

Department of Biology

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Faculty: *Professors:* James E. Bowns; W. Harold Ornes; *Associate Professors:* Helen C. Boswell; Ronald M. Martin; *Assistant Professors:* Frederic Govedich, Terri Hildebrand, Jonathan Marshall, Charlotte Rosendahl Pedersen, Paul Pillitteri, Rachel Smetanka; Paul Spruell; *Instructors:* John Taylor, Debra Hanson; *Professional Staff:* James M. Crouch

Degrees Offered

Master of Science in Forensic Science

- Forensic Biology Emphasis (see Graduate section of catalog)

Bachelor of Arts or Bachelor of Science

- Biology:
 - Botany Emphasis
 - Teacher Education Emphasis
 - Forensics Emphasis
 - Zoology Emphasis

Bachelor of Interdisciplinary Studies (see pages 101, 244)

A customized degree combining either two or three areas of student interest. Recent examples of customized combinations of coursework include Natural Resources, Environmental Studies, GIS, Criminology, Spanish, Business, and History.

Minor

- Biology

Graduate Courses in Biology

Pre-Health Profession Recommended Biology Courses

(See Other Courses page 245 for Medicine, Dentistry, Optometry, Pharmacy)

Department Statement

The biology department maintains a highly educated and an academically, philosophically, and culturally diverse faculty in order to:

1. Offer all students the opportunity to understand and use scientific thinking and techniques in the study of living things, to realize the relationships of science to other modes of thought, and to become familiar with contemporary models of biological functions and with regional ecosystems of southwest Utah and its neighbors,
2. Offer interested students the rigorous opportunity to prepare for advanced study in biology and for careers in agriculture, health care, secondary teaching and biological aspects of land management,
3. Build partnerships for service within the regional community,
4. Foster productive scholarship by students and faculty, and
5. Create a collegial department atmosphere with free exchange of ideas.

The department provides undergraduate programs in biology with emphases in botany, forensics, teaching, and zoology. Prescribed course work in the department supports the general education program of the University, builds a solid basis for graduate or professional study, prepares public school teachers, and provides the instructional foundation necessary for careers in many fields.

Goal Statement

Provide our students with quality lecture, laboratory, and field instructional experiences which foster student inquiry into science, and prepare them for post-baccalaureate pursuits.

Intended Outcomes/Objectives

1. Students will demonstrate an understanding of the dynamics of interactions and adaptations within biological systems.
2. Students will be able to use appropriate tools to carry out investigations in their intended field.
3. Students will be able to communicate effectively in oral and written formats.
4. Students will be involved in regional service partnerships.
5. Students will be prepared for post-baccalaureate plans.

Because there is considerable freedom of choice to design a program of study to meet individual objectives within the biology major, all students are strongly urged to consult a member of the department faculty for advisement within their emphasis every semester. This consultation should begin before the student enrolls for the first semester of her/his undergraduate work. In order to complete the requirements for the degree in eight semesters, students must begin taking courses in the major during the first year of undergraduate work. This is especially important for students who intend to pursue postgraduate training in health care professions because these students must be prepared to take entrance examinations at the end of the third year of instruction in order to enter professional training in a timely fashion.

Degree Requirements

ALL GRADUATING BIOLOGY MAJORS:

- a. must satisfy university requirements.
- b. will successfully complete all necessary coursework as outlined in one of the areas of emphasis
- c. must complete all General Education Core Courses, University Requirements, and other courses as outlined within the chosen emphasis.
- d. must earn sufficient additional credit hours from the department's offerings to total 40 credit hours; a minimum of 20 must be upper division department offerings; additional upper division university offerings to total 40 upper division credit hours.
- e. must complete all major coursework with a "C-" grade or above. (A course with a grade below "C-" will not be accepted in the major.)
- f. must take a national biology exit examination.
- g. are strongly encouraged to participate in cooperative education, internship, or undergraduate research experiences.
- h. Minor not required for biology students, with the exception of Teacher Education students.
- i. Credits over ten years old may not be accepted.

Recommendations for Baccalaureate Degrees

Although not required, we recommend all Biology majors take the following variable credit courses:

- BIOL 4840 Cooperative Education (1-9 hours)
- BIOL 4850 Undergraduate Research (1-9 hours)
- BIOL 4890 Internship (1-9 hours)

Biology, Botany Emphasis Bachelor of Arts/Bachelor of Science	
Course Number and Title	Credits
General Education Core (see page 108)	
Core Course Requirements	17-18
Knowledge Areas Requirements	19
University Requirements	
BA Degree – Foreign Language/ASL Requirement (16 hours or proficiency test)	
BS Degree – Math or Science minimum requirement (12 hours)	
Core Requirements (20 hours)	
All students majoring in biology must complete the following core courses. We recommend this sequence.	
BIOL 1610 General Biology I/1615 Lab	4

BIOL 1620 General Biology II/1625 Lab	4
BIOL 3030 Ecology/3035 Lab	4
BIOL 3060 Genetics/3065 Lab	4
BIOL 3110 Evolution	3
BIOL 4990 Seminar	1
Required Support Courses (18-28 hours)	
MATH 1040 Statistics	4
MATH 1050 College Algebra	4
and either:	
CHEM 1110 Elementary Chem/1115 Lab	4
CHEM 1120 Elementary Organic Bio-Chem/1125 Lab	6
or	
*CHEM 1210 Principles of Chemistry I/1215 Lab	5
*CHEM 1220 Principles of Chemistry I/1225 Lab	5
*CHEM 2310 Organic Chemistry I	4
*CHEM 2315 Organic Chemistry I Lab	1
*CHEM 2320 Organic Chemistry II	4
*CHEM 2325 Organic Chemistry II Lab	1
*required for advanced degrees (professional, graduate, etc) in biological sciences	
Botany Core Requirements (11 hours)	
BIOL 3510 Plant Anatomy and Diversity/3515 Lab	4
BIOL 3530 Plant Physiology/3535 Lab	4
BIOL 3550 Plant Taxonomy	3
In addition to the core requirements choose any one of the following (3-4 hours)	
BIOL 4070 History and Literature of Biology	3
BIOL 4310 Biotechnology/4315 Lab	4
BIOL 4410 Animal Behavior	3
BIOL 4620 Bioinformatics	3
BIOL 4650 Conservation Biology	3
Students who intend to pursue advanced degrees or careers in agronomy will be advised to select the following electives:	
AGSC 1110 Crop Production/ 1120 Lab	4
AGSC 3230 Pests and Pest Management/3240 Lab	4
AGSC 3560 Soils/3565 Lab	4
BIOL 3570 Agrostology: Wildland & Range Grasses	3
AGSC 3700 Irrigation Principles/3710 Lab	4
RANG 3600 Range Management/3610 Lab	4
Students who intend to pursue advanced degrees or careers in horticulture will be advised to select the following electives:	
AGSC 3230 Pests and Pest Management/3240 Lab	4
AGSC 3700 Irrigation Principles/3710 Lab	4
BIOL 3710 Greenhouse Practicum I/3715 Lab	2
BIOL 4530 Plant Propagation/4535 Lab	4
Free Upper Electives (includes completing B.A./B.S. requirements)	20-32
40 Biology credits total required for Biology Major; at least 20 must be upper division	
Total Credits, B.A. or B.S. degree	120

Biology, Education Emphasis Bachelor of Arts/Bachelor of Science	
Course Number and Title	Credits
General Education Core (see page 108)	

Core Course Requirements	17-18
Knowledge Areas Requirements	19
University Requirements	
BA Degree – Foreign Language/ASL Requirement (16 hours or proficiency test)	
BS Degree – Math or Science minimum requirement (12 hours)	
Core Requirements (20 hours)	
All students majoring in biology must complete the following core courses. We recommend this sequence.	
BIOL 1610 General Biology I/1615 Lab	4
BIOL 1620 General Biology II/1625 Lab	4
BIOL 3030 Ecology/3035 Lab	4
BIOL 3060 Genetics/3065 Lab	4
BIOL 3110 Evolution	3
BIOL 4990 Seminar	1
Required support courses (18-28 hours)	
MATH 1040 Statistics	4
MATH 1050 College Algebra	4
and either:	
CHEM 1110 Elementary Chem/1115 Lab	4
CHEM 1120 Elementary Organic Bio-Chem/1125 Lab	6
or	
*CHEM 1210 Principles of Chemistry I/1215 Lab	5
*CHEM 1220 Principles of Chemistry I/1225 Lab	5
*CHEM 2310 Organic Chemistry I	4
*CHEM 2315 Organic Chemistry I Lab	1
*CHEM 2320 Organic Chemistry II	4
*CHEM 2325 Organic Chemistry II Lab	1
*required for advanced degrees (professional, graduate, etc) in biological sciences	
Biology Teaching Core (17 hours*)	
In order to meet state standards for a license to teach biology in secondary schools in Utah, students will complete the following (in addition to the core requirements listed above):	
BIOL 2420 Human Physiology/2425 Lab	4
BIOL 2060 General Microbiology/2065 Lab	4
BIOL 4650 Conservation Biology	3
BIOL 4070 History and Literature of Biology	3
BIOL 4900 Biology Teaching Methods	3
Any one of the following (3-4 hours)	
BIOL 2000 Natural History Studies	3
BIOL 3390 Mammalogy/3395 Lab	4
BIOL 3410 Invertebrate Zoology/3415 Lab	4
BIOL 3430 Entomology/3435 Lab	4
BIOL 3450 Comparative Vert. Studies/3455 Lab	4
BIOL 3370 Ichthyology/3375 Lab	4
BIOL 3470 Herpetology/3475 Lab	4
BIOL 3490 Ornithology/3495 Lab	4
BIOL 4410 Animal Behavior	3
Any one of the following (3-4 hours)	
BIOL 3510 Plant Anatomy and Diversity/3515 Lab	4
BIOL 3530 Plant Physiology/3535 Lab	4
BIOL 3550 Plant Taxonomy	3

Department of Biology

Additional coursework in computer science, geology and physics selected in consultation with the departmental advisor.	
1) Secondary Teaching Certification requires specific professional education courses, consult the department of teacher education for additional advisement.	
2) This degree does not include the requisite number of upper division hours. Students completing this degree will fill the upper division requirements while completing course work for the Secondary Teaching Certificate.	
3) Bachelor of Arts degree must meet language requirements as outlined on page 101 of this catalog.	
Free Upper Electives (includes completing minor, B.A./B.S. requirements)	10-23
40 Biology credits total required for Biology Major; at least 20 must be upper division	
Total Credits, B.S. degree	120

Biology, Forensic Emphasis Bachelor of Science	
Course Number and Title	Credits
General Education Core (see page 108)	
Core Course Requirements (must take Math 1050)	17-18
Knowledge Areas Requirements (must take BIOL 1610/1615, CHEM 1210/1215, & CJ 1010)	19
University Requirements	
BA Degree – Foreign Language/ASL Requirement (16 hours or proficiency test) BS Degree – Math or Science minimum requirement (12 hours)	
Additional Core Requirements (16 hours)	
All students majoring in biology must complete the following core courses. We recommend this sequence.	
BIOL 1620 General Biology II/1625 Lab	4
BIOL 3030 Ecology/3035 Lab	4
BIOL 3060 Genetics/3065 Lab	4
BIOL 3110 Evolution	3
BIOL 4990 Seminar	1
Required support courses (34 hours)	
MATH 1040 Statistics	4
CHEM 1220 Principles of Chemistry II/1225 Lab	5
CHEM 2310 Organic Chemistry I/ 2315 Lab	5
CHEM 2320 Organic Chemistry II/2325 Lab	5
CHEM 4110 Biochemistry	4
CHEM 3000 Quantitative Analysis	3
CHEM 4540 Selected Topics: Qualitative Analysis	3
CHEM 4230 Instrumental Analysis / 4240 Analysis Lab	5
Forensics Core Requirements (27-28 hours)	
BIOL 2420 Human Physiology/2425 Lab	4
BIOL 2320 Human Anatomy/2325 Lab	4
BIOL 3250 Histology/3255 Lab	4
BIOL 3310 Cell and Molecular Biology/3315 Lab	4
BIOL 4310 Biotechnology/4315 Lab	4
And either	
BIOL 3430 Entomology/3435 Lab	4
Or one of the following:	
BIOL 3510 Plant Anatomy and Diversity/3515 Lab	4
CJ 1340 Criminal Investigation	3

CJ 1350 Introduction to Forensic Science	3
CJ 2350 Laws of Evidence	3
CJ 3100 Advanced Criminalistics	3
Free Upper Electives (includes completing B.A./B.S. requirements)	5-7
40 Biology credits total required for Biology Major; at least 20 must be upper division	
Total Credits, B.S. degree	120

Biology, Zoology Emphasis Bachelor of Arts/Bachelor of Science	
Course Number and Title	Credits
General Education Core (see page 108)	
Core Course Requirements	17-18
Knowledge Areas Requirements	19
University Requirements	
BA Degree – Foreign Language/ASL Requirement (16 hours or proficiency test) BS Degree – Math or Science minimum requirement (12 hours)	
Core Requirements (20 hours)	
All students majoring in biology must complete the following core courses. We recommend this sequence.	
BIOL 1610 General Biology I/1615 Lab	4
BIOL 1620 General Biology II/1625 Lab	4
BIOL 3030 Ecology/3035 Lab	4
BIOL 3060 Genetics/3065 Lab	4
BIOL 3110 Evolution	3
BIOL 4990 Seminar	1
Required support courses (18-28 hours)	
MATH 1040 Statistics	4
MATH 1050 College Algebra	4
and either:	
CHEM 1110 Elementary Chem/1115 Lab	4
CHEM 1120 Elementary Organic Bio-Chem/1125 Lab	6
or	
*CHEM 1210 Principles of Chemistry I/1215 Lab	5
*CHEM 1220 Principles of Chemistry I/1225 Lab	5
*CHEM 2310 Organic Chemistry I	4
*CHEM 2315 Organic Chemistry I Lab	1
*CHEM 2320 Organic Chemistry II	4
*CHEM 2325 Organic Chemistry II Lab	1
*required for advanced degrees (professional, graduate, etc) in biological sciences	
Zoology Core Requirements (15-16 hours)	
All students will complete, in addition to the core requirements listed above:	
Any three of the following (12 hours):	
BIOL 3250 Histology / 3255 Lab	4
BIOL 3270 Vertebrate Physiology / 3275 Lab	4
BIOL 3290 Vertebrate Embryology / 3295 Lab	4
BIOL 3310 Cell and Molecular Biology / 3315 Lab	4
BIOL 3390 Mammalogy / 3395 Lab	4
BIOL 3410 Invertebrate Zoology / 3415 Lab	4
BIOL 3430 Entomology/3435 Lab	4

BIOL 3450 Comparative Vert. Studies/3455 Lab	4
BIOL 3370 Ichthyology/3375 Lab	4
BIOL 3470 Herpetology/3475 Lab	4
BIOL 3490 Ornithology/3495 Lab	4
AGSC 3400 Feeding and Nutrition of Horses and Livestock/3410 Lab	4
AGSC 3500 Applied Reproduction in Livestock and Horses/3510 Lab	4
Any one of the following (3-4 hours)	
BIOL 4070 History and Literature of Biology	3
BIOL 4310 Biotechnology/4315 Lab	4
BIOL 4410 Animal Behavior	3
BIOL 4620 Bioinformatics	3
BIOL 4650 Conservation Biology	3
Students who intend to apply to health care professional school will be advised to select the following electives:	
BIOL 2060 Microbiology/2065 Lab	4
BIOL 2320 Human Anatomy/2325 Lab	4
BIOL 3050 Biomedical Ethics	2
BIOL 3270 Vertebrate Physiology/3275 Lab	4
BIOL 3310 Cell and Molecular Biology/3315 Lab	4
BIOL 3450 Comparative Vertebrate Studies/3455 Lab	4
BIOL 3990 Advanced Topics in Biology	2
Students who intend to apply to veterinary school or seek advanced degrees in animal science will be advised to select the following electives:	
AGSC 1100 Principles of Animal Science	3
AGSC 3400 Feeding and Nutrition of Horses and Livestock/3410 Lab	4
AGSC 3500 Applied Reproduction in Livestock and Horses/3510 Lab	4
AGSC 3150 Genetics of Livestock and Horse Improvements	3
BIOL 2060 Microbiology/2065 Lab	4
BIOL 3270 Vertebrate Physiology/3275 Lab	4
BIOL 3290 Embryology/3295 Lab	4
Students who intend to work or seek advanced degrees in Natural Resources or Wildlife will be advised to select the following electives with a minimum of 9 hours of Botany courses.	
BIOL 3390/ Mammalogy/3395 Lab	4
BIOL 3430 Entomology/3435 Lab	4
BIOL 3470 Herpetology/3475 Lab	4
BIOL 3490 Ornithology/3495 Lab	4
BIOL 3370 Ichthyology/3375 Lab	4
BIOL 3510 Plant Anatomy and Diversity/3515 Lab	4
BIOL 3550 Plant Taxonomy	3
BIOL 3570 Agrostology: Wildland & Range Grasses	3
BIOL 3630 Fresh Water Biology/3635 Lab	4
NR 3000 Resource Management	3
RANG 3600 Range Management	4
Free Upper Electives (includes completing B.A./B.S. requirements)	19-31
40 Biology credits total required for Biology Major; at least 20 must be upper division	

Total Credits, B.S. degree	120
Biology Minor	
Course Number and Title	Credits
Recommended Sequence	
BIOL 1610 General Biology I/1615 Lab	4
BIOL 1620 General Biology II/1625 Lab	4
BIOL 3030 Ecology/3035 Lab	4
BIOL 3060 Genetics/3065 Lab	4
Plus one additional upper division course of three or more credit hours offered by the department of biology. (see course offerings)	
Total Credits	19-20
Biology Graduate Courses	
Course Number and Title	Credits
Offerings	
BIOL 6000 Ecology of Southern Utah	3
An advanced biology course designed for Master's of Education degree students who are teaching biology or other sciences in the secondary schools.	
BIOL 6130 DNA Analysis and Quality Control	3
BIOL 6230 Forensic Microscopy and Lab	3
BIOL 6330 Readings in Forensic Biology	3
BIOL 6430 Forensic Biochemistry	2
Secondary Education Licensure	
Pre-professional Studies Requirements	
EDUC 2000 Exploring Education in Society or Equivalent	3
SCED 2010 Teaching Process Lab	1
SCED 3200 Secondary Educational Psychology	3
Professional Studies Requirements	
EDUC 3170 Instructional Technology for Educators	3
SPED 3030 Foundations of Special Education	2
Instructional Studies Requirement	
<i>Teacher Candidates must be admitted to the Teacher Education Department to take the following courses (See admission requirements in the College of Education section page 22).</i>	
Academic 4900 Methods Course	2-3
SCED 3720 Content Literacy	2
Integrated Studies Requirements	
SCED 3570 Motivation and the Management of Diverse Instructional Environments for Secondary Teachers	3
SCED 3590 Instructional Planning Delivery and Assessment for Secondary Teachers	3
SCED 4520 Practicum/Seminar	3
SCED 4980 Clinical Practice	7
Academic 4980 Clinical Practice	2
Total Credits	34-38
<i>Note: Secondary Education courses must be taken according to the Approved Sequence outlined above. Students are strongly encouraged to consult their adviser before making course work selections for secondary education and/or their accompanying major/minor.</i>	