<tr>
<td>FCSC 4106 Therapeutic Nutr Lab</td>
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<tr>
<td>FCSC 4104 Clinical Pract in Diet</td>
<td>1</td>
</tr>
<tr>
<td>FCSC 4150 Experimental Foods</td>
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</tbody>
</table>
Premedicine Career Track

Students who wish to pursue the premedicne career track will obtain the necessary coursework to apply to medical school. This track requires that specific substitutions and additions must be made to the general human nutrition and food curriculum.

Additional courses may be necessary as dictated by specific medical schools. See an adviser for these specific requirements.

Professional Child Development

The professional child development option 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-age five teaching certificate, for those students who apply to the endorsement program, or post-graduate completion of a teaching certificate in early childhood special education. This option is also available through distance delivery administered by the Outreach School.

**Indicates courses with prerequisites.

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tr>
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<td>PSYC 1000</td>
<td>General Psychology</td>
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<tr>
<td>EDEC 1020</td>
<td>Intro to Early Childhood Education</td>
<td>3</td>
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<tr>
<td>EDEC 3000</td>
<td>*Observing Young Children</td>
<td>3</td>
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<tr>
<td>EDEC 3220</td>
<td>*School Programs for Young Children</td>
<td>3</td>
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<tr>
<td>FCSC 3128</td>
<td>Child Development Practicum</td>
<td>3</td>
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<tr>
<td>EDIC 4320</td>
<td>*Oral and Written Language Acquisition</td>
<td>3</td>
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<tr>
<td>FCSC 2131</td>
<td>*Family Relations</td>
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<tr>
<td>FCSC 2110</td>
<td>Fundamentals of Aging and Human Development</td>
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<tr>
<td>FCSC 2121</td>
<td>**Child Development</td>
<td>4</td>
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<tr>
<td>FCSC 2131</td>
<td>**Family Relations</td>
<td>3</td>
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<tr>
<td>FCSC 2133</td>
<td>**Intimate Relationships</td>
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<td>FCSC 3119</td>
<td>**Parent-Child Relations</td>
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<td>FCSC 4112</td>
<td>**Family Decision Making</td>
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<td>FCSC 4117</td>
<td>**Community Leadership</td>
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<td>POLS 4710</td>
<td>**Non-Profit Mgmt &amp; Leadership</td>
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<td>FCSC 4124</td>
<td>**Families of Young Children</td>
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<tr>
<td>FCSC 4129</td>
<td>**Internship in Family &amp; Community</td>
<td>6-8</td>
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<tr>
<td>FCSC 4138</td>
<td>**Family Stress &amp; Coping</td>
<td>3</td>
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<tr>
<td>FCSC 4139</td>
<td>**Prof. Practices in FCS</td>
<td>3</td>
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<tr>
<td>CNSL 4520</td>
<td>Fund. of Counseling</td>
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<tr>
<td>FCSC 3122</td>
<td>Adolescence</td>
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<tr>
<td>PSYC 4300</td>
<td>The Adolescent</td>
<td>3</td>
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<tr>
<td>SOC 1100</td>
<td>**Social Problems/Issues</td>
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<tr>
<td>SOC 4000</td>
<td>Social Inequality</td>
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</table>

Electives in consultation with 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.

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>FCSC 1180</td>
<td>Applied Design</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2170</td>
<td>**Clothing in Modern Society</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2180</td>
<td>Housing</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 2188</td>
<td>**Interior Design I</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3170</td>
<td>Fabric Construction Techniques</td>
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</tr>
<tr>
<td>FCSC 3171</td>
<td>Intro Textile Science</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3172</td>
<td>Intro Textile Science Lab.1</td>
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<tr>
<td>FCSC 3173</td>
<td>Visual Merchandising and Production</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3184</td>
<td>Foundations of Merchandising</td>
<td>3</td>
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<tr>
<td>FCSC 4113</td>
<td>Consumer Issues</td>
<td>3</td>
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<tr>
<td>MKT 4240</td>
<td>Consumer Behavior</td>
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<tr>
<td>FCSC 4171</td>
<td>**Adv. Textiles</td>
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<tr>
<td>FCSC 4174</td>
<td>**Foundations of Merchandising II</td>
<td>3</td>
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<tr>
<td>FCSC 4175</td>
<td>**Textile Testing and Product Analysis</td>
<td>3</td>
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<tr>
<td>FCSC 4176</td>
<td>Historic Clothing</td>
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<tr>
<td>FCSC 4181</td>
<td>**Global Textile Marketplace</td>
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<tr>
<td>FCSC 4182</td>
<td>**Textile Industry and the Environment</td>
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**Required Supporting Courses**

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<tr>
<td>CHEM 1000</td>
<td>Intro. Chemistry</td>
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<tr>
<td>CHEM 1020</td>
<td>General Chemistry</td>
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<td>PSYC 1000</td>
<td>General Psychology</td>
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<tr>
<td>AGRI 1010</td>
<td>Computers in Ag.</td>
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<tr>
<td>COSC 1200</td>
<td>Computer Info. Systems</td>
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<td>ECON 1010</td>
<td>Prin. of Macroecon.</td>
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<tr>
<td>AGEC 1010</td>
<td>Prin. of Macroecon.</td>
<td>3</td>
</tr>
<tr>
<td>SOC 1000</td>
<td>Sociological Principles</td>
<td>3</td>
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<tr>
<td>ACCT 1010</td>
<td>**Prin. of Accounting I</td>
<td>3</td>
</tr>
<tr>
<td>MGT 3210</td>
<td>**Intro to Marketing</td>
<td>3</td>
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<tr>
<td>MGT 3210</td>
<td>Management and Organization</td>
<td>3</td>
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</table>
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.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FCSC 2175</td>
<td>Fashion Illustration</td>
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<tr>
<td>FCSC 3170</td>
<td>Fabric Construction Techniques</td>
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<tr>
<td>FCSC 3171</td>
<td>Intro Textile Science</td>
<td>3</td>
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<tr>
<td>FCSC 3174</td>
<td>Flat Pattern Design</td>
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<tr>
<td>FCSC 3175</td>
<td>Drafting &amp; Draping</td>
<td>3</td>
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<tr>
<td>FCSC 4178/5178</td>
<td>Fiber Arts</td>
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<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>FCSC 1180</td>
<td>Applied Design</td>
<td>3</td>
</tr>
<tr>
<td>ART 1120</td>
<td>Foundation: Three Dimension</td>
<td>3</td>
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</table>

One of the following:

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<tr>
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<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>FCSC 4171</td>
<td>Advanced Textiles</td>
<td>3</td>
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<tr>
<td>ART 1130</td>
<td>Foundation: Color Thy</td>
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One of the following:

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<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FCSC 4176/5176</td>
<td>Historic Clothing</td>
<td>3</td>
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<tr>
<td>ART 2020</td>
<td>Art History II</td>
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Total 28

Child and Family Studies

A minor in child and family studies strengthens degrees in majors such as psychology, sociology, social work, health education, nursing, criminal justice (juvenile justice), communications, African-American Studies, American Indian Studies, or Chicano Studies. Faculty emphasize cross-cultural and global issues.

**Indicates courses with prerequisites.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>FCSC 3120</td>
<td>**Multicultural Influences on the Young Child</td>
<td>3</td>
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<td>FCSC 4104</td>
<td>**Field Studies in Family and Consumer Sciences</td>
<td>3</td>
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<tr>
<td>FCSC 4112</td>
<td>**Family Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4113</td>
<td>**Consumer Issues</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4117</td>
<td>**Community Leadership</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>
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<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>
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</tbody>
</table>

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.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>FCSC 1140</td>
<td>Nutrition or</td>
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<tr>
<td>FCSC 1141</td>
<td>Principles of Nutrition</td>
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Total 2-3

Select 15-16 additional credit hours from the following:

Nutrition Group

<table>
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<tr>
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<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FCSC 3140</td>
<td>**Maternal, Infant and Adolescent Nutrition</td>
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<tr>
<td>FCSC 3145</td>
<td>Sports Nutrition and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 3147</td>
<td>Community Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>FCSC 4142</td>
<td>Nutrition &amp; the Elderly</td>
<td>1</td>
</tr>
<tr>
<td>FCSC 4145</td>
<td>**Adv. Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 4146</td>
<td>**Therapeutic Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 4147</td>
<td>**Nutrition &amp; Weight Control</td>
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</table>

Food Group

<table>
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<tr>
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<tbody>
<tr>
<td>FCSC 1150</td>
<td>Scientific Study of Food</td>
<td>3</td>
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<tr>
<td>FCSC 3150</td>
<td>**Intermediate Foods</td>
<td>2</td>
</tr>
<tr>
<td>FCSC 3152</td>
<td>**Food Systems Prod.</td>
<td>3</td>
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<td>FCSC 4150</td>
<td>**Experimental Foods</td>
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Independent Study

<table>
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<tbody>
<tr>
<td>FCSC 4106/5102</td>
<td>Special Problems</td>
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</table>

*Maximum of 3 hours

Total 18

Interior Design

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.

Required Courses

<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
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<td>**Interior Design I</td>
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<tr>
<td>ARE 2200</td>
<td>Building Materials &amp; Construction Methods</td>
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<td>FCSC 4188</td>
<td>**Interior Design II</td>
<td>3</td>
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<tr>
<td>FCSC 3171</td>
<td>**Intro Textile Science</td>
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<td>FCSC 3172</td>
<td>Intro Textile Science Lab</td>
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<td>ARE 2100</td>
<td>**Architectural Graphics</td>
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<tr>
<td>ACCT 1010</td>
<td>**Prin. of Accounting</td>
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Plus one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FCSC 1180</td>
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</tr>
<tr>
<td>ART 1110</td>
<td>Foundation: Two Dimensional</td>
<td>3</td>
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<tr>
<td>ART 1120</td>
<td>Foundation: Three Dimensional</td>
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<tr>
<td>ARE 3600</td>
<td>Architectural Design II</td>
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</table>

A minor in child and family studies strengthens degrees in majors such as psychology, sociology, social work, health education, nursing, criminal justice (juvenile justice), communications, African-American Studies, American Indian Studies, or Chicano Studies. Faculty emphasize cross-cultural and global issues.

**Indicates courses with prerequisites.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FCSC 2121</td>
<td>**Child Development</td>
<td>4</td>
</tr>
<tr>
<td>FCSC 2131</td>
<td>**Family Relationships</td>
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<tr>
<td>FCSC 2133</td>
<td>**Intimate Relationships</td>
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Elective Courses: Choose 12 credit hours. (9 credit hours must be 3000-level or above.)

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<tr>
<th>Course</th>
<th>Title</th>
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<tr>
<td>FCSC 2110</td>
<td>**Fundamentals of Aging and Human Development</td>
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<td>FCSC 3110</td>
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<td>FCSC 3119</td>
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Distance Degree and Certification

The department offers a distance degree option in professional child development as well as an early childhood director's certificate. An existing associate's degree is required for the degree option. Students who enroll in the degree or certificate program must complete a security screening upon declaring their option. Failure to do so will result in the student being dropped from the program.

A variety of methods are employed for delivery of these distance programs: online, audio-teleconference, and flexible enrollment. The diverse delivery of these programs is designed to reach a variety of learning styles.

Our distance degree programs have the same quality and requirements as on-campus programs. Completion of a distance degree requires 128 credit hours with a minimum of 30 credit hours from UW and at least 48 hours of upper division courses. All distance students are assigned an adviser to work with throughout their program. It is important for students to work closely with their adviser to be sure all requirements are met.
Professional Child Development

The distance delivery of the Professional Child Development option allows students who have an existing associates degree in child development or early childhood education to complete their bachelor's degree in Family and Consumer Sciences. Place-bound students, many of whom currently work in early childhood programs, have the opportunity to earn a UW bachelor’s degree from their own hometown.

Admission to this program is competitive; an A.A. or A.S. in Child Development or Early Childhood Education is required.

Courses also satisfy the requirements of the certificate for directors of early childhood programs for many states. In addition, they fit professional development for home providers and daycare professionals.

Those who would benefit from this program 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 teachers at developmental centers.

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. Prior to the development of this program, Wyoming was one of the only states not to have such a certification. The certificate program is designed to:

• fit Wyoming's Professional Career Development Competency Wheel and the Professional Development Career Lattice,
• fit the National Association for the Education of Young Children’s Guidelines for the Preparation of Early Childhood Professionals (1996),
• complement the definition of Quality Child Care developed by the governor's Council on Early Childhood Development,
• allow a variety of paths to certification, and
• fit the on-campus and distance delivery of the FCSC bachelor's degree.

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. For a complete list of required courses, contact the department office at 766-4145.

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.

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 one of three areas: child and family studies; 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.

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 Bulletin 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. (Normally 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. (Normally 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. (Normally offered fall semester)

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


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, sophomore standing. (Normally offered fall semester; may also be offered summer based on sufficient demand and resources)

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; sophomore standing. (Offered at least once a year)

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 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 stretching techniques. Computer applications for layout of the design are also covered. Prerequisites: FCSC 1180 or ART 1110. (Normally 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. ( Normally 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. (Normally 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. (Normally 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. Prerequisites: 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. ( Normally offered spring semester)

3152 [4152]. Food Systems Production 3. Quantity food purchasing and production, along with institutional food services experience. Prerequisites: FCSC 3150 and LIFE 1010. (Normally 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. Prerequisites: FCSC 3150, 3152, MGT 3210. (Normally 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. (Normally 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. (Normally 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 nonpersonal 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. (Normally offered fall semester)

3174 [4170]. Flat Pattern Design. 3. Techniques of garment design using the flat pattern method are utilized to create three-dimensional designs. Computer applications to garment design are also covered. Prerequisites: FCSC 2175 and 3170. (Normally offered fall semester)

3175. Drafting and Draping. 3. Principles and instructions for drafting pattern slopers through standard or individual measurements, and draping garment patterns through fabric manipulation, molding, and shaping to create three-dimensional form. Prerequisite: FCSC 3174. (Normally 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. (Normally offered every other fall semester.)

3220. Multicultural Influences on the Young Child. 3. [C2, G1(CC), CS, D] Designed to enrich students’ understanding of the cultural contexts of children’s development from birth through age eight. Issues to be explored include cultural values, learning styles, children’s acquisition of concepts of race and ethnicity, bilingualism and the theory of bicultural/bicognitive development. Prerequisites: FCSC 2121 or EDEC 1020; junior standing.

4010. Philosophical and Research Perspectives in Family and Consumer Sciences. 2. [W3*(none)] 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 & 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. (Normally 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. Community Leadership: Working with Services and Systems. 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: FCSC 2131; junior 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. (Normally offered fall semester)

4127. Directing Preschool and Daycare Programs. 3. [none]*WCC] 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. (Normally offered fall semester)

4129. Internship in Family Life Education. 6-8 (Max. 8). Provides external field experience in a human services agency or family life agency, through agreements with local organizations. Normally taken in a student's last semester. Students must complete a minimum of 6 credit hours. Prerequisites: FCSC 4139 and 417; 2.75 GPA in major.
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; FCSC 4128 or EDEC 3210; junior status. (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: senior standing, FCSC 2121, 4127, 4128 or an equivalent upper division course. (Offered all semesters)

4138. Family Stress and Coping. 3. [WI][(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. Prerequisite: FCSC 2131; junior standing. (Offered spring semester)

4139. Professional Practice Issues in Family and Community Services. 3. [(none)][WC] Issues associated with prevention and education programs are examined. Particular attention is paid to the development of professional skills relevant to professionals who work with families in community, education and prevention settings. Prerequisites: FCSC 2131 and a WB course; majors only; senior standing. (Offered fall 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. (Normally 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. (Normally 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. (Normally offered spring semester)

4147. Nutrition and Weight Control. 3. Advanced course in physiological and metabolic determinants of weight control emphasizing pathology, psychodynamics, assessment and treatment of obesity. Dual listed with FCSC 5147. Prerequisites: FCSC 1140 or 1141; ZOO 3115. (Normally 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. Prerequisite: FCSC 1150, CHEM 2300, STAT 2020, ENGL 4010, FCSC major. (Normally offered spring semester)

4171. Advanced Textiles. 3. Introduces color science as related to human perception and practical problems to 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. (Normally offered alternate fall semesters)

4175. 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 5175. Prerequisites: FCSC 3170 and 4171. (Normally 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. (Normally offered spring semesters)

4181. Global Textiles Marketplace. 3. [G1][(G)] 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. (Normally offered alternate spring semesters)

4182. Textile Industry and the Environment. 3. [W3][WC] 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. (Normally 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. (Normally offered fall semester)

4350. Health Management Issues in Early Education. 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. Prerequisite: junior or senior standing, 6 hours of education and/or the consent of instructor.

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/AST/CHST/AGRI/AMST/HIST 4546. Prerequisite: 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. Textiles Field Study Tour. 1-3 (Max. 6). Designed to provide students an opportunity to visit designer show rooms, textile manufacturers, museums, and historic/cultural sites. Serves both undergraduate and graduate students with an interest in textile and apparel design, history, and merchandising. Prerequisites: WA and consent of instructor. (Offered based on sufficient demand and resources every other spring/summer term, odd years)
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.

5105. Child Care Health Consultation. 3. Topics include consultation skills, children’s mental health, child care health and safety, child abuse and neglect, nutrition, injury prevention, oral health, caring for ill children in child care settings, working with children with special needs, issues of diversity, model child care health policies, and injury prevention. Cross listed with NURS 5105. Prerequisite: graduate standing.

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

5111. Family Decision and Resource Management. 3. Utilizes theories to facilitate understanding of problem-solving and resource management in various family structures/context 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. Prerequisite: FCSC 2131 or a psychology course or a sociology course, junior standing.

5113. 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 website used. Dual listed with FCSC 4113. Prerequisites: ECON 1000 or SOC 1000 or PSYC 1000, junior 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.

5115. Interdisciplinary Early Childhood Seminar. 3. Advanced professional course for students interested in current trends and issues in early childhood development. Interdisciplinary in nature, drawing from research in communication disorders, kinesiology and health, elementary and early childhood education and special education, child and family studies, nursing and psychology. Cross listed with EDEC, NURS, PSYC, HLED, SPPA 5115. Prerequisite: graduate standing.

5117. Community Leadership: Working with Services and Systems. 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.

5122. Behavior Disorders of Children and Adolescents. 3. An overview of common behavior problems, conduct disorders, and psychopathology from infancy through adolescence, with an emphasis on the etiology, recognition, and developmental path of various disorders. Prerequisite: FCSC 2121 or PSYC 2300.

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. Prerequisites: 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. Prerequisites: 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 FCSC4138. 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. Rational 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.

5152. 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. (Normally 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. (Normally offered alternate spring semesters)

5178. Fiber Arts. 3. 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 4178. Prerequisite: FCSC 3174. (Normally 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. (Normally 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. (Normally 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. (Normally offered alternate spring semesters)

5188. Interior Design II. 3. Advanced study of space planning and interior design. Dual listed with FCSC 4188. Prerequisites: FCSC 2180 and 2188. (Normally 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. Prerequisites: 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**

6102 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 interdepartmental 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 108 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 com-

mittee 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  
E. LEE BELDEN, veterinary sciences  
MARK GOMELSKY, veterinary sciences  
DALE D. ISAAK, molecular biology  
KURT W. MILLER, molecular biology  
KENNETH W. MILLS, veterinary sciences  
R. SCOTT SEVILLE, zoology/physiology  
PETER D. STAHL, renewable resources  
DANIEL WALL, molecular biology  
NAOMI I. WARD, molecular biology  
MEIJUN ZHU, animal sciences  
CHAOQUN YAO, veterinary 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**

<table>
<thead>
<tr>
<th>Total hours</th>
<th>128</th>
<th>3000-level or above credits</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>(university requirement)</td>
<td>Completion of University Studies 2003 Program Requirements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Basic sciences and quantitative reasoning**

| MATH | 1450 or 1400 and 1405 or 2200-4-6 |
| STAT | 2050 or 2070 | 4 |
| LIFE | 1010 and 2022 or 2023 | 8 |
| LIFE | 3050 | 4 |
| CHEM | 1020 and 1030 | 8 |
| CHEM | 2300 or 2420 and 2440 | 4-8 |
| PHYS | 1050 or 1110 and 1120 | 4-8 |
| MOLB | 3000 | 3 |
| MOLB | 3610 or 4600 and 4610 | 4-6 |
Microbiology Core Course Requirements

MICR/MOLB 2021 or 2240 ...............4-5
PATB 2220 ...........................................4
MOLB 4440 ...........................................3
PATB/MOLB 4400 .........................4-5
PATB 4710 ...........................................3
MOLB 4460 ...........................................3
MOLB 4170 ...........................................1
MOLB 4250 or 4490 .......................1
MICR Electives .................................................6

Select two seminar courses from the following:
PATB 4150, MOLB 4050, LIFE 4985
(MOLB 4051, MOLB 4052 with adviser’s approval)

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

PATB 4201 ...........................................3
PATB 4110 ...........................................3
PATB 4120 ...........................................3
PATB 4130 ...........................................3
PATB 4140 ...........................................3
PATB 4200 ...........................................1
PATB 4220 ...........................................2
PATB 4360 ...........................................2
PATB 4500 ...........................................3
PATB 5120 ...........................................1-4
MOLB 4100 ...........................................3
PHCY 4450 ...........................................4
ZOO 4110 ...........................................3

Molecular and Cell Biology

LIFE 3600 ...........................................4
MOLB 4180 ...........................................1
MOLB 4260 ...........................................1
MOLB 4440 ...........................................3
MOLB 4450 ...........................................3
MOLB 4460 ...........................................3
MOLB 4660/5660 .................3

Environmental and Applied Microbiology

BOT 4300 ...........................................1
BOT 4360 ...........................................3
BOT 5390 ...........................................3
SOIL 4140 ...........................................4
PLNT 3220 ...........................................3
PLNT 4000 ...........................................3
FDSC 4090 ...........................................3
FDSC 4100 ...........................................1
FDSC 4900 ...........................................3

***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. [M24PQB]).

2021 [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 2021. 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 eucaryotic 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. Cross listed with PATB 4001. Prerequisites: MICR 2240 or PATB 2220 and STAT 2050.


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 BIOL 2022.

4140. Soil Microbiology. 4. Fundamental principles of soil microbiology and how they relate to microbial ecology, environmental contamination, agriculture and forestry. Cross listed with SOIL/AECL 4140. Prerequisite: SOIL/AECL 2010. (Offered spring semester)

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. Prerequisites: 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. Prerequisites: 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.
Microbiology/Molecular Biology

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. 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 MIRC 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 4600 plus MOLB 4610.

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. Cross listed with PATB 4710. Prerequisite: MOLB 2220 or MOLB 2240.

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.

5220. Molecular Mechanisms of Bacterial Pathogenesis. 3. Intended for students majoring in microbiology or a related field. Consists of lectures and small group discussions. Student responsibilities include note-taking and preparation for discussion by completion of reading assignments consisting of classic and/or current 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.

Department of Molecular Biology

203 Animal Science/Molecular Biology Bldg., 766-3300
6012 Agriculture Building, 766-2171
FAX: (307) 766-5098
Web site: www.wwyo.edu/MolecBio

Department Chair: Mark M. Stayton

Professors


RANDOLPH V. LEWIS, B.S. California Institute of Technology 1972; M.S. University of California-San Diego 1974; Ph.D. 1978; Professor of Molecular Biology 1989, 1980.


DON ALLEN ROTH, B.S. University of New Hampshire 1974; M.S. Virginia Polytechnic Institute and State University 1975; Ph.D. 1978; Professor of Molecular Biology 2002, 1997.

HERMANN SCHÄTZL, M.D. Max von Pettenkofer-Institut für Hygiene und Mikrobiologie, Germany 1991; Wyoming Excellence Chair – Prion Biology; Professor Veterinary Science and Molecular Biology, 2009.


JORDANKA ZLATANOVA, M.S. St. Petersburg University 1968; Ph.D. Institute of Molecular Biology, Bulgarian Academy of Sciences 1980; Dr.Sc. Institute of Genetics, Bulgarian Academy of Sciences 1989; Professor of Molecular Biology 2004.

Associate Professors

DAVID FAY, B.S. Tufts University 1988; Ph.D. Yale University 1995; Associate Professor of Molecular Biology 2006, 2001.

MARK GOMELSKY, B.S. Moscow Institute of Chemical Technology 1986; M.S. 1988; Ph.D. Institute of Genetics and Selection of Industrial Microorganisms 1991; Associate Professor of Molecular Biology 2005, 1999.


MARK M. STAYTON, B.S. University of Missouri at Kansas City 1975; Ph.D. Iowa State University 1980; Associate Professor of Molecular Biology 1994, 1988.

ANNEW. SYLVESTER, B.S. University of Washington 1980; M.S. 1982, Ph.D. 1987; Associate Professor of Molecular Biology 2006.

Assistant Professors

DAVID A. LIBERLES, B.S. B.A. Oberlin College 1991; M.S. California Institute of Technology 1995; Ph.D. 1997; Assistant Professor of Molecular Biology 2005.

DANIEL WALL, B.A. Sonoma State University 1988; Ph.D. University of Utah 1994; Assistant Professor of Molecular Biology 2007.

NAOMI WARD, B.Sc. University of Queensland 1993; Ph.D. University of Warwick 1997; Assistant Professor of Molecular Biology and Botany 2007.

CYNTHIA WEINIG, B.A. Brown University 1991; Ph.D. Indiana University; Assistant Professor of Botany and Molecular Biology 2007.

Professor Emeritus


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 experts.
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 graduate 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

- **Total credits (college requirement)**: 128
- **3000-level or above**
  - (university requirement): 48
- **Fulfillment of University Studies Program**
  - (consult adviser)
- **Fulfillment of molecular biology core requirements listed below**

**MOLB Core Requirements**

<table>
<thead>
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<th>Course</th>
<th>Hours</th>
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<tr>
<td><strong>General Science Courses</strong></td>
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<tr>
<td>LIFE 1010</td>
<td>4</td>
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<tr>
<td>LIFE 2022 or 2023</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 3050</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1020 and 1030</td>
<td>8</td>
</tr>
<tr>
<td>CHEM 2420 and 2440</td>
<td>8</td>
</tr>
<tr>
<td>PHYS 1110 and 1120</td>
<td>8</td>
</tr>
<tr>
<td>MATH 2200*</td>
<td>4</td>
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<tr>
<td>STAT 2050</td>
<td>4</td>
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<td><strong>Total</strong></td>
<td>44</td>
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*The alternative math courses (MATH 1450 or 1400 and 1405) may be substituted with adviser approval

**MOLB Department Courses**

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<th>Course</th>
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<tr>
<td>MOLB 4050/4051/4052</td>
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<tr>
<td>MOLB 4170</td>
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<tr>
<td>MOLB 4180</td>
<td>1</td>
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<tr>
<td>MOLB 4485</td>
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</tr>
<tr>
<td>MOLB 4440 or 4450 or 4660</td>
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</tr>
<tr>
<td>MOLB 4050 and 4051 or 4052</td>
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<tr>
<td><strong>Total</strong></td>
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**MOLB Electives:** choose from the following courses to fulfill the 10-credit MOLB elective requirement; note limitations below

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

<table>
<thead>
<tr>
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<td>MOLB 4450</td>
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<tr>
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<td>MOLB 5010</td>
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**Computational Molecular Biology**

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<td>COSC 2030</td>
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<td>IMGT 2400</td>
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<td>BOT 4550</td>
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**Microbiology**

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**Preprofessional**

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<td>ZOO 4670</td>
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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.
**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.

<table>
<thead>
<tr>
<th>Freshman Year: Fall</th>
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<tr>
<td>LIFE 1010</td>
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<td>MATH 2200</td>
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**FRESHMAN YEAR: Spring**

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<td>LIFE 2022</td>
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<table>
<thead>
<tr>
<th>Electives</th>
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<table>
<thead>
<tr>
<th>Sophomore Year: Fall</th>
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<tbody>
<tr>
<td>MICR/MOLB 2021</td>
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<tr>
<td>CHEM 2420</td>
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<tr>
<td>PHYS 1110</td>
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<td>Electives</td>
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**Sophomore Year: Spring**

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<table>
<thead>
<tr>
<th>JUNIOR YEAR: Fall</th>
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<tbody>
<tr>
<td>MOLB 4600</td>
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<tr>
<td>LIFE 3050</td>
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<tr>
<td>Electives</td>
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<th>JUNIOR YEAR: Spring</th>
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<tr>
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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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<tr>
<td>MOLB Electives</td>
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<td>Other Electives</td>
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<thead>
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<th>JUNIOR YEAR: Summer</th>
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<td>(Optional)</td>
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<tr>
<td>MOLB 4052</td>
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**SENIOR YEAR: Fall**

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<th>Hrs.</th>
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<tbody>
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<td>MOLB 4050 or 4051</td>
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<tr>
<td>MOLB 5010</td>
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**MOLB Electives**

<table>
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<tr>
<th>Other Electives</th>
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</table>

**Molecular Biology**

- 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**

- LIFE 1010: 4 Hrs.
- CHEM 1020: 4 Hrs.
- ENGL 1010: 4 Hrs.
- MATH 2200: 4 Hrs.
- MOLB 1010: 1 Hr.

**Freshman Year: Spring**

- LIFE 2022: 4 Hrs.
- CHEM 1030: 4 Hrs.
- COJO 1010: 3 Hrs.
- STAT 2050: 4 Hrs.

**Sophomore Year: Fall**

- MICR/MOLB 2021: 4 Hrs.
- CHEM 2420: 4 Hrs.
- PHYS 1110: 4 Hrs.
- Electives: 

**Sophomore Year: Spring**

- CHEM 2440: 4 Hrs.
- MOLB 3000: 3 Hrs.
- PHYS 1120: 4 Hrs.
- Electives: 

**Junior Year: Fall**

- MOLB 4600: 3 Hrs.
- LIFE 3050: 3 Hrs.

**Junior Year: Spring**

- MOLB 4610: 3 Hrs.
- MOLB 4170: 1 Hr.
- MOLB 4180: 1 Hr.
- MOLB 4250: 1 Hr.
- MOLB 4300: 1 Hr.
- MOLB Electives: 

**Junior Year: Summer**

- (Optional) MOLB 4052: 1 Hr.
- MOLB 5010: 3 Hrs.

**Senior Year: Fall**

- MOLB 4050 or 4051: 1 Hr.
- MOLB 5010: 3 Hrs.

**Molecular Biology Electives**

- Other Electives: 

**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 plan A, plan B, 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 interdepartmental 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

#### Plan A (thesis)

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 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. Plan A 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 dissertation committee;
Additional requirements specified in the Departmental Policies for the Graduate Programs, available from the Graduate Program Chairperson.

Molecular Biology MS Plan B (non-thesis)

After consultation with the student’s advisor 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 Plan B master’s 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.

Recommendations for fulfilling the 16 remaining hours of the 30-hour requirement:
Other advanced molecular biology courses and lab pods.
MOLB 5010 (total max. 6 credits per degree program); 5520-01 credits (total max. 10 credits per degree program).
Please note that ENGL 5910 credits cannot be included in the program of study even if a student is required to take this course.
MOLB 5900 hours can be included in the program of study.

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 Departmental 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. [M24•QB]).
1010. Science and Society. 1. (none) I, L
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. Prerequisite: 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 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 or 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 underlying 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).
Prerequisites: MOLB 3610 or 4600 plus 4610.

4520. *Public Health Issues in Developing Countries.* 2. [none] G  
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 health care 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.

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)

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

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.

Prerequisites: 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.

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.

Prerequisite: 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 immunological techniques. Dual listed with MOLB 4400.  
Prerequisite: MOLB 2021, 3610, or LIFE 4000.

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.

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.

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.  
Prerequisite: 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 rhodother bacter sphaeroides in response to environmental conditions. Dual listed with MOLB 4490. Prerequisite: MOLB 4610/5610 or MOLB 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.

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 Cellular 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). 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.
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:

Ron Delaney, David Koch, Thomas D. Whiston, Alan Gray, Stephen D. Miller

The Department of Plant Sciences offers two programs leading to a Bachelor of Science degree and three minors programs. The Bachelor of Science programs include agroecology (an interdepartmental program offered through the Department of Plant Sciences and the Department of Renewable Resources) and agroecology/environment and natural resources (an interdisciplinary program offered through the Departments of Plant Sciences, Renewable Resources, and the School of Environment and Natural Resources). The minors program in plant protection includes the disciplines of agronomy, plant genetics, plant pathology and weed science. The minors program in horticulture encompasses landscape design, plant materials and their propagation, organic food production, turfgrass science, and greenhouse design and management. These minors allow students within many bachelors programs to obtain an added emphasis in an area(s) which enjoys 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 the collaborative teaching, advising and research expertise 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.

The ability to form sound conclusions by critical evaluation of empirical data, the ability to distinguish beliefs and assumptions from conclusions that are legitimately based on demonstrable evidence, and the ability to apply the scientific method and its derivatives to arrive at such conclusions.

- 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:

Rollin H. Abernethy, plant sciences
Gary D. Frane, plant sciences
Angela L. Hild, renewable resources
James M. Krall, plant sciences
David E. Legg, renewable resources
Larry C. Munn, renewable resources
K.J. Reddy, renewable resources
Scott R. Shaw, renewable resources
Michael A. Smith, renewable resources
Thomas L. Thurow, renewable resources
George F. Vance, renewable resources
James K. Wangberg, 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
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. Mealar, plant sciences
Urszula Norton, plant sciences

Academic Professionals:

Mark Ferrell, plant sciences
Abdel Mesbah, plant sciences
Karen Panter, plant sciences
David Wilson, plant sciences

Agroecology Major

A B.S. degree in agroecology, the study of sustainable agricultural ecosystems, 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 such areas as biology, chemistry, crop science, entomology, environmental studies, natural resource management, soil science, plant pathology, weed science, horticulture, turf management, preveterinary 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 which, like an ecological web, 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.

Agroecology .................................................. 26
    AECL 1000, 2010, 3030, 4140, 4990 and 4 hrs from either or a combination of AECL 4920, 4930 or 4960
Supporting Science
Supporting Science Biology/Genetics...21-22
    ENTO 1000 or 1001 or RNEW 3020 or
    ANSC 1010, and AGEC 1010 or 1020 and LIFE 1010, 2023, 3400, and CHEM 1000, 2300
Math/Statistics ............................................. 7
    MATH 1000 or 1400, STAT 2050
Communications ........................................... 3
    COJO 1010

Agroecology Electives......................... 9
    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.

Supporting Electives............................... 9
    Select 9 hours upper division from any of the following: agroecology, agricultural economics, animal science, biology, botany, chemistry, communications, crop science/horticulture, environment and natural resources, entomology, food science, geography and recreation, microbiology, molecular biology, rangeland ecology and watershed management, pathobiology, plant pathology, soil science or zoology.

Additional University Studies........ 14-23

Electives .................................................. 22-31

Total .................................................. 120

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: AECL/SOIL 2010, LIFE 2023, AECL 3030, and 9 additional upper division hours from the following: ENTO, PLNT, and/or SOIL

Agricultural Entomology Minor

(Renewable Resources)

Minimum requirements.............................11
From the following: ENTO 1000 or 1001; 4682, 4685, or AECL 3030; ENTO 4360 or 4500 or 4665.

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.

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.

At present, no program for a graduate degree in agroecology is offered; however, some courses at the graduate level are available.

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

The department typically offers at least 10 graduate assistantships, 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.

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. [M2QBJ]).

1000 [CROP/BOT 2000]. Agroecology. 4. [SI•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.

2010 [SOIL 2100]. Introduction to Soil Science. 4. [S3•SE] Introduces soil ecological processes and management in terrestrial environments. Discusses interaction of soil, biological, chemical, morphological, and physical properties with land management in wildland and agricultural ecosystems. Emphasis of the course is on plant response to soil conditions. Cross listed with SOIL 2010. Prerequisite: 4 hours of chemistry. (Offered spring 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 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 4310. Prerequisites: QA course and 9 credit hours in student’s major field and junior/senior standing.

4140. Soil Microbiology. 4. Fundamental principles of soil microbiology and how they relate to microbial ecology, environmental contamination, agriculture and forestry. Cross listed with SOIL/MICR 4140. Prerequisite: SOIL/AECL 1010. (Offered spring semester)

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 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. [M2QBJ]).

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. 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 AECL 2026. Prerequisites: AECL 1000 or LIFE 1010. (Offered fall semester)
2300. Irrigation Principles. 3. Studies basic soil-water relationships, evapotranspiration, water quality criteria, efficiencies, plant response and management, as they apply to irrigation of agricultural lands. Cross listed with SOIL 2300. Prerequisite: MATH 1400.

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, flowing 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. Prerequisite: AECL/PLNT 2025 or LIFE 2025 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. [M3Ϙ(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. Prerequisite: 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

5100. Pesticide Science. 3. Pesticide development and registration. Classification and structure of agricultural pesticides. Mode of action; biological and environmental factors that influence efficacy; environmental concerns and pesticide resistance. Cross listed with ENTO 5100. Prerequisite: graduate standing or 3 hours of biochemistry.

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. Prerequisite: 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.

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.

Department of Renewable Resources

2013 Agriculture Building, 766-2263
FAX: (307) 766-6403
Web site: uwyo.edu/renewableresources
Department Head: John A. Tanska
Professors:


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


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.  


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.  


J. DANIEL RODGERS, B.S. East Texas State University 1963; M.S. Texas Tech University 1966; Ph.D. Utah State University 1980; Associate Professor of Rangeland Ecology and Watershed Management.  

JAMES W. WAGGONER, JR., B.S. New Mexico State University 1970; M.S. 1972; Ph.D. University of Illinois 1975; Associate Professor of Rangeland Ecology and Watershed Management 1994.  

Assistant Professors:  

JEFFREY L. BECK, B.S. Brigham Young University 1993; M.S. 1996; Ph.D. University of Idaho 2003; Assistant Professor of Rangeland Ecology and Watershed Management 2007.  


JAY B. NORTON, B.S. University of Montana 1985; M.S. Iowa State University 1996; Ph.D. University of Montana 2000; Assistant Professor of Soil Science 2006.  


Academic Professional:  

RACHEL D. MEALOR, B.S. University of Wyoming 2004; M.S. 2007; Assistant University Extension Coordinator 2007.  


SHIKHA SHARMA, M.S. University of Lucknow, India 1993; Ph.D. 1998; Assistant Research Scientist 2006.  

Adjunct Professors:  

Justin Derner, Brian Mealor, Jack Morgan, Ursula Norton, Ed Schmidtmann, Gerald Schuman, Nancy Shaw, Ramesh Sivapilli, Jeffrey Smith  

Professors Emeriti:  

Robert Heil, Robert Lavigne, William Laycock, John Lloyd, Richard Olson, Robert Pfadt, Quentin Skinner, Thomas Wesche  

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 complement 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 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.  

Hrs.  

Minimum Requirements ...................................... 20  

RNEW 2100, SOIL 4150, RNEW 4775,  

and RNEW 4540. Choose one from RNEW 3100, RNEW 4285, RNEW 4700, or GEOG 4420; choose one from GEOG 2550 or RNEW 4103; choose one from RNEW 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.  

Hrs.  

Required Courses .............................................. 14  

LIFE 3400, SOIL 2010, RNEW 4200,  

4210, 4580  

Planning and Policy (choose one).......................3  

AGEC 4710, ENR 3000, GEOG 4040,  

4750, RNEW 4051, 4052, 4900  

Below-Ground Processes  

(choose one) ..................................................3-4  

LIFE 4400, CE 4800, 4820, SOIL 4100,  

4120, 4140, 4150, 4160  

Above-Ground Processes  

(choose one) .................................................2-4  

BOT 4140, 4700, 4111, ENTO 4678, 4685,  

GEOG 4200, RNEW 4285, 4540, 4700,  

4710, 4850, ZOO 4550  

Total ............................................... 22-25
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/uwr&ewable. 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.

Plan B (non-thesis)

Requires 30 hours of graduate credit to include 9 hours of required courses, 11 hours of required electives, and 10 hours of other electives.

Plan B project - follows format of Plan A thesis.

A Plan B master of science will be a terminal degree program in the Department of Renewable Resources. Students completing this option will not qualify for a subsequent Ph.D. program in Department of Renewable Resources at the University of Wyoming.

Master of Science in Entomology/Water Resources

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

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.

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 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 Soil Science/Water Resources

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

Doctoral Programs

Doctor of Philosophy in Entomology

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 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.
Renewable Resources

Reneable Resources (RNEW)

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M24QB]).

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. Prerequisites: LIFE 1001 or 1010.

2345. Natural Resource Ethics. 3.0. [(none)\(\text{CH, D}\)] Introduction to ethics in 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. Prerequisites: 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. Prerequisites: LIFE 1001 or 1010.

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 AECL/BOT 4130; dual listed with RNEW 5130. Prerequisites: QA course and 9 credit hours in student’s major field and junior/senior standing or permission of instructor.

4340. Issues: Environmental Ethics. 3. Encompasses selected topics in environmental and natural resource ethics. Cross listed with PHIL 4340. Prerequisites: PHIL 2330, 2340, 3300, 3350.

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 RNEW 5400; cross listed with AECL 4400. Prerequisite: LIFE 3400.

4510. Research Planning in Renewable Resources. 3. [W3\(\text{\(W\)}\)] An interdisciplinary course examining the process and nature of scientific inquiry in renewable resources. Topics include: types of inquiry, forming and testing hypotheses, literature review, methodology, data summary and scientific writing. Each student prepares a study plan, grant, research proposal, journal article, or initial thesis draft. Writing is emphasized. Dual listed with RNEW 5510. Prerequisite: basic training in renewable resources, ecology or related discipline.

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. Prerequisites: 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 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.

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)
GEOL 5070, GEOL 5111, BOT 5700, BOT 5740, 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, GEOG 5260, LAW 6660, POLS 5050.......................... 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.
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 4400; cross listed with AECL 5400. Prerequisite: SITEG 4210 or equivalent.

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.

5510. Research Planning in Renewable Resources. 3. An interdisciplinary course examining the process and nature of scientific inquiry in renewable resources. Topics include: types of inquiry, forming and testing hypotheses, literature review, methodology, data summary and scientific writing. Each student prepares a study plan, grant or research proposal, journal article or initial thesis draft. Writing is emphasized. Dual listed with RNEW 4510. Prerequisite: basic training in renewable resources, ecology or related 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.

5730. Plant Physiological Ecology. 4. 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.

5775. 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. 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. Prerequisites: none.

Environment and Natural Resources Affiliate 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.

Minor in Agricultural Entomology

This minor is intended for students who have an interest in insects as beneficial and pestiferous agents in agricultural and health settings, with an emphasis on the applied ecology and management of these organisms. As insect damage (e.g., plant feeding, disease transmission, etc.) and services (e.g., biological control, pollination, etc.) are each valued at billions of dollars per year, students majoring in agroecology, animal science, rangeland ecology and watershed management or similar...
fields will find the study of these organisms a rewarding and valuable (if not essential) element of their education.

Minimum requirements

From the following: ENTO 1000 or 1001; ENTO 4682, 4685 or AECI 3030; ENTO 4765 or 4500 or 4665

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.

1100. The Biodiversity Crisis. 3. [S1,G1●(none)] Addresses ongoing, unprecedented rate of extinction. Examines how biological diversity is measured, factors causing current extinctions and biological, as well as technological and political/economic means of conserving biodiversity.

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)

1345. Entomological Experimentation. 1-3 (Max. 3). Individual library, laboratory or field study of insects. Experiments can be conducted during summer months, and/or at sites removed from the university, at discretion and consent of instructor. Offered S/U only. (Offered fall, spring and summer semesters)

2000. Pest and Beneficial Insects of the Farm and Rangeland. 1. Interactions of insects with plants and domestic animals with an emphasis on biologically-based pest management. Offered S/U only. Prerequisite: 3 credit hours of biology, or relevant work experience.

2001. Insects in the Urban Environment. 1. Detection, identification and management of insects adversely affecting plant and human health in the urban environment. Satisfactory/ Unsatisfactory only. Prerequisite: 3 credit hours of biology, or relevant work experience.

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.

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. Dual listed with ENTO 5360. Prerequisite: 8 hours of biological science. (Normally offered spring semester)

4665. Insects Affecting Livestock. 3. Biology, importance and control of insect pests of livestock. Recognition of live and preserved specimens. Recent research. Dual listed with ENTO 5665. Prerequisite: ENTO 1000. (Normally offered spring semester of even-numbered years)

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; ENTO 4670 is recommended. (Normally offered fall semester of odd-numbered years)

4685. Insect-Plant Interactions. 2. Ecology of insect-plant interactions, including host finding and utilization and plant response to insect feeding. Aspects of chemical/physiological ecology, and management of insects using biologically-based techniques are addressed. Examples from various terrestrial systems, including cultivated lands, grasslands, and forest systems, are used. Dual listed with ENTO 5685. Prerequisite: one year of basic biology; course work in entomology and botany recommended. (Normally offered fall semester of even-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.

4765. Medical Entomology. 3. Recognition and bionomics of insects of medical importance. Dual listed with ENTO 5765. Prerequisite: ENTO 1000. (Normally offered spring semester of even-numbered years)

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.

5100. Pesticide Science. 3. Pesticide development and registration. Classification and structure of agricultural pesticides. Mode of action; biological and environmental factors that influence efficacy; environmental concerns and pesticide resistance. Cross listed with PLNT 5100. Prerequisite: graduate standing, 3 hours of biochemistry.

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.

5360. Medical Entomology and Parasitology. 4. Emphasis is on medically important arthropods, protozoa and worms; clinical effects of infection, epidemiology, avoidance/control and identification/diagnosis. Dual listed with ENTO 4360; cross listed with PATB 5360. Prerequisite: 8 hours of biological science.

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 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.

5655. Insects Affecting Lifestyles. 3. Biology, importance and control of insect pests of livestock. Recognition of live and preserved specimens. Recent research. Dual listed with ENTO 4663. Prerequisite: ENTO 1000 or one course in biology or zoology.

5672. Biology of Honey Bee. 3. Bee evolution, physiology, behavior, genetics, and pathology. Also honey production, management, and pollination. Prerequisite: ENTO 1000 or one course in biology or zoology.

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: 1 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.

5685. Insect-Plant Interactions. 2. Ecology of insect-plant interaction, including host finding/utilization and plant response to insect feeding. Aspects of chemical/physiological ecology, landscape ecology, and management of insects using biologically-based techniques will be addressed. Examples from various terrestrial systems, including cultivated lands, grasslands, and forest systems, will be used. Dual listed with ENTO 4685. Prerequisite: one year of basic biology; course work in entomology and botany 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.

5688. Contemporary and Classical Issues in the Life Sciences. 1-6 (Max. 6). A readings and discussion course centered on current and historical topics in biological sciences, related to social, cultural, theological and ethical issues. Topic of the course is democratically determined by the enrolled students of the previous semester and therefore changes with each offering. Prerequisite: 3 hours of life or social sciences or junior standing.

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.

5765. Medical Entomology. 3. Recognition and bionomics of insects of medical importance. Dual listed with ENTO 4765. Prerequisite: ENTO 1000.

5820. Principles of Systematics. 3. Examines principles of classification and phylogenetic relationships of organisms and practical methods of curation. Prerequisite: ENTO 1000 or 5684.

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.

5882. Insect Population Biology. 3. Study of quantitative ecological processes as they relate to the ecology of pest populations, including pesticide resistance, pest outbreaks, biological control and integrated pest management. Prerequisite: ENTO 5683 or LIFE 2400.

5884. Insect Behavior. 3. Fundamentals of insect behavior and an analysis of behavioral patterns. Dual listed with ENTO4884. Prerequisite: one year of basic biology or equivalent; ENTO 5682 is recommended.

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.
Agroecology Program
Rooms 50/2013 Agriculture Building
(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 the collaborative teaching, advising and research expertise in the Departments of Plant Sciences and Renewable Resources. An agroecology minor is also available. See page 91 for more information on the Agroecology program.

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>
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<tr>
<td>REWM 2000, 2500, 3020, 3500, 4330, 4530, 4700, 4830, 4850, 4900</td>
</tr>
<tr>
<td>Resource management</td>
</tr>
<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>
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<td>LIFE 1010 and 2022, 2023, or MICR 2021, LIFE 3400, and BOT 4680 or REWM 4300</td>
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<td>CHEM 1000</td>
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<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 1000 or 1400, STAT 2050</td>
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<td>Physical education</td>
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<td>Electives</td>
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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\Q5B]).

1000. Introduction to Range Management. 1. Introduces range management profession and the department. Assists in outlining an academic and work experience program consistent with students’ career objectives. Discusses employment opportunities in range management and related fields. (Offered based on sufficient demand and resources)

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 watersheds 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 3000, 3320, LIFE 2022. (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 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\W5C] 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 GEOG 2550. (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 for animal and natural resource production. Dual listed with REWM 5150. Prerequisite: 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: LIFE 2022. (Normally offered spring semester)

4330. Rangeland Ecosystem Assessment and Monitoring. 3. [M3\none] Inventory and analysis of rangeland resources; vegetation; as well as concepts and techniques for utilization, condition, trend and suitability determination. Prerequisites: QA (such as MATH 1000), REWM 2000, SB. (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)

4350. Rangeland Management Techniques Field Trip. 2 (Max. 4). Visits to range improvement projects and range research areas. Prerequisite: one full year of life science, preferably botany. (Normally offered spring semester of odd-numbered years)

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. 3.0.
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 4850 or 4200, BOT 4700.

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:** REWM 2000, CHEM 1000, LIFE 1001. (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 1030, MATH 2200 and CHEM 2230 recommended. (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.

4790. Stable Isotope Application in Water and Energy. 3.
Stable isotope fundamentals and their applications in tracing waters, understanding surface water-groundwater interactions, tracking sources of water pollution, natural gas origin/exploration and assessing hydrological impacts of natural gas extraction and carbon dioxide sequestration. Laboratory exercises will provide hands-on training in stable isotope measurement techniques. Dual listed with REWM 5790. **Prerequisites:** CHEM 1000 or 1020 and junior standing.

4830. Ecological Applications for Wildland Management. 2.
Emphasis on ecologically-sound management to develop an understanding of interactions among rangeland ecosystems and herbivores and the influences of rangeland management on ecosystem stability, resilience and succession trajectory. **Prerequisites:** LIFE 3400 and REWM 2000. (Normally offered spring 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]+[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 geography 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. **Prerequisites:** graduate or senior standing and REWM 2000 and ANSC 2000 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; GEOG 2550.

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.

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.

5280. Stream Habitat Management. 3.
Trains students in planning, design, implementation and evaluation of stream rehabilitation measures. Includes principles of ecology, hydrology, and river processes as applied to mitigate adverse environmental impacts to watersheds and river systems.

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:** LIFE 2020.

5510. Quantitative Methods of Range Analysis. 3.
Concepts and methods of designing and implementing analysis of animal, plant and environmental relationships. **Prerequisites:** BOT 4700 and basic training in statistics.

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.

5560. Range Plant Distribution. 3.
Evolution and description of the worlds vegetation. Study of fossil record and shifting florals. **Prerequisite:** REWM 4300/5300.

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 4850 or REWM 4200 and BOT 4700/5700.
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 1030 and MATH 2200.

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.

5790. Stable Isotope Application in Water and Energy. 3. Stable isotope fundamentals and their applications in tracing waters, understanding surface water-groundwater interactions, tracking sources of water pollution, natural gas origin/exploration and assessing hydrological impacts of natural gas extraction and carbon dioxide sequestration. Laboratory exercises will provide hands-on training in stable isotope measurement techniques. Dual listed with REWM 4790. Prerequisites: CHEM 1000 or 1020 and junior standing.

5830. Wildlife Habitat Ecology. 2. or 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. Prerequisite: 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. 6). 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.

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

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SOPHOMORE YEAR: Fall

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JUNIOR YEAR: Summer (optional)

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Total Credit Hours 120

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] [M2 qB]).

2010 [AECL 2010]. Introduction to Soil Science. 4. [S3 qb SE] Introduces soil ecological processes and management in terrestrial environments. Discusses interaction of soil, biological, chemical, morphological, and physical properties with land management in wildland and agricultural ecosystems. Emphasis of the course is on plant response to soil conditions. Prerequisite: 4 hours of chemistry. (Offered spring semester)

2300. Irrigation Principles. 3. Studies basic soil-water relationships, evapotranspiration, water quality criteria, efficiencies, plant response and management, as they apply to irrigation of agricultural lands. Cross listed with PLNT 2300. Prerequisite: MATH 1400.

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, phosphorus, 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 qb (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.

4120. Genesis, Morphology and Classification of Soils. 4. Processes of soil development and methods of description, survey and classification. Includes field trips which examine soils in the Laramie Basin and surrounding mountains. Dual listed with SOIL 5120. Prerequisite: SOIL 2010. (Offered fall semester)

4130. Chemistry of the Soil Environment. 3. [M3 qb (none)] Introduction to the chemical 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 5130. Prerequisite: SOIL 2010, CHEM 1030 or CHEM 1060. (Offered spring semester)

4135. Soil Chemistry Laboratory. 2. Laboratory methods and techniques of analysis will be used to examine soils, sediments, and water chemical characteristics and reactions. Experiments will include data analysis, computer models, nutrient and contaminant characteristics, mineral properties, soil/sediment oxidation-reduction reactions as well as others. Students will be required to develop a soil chemistry experiment in their area of interest. Dual listed with SOIL 5135. Prerequisite: completion or concurrent enrollment in SOIL 4130/5130 or GEOL 4777.

4140. Soil Microbiology. 4. Fundamental principles of soil microbiology and how they relate to microbial ecology, environmental contamination, agriculture, and forestry. Dual listed with SOIL 5140; Cross listed with AECL/MICR 4140. Prerequisite: SOIL/AECL 2010. (Offered spring semester)

4150. Forest and Range Soils. 3. Characteristics and management of forest and range soils primarily in arid environments. Examines pedagogical units representative of forests and ranges and soil properties, such as nutrient availability and water relations that influence plant growth. Dual listed with SOIL 5150. Prerequisite: SOIL 2010 and LIFE 2023. (Normally offered fall semester)

4160. Soil Fertility and Fertilizers. 3. Physical, chemical and biological aspects of soils that impact fertilizer fate, uptake and plant growth. Dual listed with SOIL 5160. Prerequisite: SOIL 2010. (Normally offered fall semester of odd-numbered years)

4170. Analytical Methods for Ecosystems Research. 4. Introduces methods for collecting, preparing and analyzing environment soil and solution samples. Emphasizes instrumental methods, quality control/quality assurance and data analysis. Requires student participation in laboratory sessions, which involve analysis of different environmental samples. Dual listed with SOIL 5170. Prerequisites: CHEM 1030, CHEM 1060 and CHEM 2230 recommended. (Normally offered fall semester of odd-numbered years)

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. Prerequisite: SOIL 2010, completion of courses in introductory college chemistry and biology, and consent of instructor(s).

4565. Research: Soil Science. 1-4 (Max. 6.0). Library, laboratory, and/or green-house 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 pedogenic 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. Prerequisite: SOIL/ AECL 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.


5170. Analytical Methods for Ecosystems Research. 4. Introduction to methods for collecting, preparing and analyzing environmental solid and solution samples. Instrumental methods, quality control/quality assurance and data analysis will be emphasized. Laboratory sessions will require student participation in analysis of different environmental samples. Dual listed with SOIL 4170. Prerequisites: CHEM 1030, CHEM 1060, and recommend CHEM 2230.

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.

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.
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 bulletin.

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.
**Pathobiology (PATB)**

USP Codes are listed in brackets by the 1991 USP code followed by the 2003 USP code (e.g. [M2ÔQB]).

**1001. Discovering Careers in Veterinary Medicine.** 1. [none][1, L] Career paths open to veterinarians are diverse including private practice, clinical specialties, basic/applied sciences like environmental/public health, preventive medicine, military service, microbiology and research. Additional topics: veterinary college application process, financing veterinary education, personal time/stress management of choosing a career in veterinary medicine and animal health. Prerequisite: none.

**2220. Pathogenic Microbiology.** 4. Major communicable diseases of man caused by bacteria, mycoplasma. Discusses disease, diagnosis, treatment, prevention, and transmission. Cross listed with MIRC 2220. Prerequisite: MICR 2210. (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. 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)

**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 LIFIE 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. Prerequisite: 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. Prerequisite: 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. Prerequisite: 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 spring semester)

**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 MOLB 4400. Dual listed with PATB 5400. Prerequisite: MOLB 2220. (Normally offered spring semester)

**4500. Veterinary Parasitology.** 3. [S1Ô(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)

**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)
5110. 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. Prerequisite: graduate standing.

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. Prerequisite: 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 MIRC 5220. Prerequisite: PATB/MIRC 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. 3. 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 identificational familiarity with 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 4510. 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.