

Program

BS in Biological Sciences

**Option in: Cellular and Molecular Biology
Ecological, Evolutionary, and
Organismal Biology
Plant Biology
General Biology**

BS in Microbiology

**Option in: General Microbiology
Clinical Laboratory Science**

Minor in Biological Sciences

Pre-Professional Programs:

- Dentistry**
- Medicine**
- Physician's Assistant**
- Physical Therapy**
- Veterinary Medicine**

Single Subject Teaching

**Credential in Science with a
Concentration in Biological Science**

MS in Biological Sciences

MS in Botany

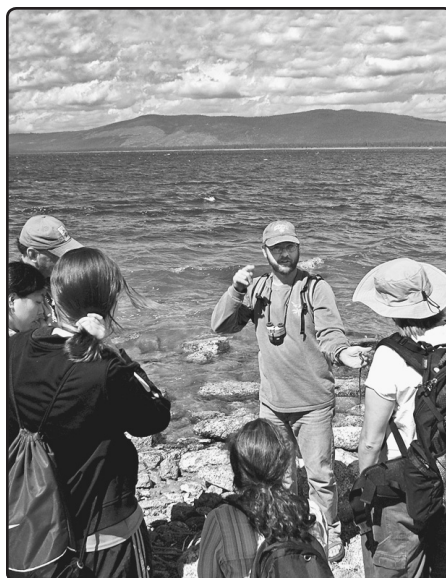
Biological Sciences

The Department of Biological Sciences is committed to becoming Northern California's premier facility for the education of students, the creation of insightful researchers, skilled professionals, and knowledgeable citizens who will have the capacity to meet biological challenges of the future and will continue contributing towards our understanding of life. We introduce our majors to current research and techniques in biological sciences and prepare them for employment opportunities, graduate education, or professional programs of study. Students are strongly encouraged to become involved in faculty research projects in the laboratory and the field.

Students who pursue a B.S. in Biological Sciences choose one of four options. The Cellular and Molecular Biology Option prepares students for professional programs, graduate studies in cellular and molecular biology, or entry level positions into the biotechnology industry. The Ecological, Evolutionary, and Organismal Biology Option prepares students for positions within environmental and resource management or graduate studies in ecology and evolutionary biology. The Plant Biology Option prepares students for positions in habitat restoration, field botany, forestry or range management, agricultural biotechnology or graduate studies in plant biology.

The General Biology Option is designed for those students who want a broad background in the biological sciences. For students who intend to become secondary school teachers, this option offers the necessary preparation for earning a single subject credential.

Microbiology majors choose either the Option in General Microbiology or Clinical Laboratory Science. The General Microbiology Option is designed to prepare students for careers in biotechnology, environmental or industrial microbiology, pharmaceutical and biomedical research, or graduate studies. The Clinical Laboratory Science Option prepares students for an internship to become a clinical laboratory scientist or public health microbiologist.



Faculty and Facilities

The faculty represent diverse academic backgrounds and are vitally interested in their students. In addition to teaching and advising, faculty are actively involved in research and scientific publication and encourage undergraduates to be involved in their research programs. Natural research sites such as Big Chico Creek Ecological Reserve and the Eagle Lake Field Station also provide year-round research opportunities to undergraduates and graduate students. Summer course work is also offered at the field station.

The department has many well-equipped teaching and research facilities in addition to an electron microscope lab, natural history museum, herbarium, and several greenhouses.

Graduate Programs

The objectives of the graduate program are to develop research and analytical skills so that students are equipped to conduct independent research and teach as professional biologists upon graduation. The MS in Biological Sciences and in Botany combine course work and satisfactory completion of original research, presented in a thesis.

Career Outlook

The organizational, data-gathering, and written communication skills acquired by biology majors prepare students for a wide variety of careers. Students may prepare themselves for employment in laboratories, business, or teaching. Laboratory positions are available in university and governmental research centers, pharmaceutical and biological product manufacturers, biotechnology firms, and agricultural and food processing companies. Teacher shortage in the United States is critical, so a teaching career, especially in the sciences, has a bright outlook.

Students who emphasize field studies may prepare themselves for positions in private companies as well as state and federal agencies. Participation in internships or cooperative education programs enhances employability in these areas.

Biological Sciences

College of Natural Sciences
Interim Dean: Margaret A. Owens

Department of Biological Sciences

Holt Hall 205

530-898-5356

e-mail: biol@csuchico.edu

<http://www.csuchico.edu/biol/>

Chair: Ailsie McEnteggart

Graduate Coordinator: Jonathan Day

Undergraduate Advisors:

Assigned by the Chair

Credential Advisor: Bev Marcum

The Bachelor of Science in Biological Sciences

Student Learning Outcomes

All candidates for the BS in Biological Sciences will demonstrate mastery in the following Student Learning Outcomes:

1. Students can describe the structure and function of cellular components and explain how they interact in a living cell.
2. Students can demonstrate an understanding of the mechanisms driving evolution and can describe similarities and differences of the major taxonomic groups.
3. Students can describe how cells interact to develop tissues and organs and how these contribute to a functional organism.
4. Students can describe how organisms interact with one another and to their environment and are able to explain interactions at the population and community levels.
5. Students demonstrate an understanding of, and ability to use, the processes and methods of scientific inquiry.
6. Students can formally communicate the results of biological investigations using both oral and written communication skills.

Total Course Requirements for the Bachelor's Degree: 120 units

See "Requirements for the Bachelor's Degree" in the *University Catalog* for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

A suggested Major Academic Plan (MAP) has been prepared to help students meet all graduation requirements within four years. Please request a plan from your major advisor or view it and other current advising information at <http://em.csuchico.edu/aap/ProgramSearch>.

General Education Requirements: 48 units

See "General Education Requirements" in the University Catalog and the Class Schedule for the most current information on General Education Requirements and course offerings. The course requirements marked below with an asterisk (*) may also be applied toward General Education.

Biological Sciences majors may meet the Breadth Area B2 requirement by completing BIOL 151.

Diversity Course Requirements: 6 units

See "Diversity Requirement" in the University Catalog. Most courses taken to satisfy these requirements may also apply to General Education.

U.S. History, Constitution, and American Ideals: 6 units

See "U.S. History, Constitution, and American Ideals" under "Bachelor's Degree Requirements". For this major, this requirement is normally fulfilled by completing HIST 130 and POLS 155 or approved equivalents.

Majors may count HIST 130 for a Breadth Area C requirement and POLS 155 for a Breadth Area D requirement.

Literacy Requirement:

See "Mathematics and Writing Requirements" in the University Catalog. Writing proficiency in the major is a graduation requirement and may be demonstrated through satisfactory completion of a course in your major which has been designated as the Writing Proficiency (WP) course for the semester in which you take the course. Students who earn below a C- are required to repeat the course and earn a C- or better to receive WP credit. See the Class Schedule for the designated WP courses for each semester. You must pass ENGL 130 (or its equivalent) with a C- or better before you may register for a WP course.

Course Requirements for the Major: 78 units

Completion of the following courses, or their approved transfer equivalents, are required of all candidates for this degree. Additional required courses, depending upon the selected option or advising pattern, are outlined following the major core program requirements.

Major Core Program: 53 units

Lower-Division Requirements: 39 units

10 courses required:

BIOL 151	Prin of Cell and Molec Biology	4.0	FS
Prerequisites: Recommend CHEM 111 or concurrent enrollment.			
BIOL 152	Prin Ecol, Evol, Org Biology	4.0	SP
Prerequisites: BIOL 151 or faculty permission; recommend CHEM 112 or concurrent enrollment.			
BIOL 153	Prin of Physiology & Developmt	4.0	FA
Prerequisites: BIOL 151; CHEM 112 or concurrent enrollment recommended.			
CHEM 111	General Chemistry	4.0	FS *
Prerequisites: Second-year high school algebra; one year high school chemistry. (One year of high school physics and one year of high school mathematics past Algebra II are recommended.)			

CHEM 112	General Chemistry	4.0	FS
Prerequisites: CHEM 111 with a grade of C- or higher.			
CHEM 270	Organic Chemistry	4.0	FS
Prerequisites: CHEM 112.			
ENVL 105	Environmental Literacy	3.0	FS *
PHYS 202A	General Physics	4.0	FS *
Prerequisites: High school physics or faculty permission. High school trigonometry and second-year high school algebra or equivalent (MATH 051 and MATH 118 at CSU, Chico).			
PHYS 202B	General Physics	4.0	FS
Prerequisites: PHYS 202A.			
MATH 109	Survey of Calculus	4.0	FS *
Prerequisites: Completion of ELM requirement; MATH 118, MATH 119 (or High School equivalents).			

Upper-Division Requirements: 14 units

Biological sciences majors are expected to have completed BIOL 151, BIOL 152, BIOL 153, CHEM 111, and CHEM 112 before beginning their upper-division requirements.

5 courses required:

BIOL 350	Fundamentals of Ecology	3.0	FS WP
Prerequisites: BIOL 152 or faculty permission. Some taxonomic background is recommended.			
BIOL 360	Genetics	4.0	FS
Prerequisites: BIOL 153 or permission of instructor.			
BIOL 492	Seminars in Biological Science	1.0	FS
Prerequisites: Junior or senior standing or faculty permission.			
CHEM 370	Organic Chemistry	3.0	FS
Prerequisites: CHEM 270 with a grade of C- or higher.			
MATH 315	Statistical Methods I	3.0	FA
Prerequisites: MATH 105 or MATH 350 or faculty permission.			

Major Option Course Requirements: 25 units

The following courses, or their approved transfer equivalents, are required dependent upon the option chosen. Students must select one of the following options for completion of the major course requirements.

The Option in Cellular and Molecular Biology: 25 units

4 courses required:

BIOL 409	Molecular Biology	4.0	SP
Prerequisites: BIOL 153, BIOL 360.			
BIOL 411	Cell Biology	4.0	FA
Prerequisites: BIOL 153, BIOL 360.			
CHEM 451	Biochemistry	3.0	FS
Prerequisites: CHEM 370 with a grade of C- or higher.			
CHEM 455L	Biochemistry Laboratory	2.0	FS
Prerequisites: CHEM 320, CHEM 451; CHEM 370L or CHEM 370M; or faculty permission.			

12 units selected from:

BIOL 371	Microbiology	4.0	FS WP
Prerequisites: ENGL 130 (or its equivalent) with a grade of C- or higher; BIOL 151, BIOL 152, BIOL 153, or faculty permission.			
BIOL 399	Special Problems	1.0-3.0	FS
BIOL 412	Bacterial Physiology	4.0	SP
Prerequisites: BIOL 371, BIOL 360, CHEM 270. CHEM 451 is recommended.			
BIOL 416	Vertebrate Physiology	4.0	FS
Prerequisites: BIOL 152, BIOL 153; CHEM 108 or CHEM 270.			
BIOL 418	Neurophysiology	4.0	SP
Prerequisites: BIOL 152, BIOL 153; CHEM 108 or CHEM 270.			
BIOL 426	Embryology	4.0	SP
Prerequisites: BIOL 152, BIOL 153, or faculty permission.			
BIOL 440	Plant Development	4.0	SP
Prerequisites: BIOL 153.			
BIOL 446	Plant Pathology	4.0	FA
Prerequisites: BIOL 153 or PSCC 101 or faculty permission.			
BIOL 460	Histology	4.0	S1
Prerequisites: BIOL 152, BIOL 153.			
BIOL 462	Hematology	3.0	S1
Prerequisites: BIOL 153. Recommended: BIOL 424 and CHEM 270.			
BIOL 464	Medical Genetics	3.0	SP
Prerequisites: BIOL 360.			
BIOL 466	Immunology	4.0	SP
Prerequisites: BIOL 153.			
BIOL 470	Medical Bacteriology	5.0	FA WP
Prerequisites: BIOL 371, BIOL 466, CHEM 270. Immunization against tetanus and diphtheria required.			
BIOL 476	General Virology	4.0	SP
Prerequisites: BIOL 153. Recommended: BIOL 371.			
BIOL 480	Developmental Biology	3.0	F2
Prerequisites: BIOL 153.			
BIOL 485	Electron Microscopy	2.0	SP
Prerequisites: PHYS 202A, PHYS 202B.			
BIOL 489	Internship in Biology	1.0-3.0	FS
Prerequisites: Necessary background for the specific internship.			

BIOL 499H	Biological Research: Honors	3.0-6.0	Inq
Prerequisites: Faculty permission.			
BIOL 609	Adv Cellular/Molecular Biology	4.0	F2
Prerequisites: BIOL 409 or CHEM 451.			
BIOL 611	Advanced Physiology/Cell Biol	4.0	F1
Prerequisites: BIOL 411 or BIOL 414 or BIOL 416 or BIOL 417.			
BIOL 670	Plant Molecular Biology	4.0	FS
Prerequisites: BIOL 409.			

Note: Undergraduate students need permission to enroll in 600-level courses. Please see the Department of Biological Sciences to obtain permission.

Unit Restrictions

A maximum of 3 units of BIOL 399 may be taken in one semester, and a maximum of 3 units of BIOL 399, BIOL 489, or BIOL 499H may be credited toward the major.

The Option in Ecological, Evolutionary, and Organismal Biology: 25 units

1 course required:

BIOL 408	Principles of Evolution	3.0	FA
Prerequisites: BIOL 360.			

1 course selected from:

BIOL 369	Advanced Plant Biology	3.0	FS
Prerequisites: BIOL 151, BIOL 152, and BIOL 153, or faculty permission.			
BIOL 370	Advanced Zoology	3.0	FS
Prerequisites: BIOL 151, BIOL 152, and BIOL 153, or faculty permission.			

1 course selected from:

BIOL 411	Cell Biology	4.0	FA
Prerequisites: BIOL 153, BIOL 360.			
BIOL 414	Plant Physiology	4.0	FS
Prerequisites: BIOL 108 or BIOL 153; CHEM 108 or CHEM 270; or faculty permission.			
BIOL 416	Vertebrate Physiology	4.0	FS
Prerequisites: BIOL 152, BIOL 153; CHEM 108 or CHEM 270.			

15 units selected from:

Select courses from the following groups, for 25 units total for this option.

1 course selected from:

BIOL 456	Field Botany	2.0	SM
Prerequisites: BIOL 152.			
BIOL 484	Field Ecology	3.0	Inq
Prerequisites: BIOL 152.			
BIOL 479	Zooarchaeology and Field Ecol	3.0	SM
Prerequisites: Faculty permission. This course is also offered as ANTH 479.			
BIOL 496	Field Study in Natural History	1.0-3.0	Inq

1 course selected from:

BIOL 402	Microbial Ecology	4.0	FA
Prerequisites: BIOL 152. Recommended: BIOL 371.			
BIOL 404	Aquatic Ecology	4.0	FA
Prerequisites: BIOL 152, CHEM 112.			
BIOL 428	Animal Behavior	3.0	F1
Prerequisites: BIOL 153.			
BIOL 613	Methods in Population Ecology	4.0	F2
Prerequisites: BIOL 350.			
BIOL 668	Community and Ecosystem Ecol	3.0	S1
Prerequisites: BIOL 350 and a statistics course.			
BIOL 672	Plant Ecology	4.0	S2
Prerequisites: BIOL 350, BIOL 448, graduate standing.			
GEOS 536	Applied Ecology	3.0	SP
Prerequisites: BIOL 350.			

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A minimum of two courses from:

BIOL 399	Special Problems	1.0-3.0	FS
BIOL 420	Invertebrate Zoology	4.0	S2
Prerequisites: BIOL 152, BIOL 153.			
BIOL 422	General Entomology	4.0	SP
Prerequisites: BIOL 152 or faculty permission. Recommended: BIOL 153.			
BIOL 430	Comparative Anat: Vertebrates	4.0	FA
Prerequisites: BIOL 152, BIOL 153.			
BIOL 432	Ichthyology	4.0	S2
Prerequisites: BIOL 152, BIOL 153.			
BIOL 433	Herpetology	4.0	S1
Prerequisites: BIOL 153.			
BIOL 434	Ornithology	4.0	S2
Prerequisites: BIOL 152, BIOL 153.			
BIOL 435	Mammalogy	3.0	FA
Prerequisites: BIOL 152.			

BIOL 446	Plant Pathology	4.0	FA
Prerequisites: BIOL 153 or PSSC 101 or faculty permission.			
BIOL 448	Plant Diversity/Identification	4.0	SP
Prerequisites: BIOL 152 or faculty permission.			
BIOL 451	Plant Geography	3.0	FA
Prerequisites: BIOL 152, BIOL 369.			
BIOL 452	Phycology	3.0	SP
Prerequisites: BIOL 152.			
BIOL 454	Mycology	4.0	Inq
Prerequisites: BIOL 152.			
BIOL 489	Internship in Biology	1.0-3.0	FS
Prerequisites: Necessary background for the specific internship.			
BIOL 499H	Biological Research: Honors	3.0-6.0	Inq
Prerequisites: Faculty permission.			

Unit Restrictions

A maximum of 3 units of BIOL 399 may be taken in one semester, and a maximum of 3 units of BIOL 399, BIOL 489, or BIOL 499H may be credited toward the major.

The Option in Plant Biology: 25 units

3 courses required:

BIOL 369	Advanced Plant Biology	3.0	FS
Prerequisites: BIOL 151, BIOL 152, and BIOL 153, or faculty permission.			
BIOL 408	Principles of Evolution	3.0	FA
Prerequisites: BIOL 360.			
BIOL 414	Plant Physiology	4.0	FS
Prerequisites: BIOL 108 or BIOL 153; CHEM 108 or CHEM 270; or faculty permission.			

1 course selected from:

BIOL 448	Plant Diversity/Identification	4.0	SP
Prerequisites: BIOL 152 or faculty permission.			
BIOL 451	Plant Geography	3.0	FA
Prerequisites: BIOL 152, BIOL 369.			
BIOL 484	Field Ecology	3.0	Inq
Prerequisites: BIOL 152.			

11-12 units selected from:

Select courses from the following groups, for 25 units total for this option.

A minimum of one course from:

BIOL 409	Molecular Biology	4.0	SP
Prerequisites: BIOL 153, BIOL 360.			
BIOL 440	Plant Development	4.0	SP
Prerequisites: BIOL 153.			
BIOL 446	Plant Pathology	4.0	FA
Prerequisites: BIOL 153 or PSSC 101 or faculty permission.			
BIOL 670	Plant Molecular Biology	4.0	FS
Prerequisites: BIOL 409.			
CHEM 451	Biochemistry	3.0	FS
Prerequisites: CHEM 370 with a grade of C- or higher.			
CHEM 455L	Biochemistry Laboratory	2.0	FS
Prerequisites: CHEM 320, CHEM 451; CHEM 370L or CHEM 370M; or faculty permission.			

A minimum of one course from:

BIOL 370	Advanced Zoology	3.0	FS
Prerequisites: BIOL 151, BIOL 152, and BIOL 153, or faculty permission.			
BIOL 371	Microbiology	4.0	FS WP
Prerequisites: ENGL 130 (or its equivalent) with a grade of C- or higher; BIOL 151, BIOL 152, BIOL 153, or faculty permission.			
BIOL 399	Special Problems	1.0-3.0	FS
BIOL 422	General Entomology	4.0	SP
Prerequisites: BIOL 152 or faculty permission. Recommended: BIOL 153.			
BIOL 442	Plant Morphology	4.0	FA
Prerequisites: BIOL 153.			
BIOL 448	Plant Diversity/Identification	4.0	SP
Prerequisites: BIOL 152 or faculty permission.			
BIOL 451	Plant Geography	3.0	FA
Prerequisites: BIOL 152, BIOL 369.			
BIOL 452	Phycology	3.0	SP
Prerequisites: BIOL 152.			
BIOL 454	Mycology	4.0	Inq
Prerequisites: BIOL 152.			
BIOL 456	Field Botany	2.0	SM
Prerequisites: BIOL 152.			
BIOL 484	Field Ecology	3.0	Inq
Prerequisites: BIOL 152.			
BIOL 489	Internship in Biology	1.0-3.0	FS
Prerequisites: Necessary background for the specific internship.			
BIOL 499H	Biological Research: Honors	3.0-6.0	Inq
Prerequisites: Faculty permission.			

The Option in General Biology: 25 units

2 courses required:

BIOL 408	Principles of Evolution	3.0	FA
Prerequisites: BIOL 360.			

Biological Sciences

BIOL 489 Internship in Biology 1.0-3.0 FS
Prerequisites: Necessary background for the specific internship.
Note: BIOL 489 must be taken for 2 units.

1 course selected from:

BIOL 369 Advanced Plant Biology 3.0 FS
Prerequisites: BIOL 151, BIOL 152, and BIOL 153, or faculty permission.
BIOL 370 Advanced Zoology 3.0 FS
Prerequisites: BIOL 151, BIOL 152, and BIOL 153, or faculty permission.
BIOL 371 Microbiology 4.0 FS WP
Prerequisites: ENGL 130 (or its equivalent) with a grade of C- or higher; BIOL 151, BIOL 152, BIOL 153, or faculty permission.

1 course selected from:

BIOL 411 Cell Biology 4.0 FA
Prerequisites: BIOL 153, BIOL 360.
BIOL 412 Bacterial Physiology 4.0 SP
Prerequisites: BIOL 371, BIOL 360, CHEM 270. CHEM 451 is recommended.
BIOL 414 Plant Physiology 4.0 FS
Prerequisites: BIOL 108 or BIOL 153; CHEM 108 or CHEM 270; or faculty permission.
BIOL 416 Vertebrate Physiology 4.0 FS
Prerequisites: BIOL 152; CHEM 108 or CHEM 270.

12-13 units selected from:

Select courses from the following groups, for 25 units total for this option.

A minimum of one course from:

BIOL 399 Special Problems 1.0-3.0 FS
BIOL 409 Molecular Biology 4.0 SP
Prerequisites: BIOL 153, BIOL 360.
BIOL 418 Neurophysiology 4.0 SP
Prerequisites: BIOL 152, BIOL 153; CHEM 108 or CHEM 270.
BIOL 426 Embryology 4.0 SP
Prerequisites: BIOL 152, BIOL 153, or faculty permission.
BIOL 440 Plant Development 4.0 SP
Prerequisites: BIOL 153.
BIOL 446 Plant Pathology 4.0 FA
Prerequisites: BIOL 153 or PSSC 101 or faculty permission.
BIOL 460 Histology 4.0 S1
Prerequisites: BIOL 152, BIOL 153.
BIOL 462 Hematology 3.0 S1
Prerequisites: BIOL 153. Recommended: BIOL 424 and CHEM 270.
BIOL 464 Medical Genetics 3.0 SP
Prerequisites: BIOL 360.
BIOL 466 Immunology 4.0 SP
Prerequisites: BIOL 153.
BIOL 470 Medical Bacteriology 5.0 FA WP
Prerequisites: BIOL 371, BIOL 466, CHEM 270. Immunization against tetanus and diphtheria required.
BIOL 476 General Virology 4.0 SP
Prerequisites: BIOL 153. Recommended: BIOL 371.
BIOL 480 Developmental Biology 3.0 F2
Prerequisites: BIOL 153.
BIOL 485 Electron Microscopy 2.0 SP
Prerequisites: PHYS 202A, PHYS 202B.
BIOL 499H Biological Research: Honors 3.0-6.0 Inq
Prerequisites: Faculty permission.
BIOL 609 Adv Cellular/Molecular Biology 4.0 F2
Prerequisites: BIOL 409 or CHEM 451.
BIOL 611 Advanced Physiology/Cell Biol 4.0 F1
Prerequisites: BIOL 411 or BIOL 414 or BIOL 416 or BIOL 417.
BIOL 670 Plant Molecular Biology 4.0 FS
Prerequisites: BIOL 409.

Note: Undergraduate students need permission to enroll in 600-level courses. Please see the Department of Biological Sciences to obtain permission.

A minimum of one course from:

BIOL 402 Microbial Ecology 4.0 FA
Prerequisites: BIOL 152. Recommended: BIOL 371.
BIOL 404 Aquatic Ecology 4.0 FA
Prerequisites: BIOL 152, CHEM 112.
BIOL 420 Invertebrate Zoology 4.0 S2
Prerequisites: BIOL 152, BIOL 153.
BIOL 422 General Entomology 4.0 SP
Prerequisites: BIOL 152 or faculty permission. Recommended: BIOL 153.
BIOL 428 Animal Behavior 3.0 F1
Prerequisites: BIOL 153.
BIOL 430 Comparative Anat: Vertebrates 4.0 FA
Prerequisites: BIOL 152, BIOL 153.
BIOL 432 Ichthyology 4.0 S2
Prerequisites: BIOL 152, BIOL 153.
BIOL 433 Herpetology 4.0 S1
Prerequisites: BIOL 153.
BIOL 434 Ornithology 4.0 S2
Prerequisites: BIOL 152, BIOL 153.

BIOL 435 Mammalogy 3.0 FA
Prerequisites: BIOL 152.
BIOL 442 Plant Morphology 4.0 FA
Prerequisites: BIOL 153.
BIOL 446 Plant Pathology 4.0 FA
Prerequisites: BIOL 153 or PSSC 101 or faculty permission.
BIOL 448 Plant Diversity/Identification 4.0 SP
Prerequisites: BIOL 152 or faculty permission.
BIOL 451 Plant Geography 3.0 FA
Prerequisites: BIOL 152, BIOL 369.
BIOL 452 Phycology 3.0 SP
Prerequisites: BIOL 152.
BIOL 454 Mycology 4.0 Inq
Prerequisites: BIOL 152.
BIOL 489 Internship in Biology 1.0-3.0 FS
Prerequisites: Necessary background for the specific internship.
BIOL 668 Community and Ecosystem Ecol 3.0 S1
Prerequisites: BIOL 350 and a statistics course.
BIOL 672 Plant Ecology 4.0 S2
Prerequisites: BIOL 350, BIOL 448, graduate standing.

Note: Undergraduate students need permission to enroll in 600-level courses. Please see the Department of Biological Sciences to obtain permission.

Unit Restrictions

A maximum of 3 units of BIOL 399 may be taken in one semester, and a maximum of 3 units of BIOL 399, BIOL 489, or BIOL 499H may be credited toward the major.

Electives Requirement:

To complete the total units required for the bachelor's degree, select additional elective courses from the total University offerings. You should consult with an advisor regarding the selection of courses which will provide breadth to your University experience and possibly apply to a supportive second major or minor.

Grading Requirement:

All courses taken to fulfill major course requirements must be taken for a letter grade except those courses specified by the department as Credit/No Credit grading only.

Advising Requirement:

Advising is mandatory for all majors in this degree program. Consult your undergraduate advisor for specific information.

Honors in the Major

Honors in the Major is a program of independent work in your major. It requires 6 units of honors course work completed over two semesters.

The Honors in the Major program allows you to work closely with a faculty mentor in your area of interest on an original performance or research project. This year-long collaboration allows you to work in your field at a professional level and culminates in a public presentation of your work. Students sometimes take their projects beyond the University for submission in professional journals, presentation at conferences, or academic competition. Such experience is valuable for graduate school and professional life. Your honors work will be recognized at your graduation, on your permanent transcripts, and on your diploma. It is often accompanied by letters of commendation from your mentor in the department or the department chair.

Some common features of Honors in the Major program are

1. You must take 6 units of Honors in the Major course work. All 6 units are honors classes (marked by a suffix of H), and at least 3 of these units are independent study (399H, 499H, 599H) as specified by your department. You must complete each class with a minimum grade of B.
2. You must have completed 9 units of upper-division course work or 21 overall units in your major before you can be admitted to Honors in the Major. Check the requirements for your major carefully, as there may be specific courses that must be included in these units.
3. Your *cumulative* GPA should be at least 3.5 or within the top 5% of majors in your department.
4. Your GPA *in your major* should be at least 3.5 or within the top 5% of majors in your department.
5. Most students apply for or are invited to participate in Honors in the Major during the second semester of their junior year. Then they complete the 6 units of course work over the two semesters of their senior year.
6. Your honors work culminates with a public presentation of your honors project.

While Honors in the Major is part of the Honors Program, each department administers its own program. Please contact your major department or major advisor to apply.

The Bachelor of Science in Microbiology

Student Learning Outcomes

All candidates for the BS in Microbiology will demonstrate mastery in the following Student Learning Outcomes:

1. Students can demonstrate knowledge of cell structure and metabolism.
2. Students can demonstrate knowledge of evolutionary forces and their consequences.
3. Students can demonstrate knowledge as to how microorganisms interact with their environment.
4. Students can demonstrate knowledge of the interaction between humans and microorganisms.
5. Students can describe and use new and existing methods and technologies in and out of the laboratory setting.
6. Students can formally communicate the results of biological investigations using both oral and written communication skills.
7. Students can demonstrate an understanding, and ability to use, the scientific method including observation, hypotheses testing, data collection, and analysis.

Total Course Requirements for the Bachelor's Degree: 120 units

See "Requirements for the Bachelor's Degree" in the *University Catalog* for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

A suggested Major Academic Plan (MAP) has been prepared to help students meet all graduation requirements within four years. Please request a plan from your major advisor or view it and other current advising information at <http://em.csuchico.edu/aap/ProgramSearch>.

Please see the General Education, Diversity, and U.S. History, Constitution, and American Ideals requirements outlined under the BS in Biological Sciences.

For Microbiology majors, the following courses are to be double-counted toward General Education and a microbiology major: Breadth Area B2 requirement may be fulfilled by BIOL 151.

Literacy Requirement:

See "Mathematics and Writing Requirements" in the *University Catalog*. Writing proficiency in the major is a graduation requirement and may be demonstrated through satisfactory completion of a course in your major which has been designated as the Writing Proficiency (WP) course for the semester in which you take the course. Students who earn below a C- are required to repeat the course and earn a C- or better to receive WP credit. See the Class Schedule for the designated WP courses for each semester. You must pass ENGL 130 (or its equivalent) with a C- or better before you may register for a WP course.

Course Requirements for the Major: 78 units

Completion of the following courses, or their approved transfer equivalents, are required of all candidates for this degree. Additional required courses, depending upon the selected option or advising pattern, are outlined following the major core program requirements.

Major Core Program: 56 units

Lower-Division Requirements: 39 units

10 courses required:

BIOL 151	Prin of Cell and Molec Biology	4.0	FS
Prerequisites: Recommend CHEM 111 or concurrent enrollment.			
BIOL 152	Prin Ecol, Evol, Org Biology	4.0	SP
Prerequisites: BIOL 151 or faculty permission; recommend CHEM 112 or concurrent enrollment.			
BIOL 153	Prin of Physiology & Developmt	4.0	FA
Prerequisites: BIOL 151; CHEM 112 or concurrent enrollment recommended.			
CHEM 111	General Chemistry	4.0	FS *
Prerequisites: Second-year high school algebra; one year high school chemistry. (One year of high school physics and one year of high school mathematics past Algebra II are recommended.)			
CHEM 112	General Chemistry	4.0	FS
Prerequisites: CHEM 111 with a grade of C- or higher.			
CHEM 270	Organic Chemistry	4.0	FS
Prerequisites: CHEM 112.			
ENVL 105	Environmental Literacy	3.0	FS *
MATH 109	Survey of Calculus	4.0	FS *
Prerequisites: Completion of ELM requirement; MATH 118, MATH 119 (or High School equivalents).			
PHYS 202A	General Physics	4.0	FS *
Prerequisites: High school physics or faculty permission. High school trigonometry and second-year high school algebra or equivalent (MATH 051 and MATH 118 at CSU, Chico).			
PHYS 202B	General Physics	4.0	FS
Prerequisites: PHYS 202A.			

Upper-Division Requirements: 17 units

Microbiology majors are expected to have completed BIOL 151, BIOL 152, BIOL 153, CHEM 111, and CHEM 112 before beginning their upper-division requirements.

6 courses required:

BIOL 360	Genetics	4.0	FS
Prerequisites: BIOL 153 or permission of instructor.			
BIOL 371	Microbiology	4.0	FS WP
Prerequisites: ENGL 130 (or its equivalent) with a grade of C- or higher; BIOL 151, BIOL 152, BIOL 153, or faculty permission.			
CHEM 370	Organic Chemistry	3.0	FS
Prerequisites: CHEM 270 with a grade of C- or higher.			
CHEM 370L	Organic Chem Laboratory	1.0	FS
Prerequisites: CHEM 370 may be taken as a prerequisite or concurrently with CHEM 370L.			
CHEM 451	Biochemistry	3.0	FS
Prerequisites: CHEM 370 with a grade of C- or higher.			
CHEM 455L	Biochemistry Laboratory	2.0	FS
Prerequisites: CHEM 320, CHEM 451; CHEM 370L or CHEM 370M; or faculty permission.			

Major Option Course Requirements: 22 units

The following courses, or their approved transfer equivalents, are required dependent upon the option chosen. Students must select one of the following options for completion of the major course requirements.

The Option in General Microbiology: 22 units

2 courses required:

BIOL 402	Microbial Ecology	4.0	FA
Prerequisites: BIOL 152. Recommended: BIOL 371.			
BIOL 412	Bacterial Physiology	4.0	SP
Prerequisites: BIOL 371, BIOL 360, CHEM 270. CHEM 451 is recommended.			

14 units selected from:

1 course selected from:

CHEM 320	Quantitative Analysis	4.0	FS
Prerequisites: CHEM 112 with a grade of C- or higher..			
MATH 315	Statistical Methods I	3.0	FA
Prerequisites: MATH 105 or MATH 350 or faculty permission.			

2 courses selected from:

BIOL 466	Immunology	4.0	SP
Prerequisites: BIOL 153.			
BIOL 470	Medical Bacteriology	5.0	FA WP
Prerequisites: BIOL 371, BIOL 466, CHEM 270. Immunization against tetanus and diphtheria required.			
BIOL 472	Microbial Genetics	4.0	FA
Prerequisites: BIOL 360. BIOL 371 is recommended.			
BIOL 474	Food and Industrial Microbio	3.0	SP
Prerequisites: BIOL 371, CHEM 270.			
BIOL 476	General Virology	4.0	SP
Prerequisites: BIOL 153. Recommended: BIOL 371.			

1-4 units selected from:

BIOL 399	Special Problems	1.0-3.0	FS
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Note: A maximum of 3 units of BIOL 399 may be applied to the major.

Or any 400-level biology (BIOL) courses.

The Option in Clinical Laboratory Science: 22 units

5 courses required:

BIOL 416	Vertebrate Physiology	4.0	FS
Prerequisites: BIOL 152, BIOL 153; CHEM 108 or CHEM 270.			
BIOL 462	Hematology	3.0	S1
Prerequisites: BIOL 153. Recommended: BIOL 424 and CHEM 270.			
BIOL 466	Immunology	4.0	SP
Prerequisites: BIOL 153.			
BIOL 470	Medical Bacteriology	5.0	FA WP
Prerequisites: BIOL 371, BIOL 466, CHEM 270. Immunization against tetanus and diphtheria required.			
CHEM 320	Quantitative Analysis	4.0	FS
Prerequisites: CHEM 112 with a grade of C- or higher..			

2 units selected from:

BIOL 399	Special Problems	1.0-3.0	FS
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Or any 400-level biology (BIOL) course.

Please see the Grading, Literacy, and Advising Requirements outlined under the BS in Biological Sciences above.

The Minor in Biological Sciences

Course Requirements for the Minor: 21 units

The following courses, or their approved transfer equivalents, are required of all candidates for this minor.

Biological Sciences

3 courses required:

BIOL 151	Prin of Cell and Molec Biology	4.0	FS
Prerequisites: Recommend CHEM 111 or concurrent enrollment.			
BIOL 152	Prin Ecol, Evol, Org Biology	4.0	SP
Prerequisites: BIOL 151 or faculty permission; recommend CHEM 112 or concurrent enrollment.			
BIOL 153	Prin of Physiology & Developmt	4.0	FA
Prerequisites: BIOL 151; CHEM 112 or concurrent enrollment recommended.			

9 units selected from:

Any upper-division biology courses, with no more than 1 unit of BIOL 399, to bring the total for the minor to 21 units.

Written Notice

Departmental approval is required before you begin course work for this minor. Approval can be obtained by providing written notice of your intention to declare this minor to the department office.

Pre-Professional Programs

For each of the pre-professional programs offered by the Department of Biological Sciences, it is recommended that students choose the Option in Cellular and Molecular Biology to fulfill the minimum requirements of professional schools.

Pre-Dentistry

While dental schools do not require a degree in biology, over 90 percent of students accepted into dental schools have four years of undergraduate education or more, and over 65 percent have majors in some area of the biological sciences. It is usual for pre-dental students to complete a bachelor's degree in biological sciences while broadly educating themselves in non-scientific subjects. Other scientific majors are also possible (see chemistry). The most important part of the pre-dentistry program is a solid general education. Dental schools select highly motivated students who have shown evidence of above-average accomplishments in a rigorous academic program. During each semester your program of courses outside the sciences should reflect this commitment to becoming well-educated.

Pre-dental students should consult with the pre-dental advisor each semester. Note that many dental schools also require an upper-division course in psychology and/or biochemistry. The Dental Aptitude Test is required for application to dental school. While acceptance rates into dental schools vary from year to year, CSU, Chico has a high rate of acceptance.

Pre-Medicine

Although a BS in biological sciences is not absolutely essential for admission to medical schools, the majority of students admitted to those schools that release their admissions statistics have degrees in the biological sciences. Degrees in other science majors are possible (see chemistry for an alternative program). Successful medical school applicants often have a second, non-science major to complement their degree in biological sciences. While students may apply for admission to medical school any time after their junior year, the majority of those admitted have completed a four-year degree, and a sizable number are admitted only after additional graduate work. The education recommended, therefore, is also appropriate for those seeking advanced training in graduate schools or employment in fields related to medicine.

Pre-medicine students should consult with the pre-medicine advisor each semester. The Medical College Aptitude Test is required for application to medical school. While acceptance rates into medical schools vary from year to year, CSU, Chico has a high rate of acceptance.

Pre-Physician's Assistant

Physician's Assistant (PA) training programs are a relatively recent addition to the biomedically oriented undergraduate student's career options. Postgraduate PA training is widely available in northern California. These programs are competitive and require an extensive science background similar to medical schools. The Option in Cellular and Molecular Biology will fulfill these minimum requirements. For further information on this expanding career opportunity in human health and medicine, consult with the pre-medicine advisor.

Pre-Physical Therapy

The Department of Biological Sciences offers up-to-date information and advising for those interested in a postbaccalaureate Physical Therapy degree. Many of the required courses are offered in the department and many of the department's majors have entered a Physical Therapy program after graduation.

Pre-Veterinary Medicine

Admission to a veterinary college is highly competitive. Academic performance and non-academic factors, such as appropriate work experience, are a major part of the selection criteria. Pre-veterinary medicine students should consult with the pre-veterinary advisor each semester. The Option in Cellular and Molecular Biology meets the minimum course requirements for admission to the School of Veterinary Medicine, University

of California, Davis. It is strongly recommended that an upper-division course in comparative anatomy also be taken.

The Single Subject Matter Preparation Program in Science with a Concentration in Biological Science

Course requirements for the Single Subject Matter Preparation Program, in conjunction with the Professional Education Program, leads to a Single Subject Teaching Credential.

In most majors, candidates for this credential will normally fulfill the single subject matter preparation program by completing the appropriate education option in the major. The Option in General biology is recommended for the pre-credential student. In addition to the single subject matter preparation program, completion of an additional professional education program is required to qualify for a California teaching credential. Professional education (credential) programs are available through the School of Education. For prerequisites and other admission requirements to professional education programs, see the "Education" chapter of this catalog.

Your departmental credential advisor is responsible for verifying that the subject matter preparation program has been completed. If you are interested in obtaining a teaching credential, confer with the appropriate credential advisor early in your University career. Department credential advisors can assist you in planning an educational program that meets both major and credential requirements.

Subject matter preparation requirements are governed by federal and state legislative action and approval of the California Commission on Teacher Credentialing. Requirements may change between catalogs.

Please consult with your departmental credential advisor for current information.

The Master of Science in Biological Sciences

Course Requirements for the Master's Degree: 30 units

Continuous enrollment is required. A maximum of 9 semester units of transfer and/or CSU Chico Open University course work may be applied toward the degree.

Graduate Time Limit:

All requirements for the degree are to be completed within five years of the end of the semester of enrollment in the oldest course applied toward the degree. See "Graduate Education" in the University Catalog for complete details on general degree requirements.

Prerequisites for Admission to Conditionally Classified Status:

1. Satisfactory grade point average as specified in "Admission to Master's Degree Programs" in the University Catalog.
2. Approval by the department and the Office of Graduate Studies.
3. An acceptable baccalaureate in biological sciences from an accredited institution, or an equivalent approved by the Office of Graduate Studies.
4. Completion of the Graduate Record Examination with a minimum combined score (verbal and quantitative) of 1000, and an analytical score above 3.5.
5. Letter of Intent and two letters of recommendation.
6. Approval by at least two potential faculty mentors.

Prerequisites for Admission to Classified Status:

In addition to any requirements listed above:

1. Undergraduate GPA of 3.0 in the last 60 units.
2. Acceptance by a CSU, Chico faculty mentor.

Advancement to Candidacy:

In addition to any requirements listed above:

1. Satisfactory completion of BIOL 600.
2. Satisfactory scores on each area of the Biology Subject GRE.
3. Establishment of a Graduate Advisory Committee.
4. Submission of an Approved Program Plan.
5. Successful completion of a written qualifying exam in the student's specialty area (cell/molecular biology, ecology, microbiology, or botany).

Requirements for the MS in Biological Sciences:

Completion of all requirements as established by the departmental graduate committee, the Graduate Advisory Committee, and the Office of Graduate Studies, to include:

1. Completion of an approved program consisting of 30 units of 400/500/600-level courses as follows:

(a) At least 18 units in the discipline of biological sciences, including at least one course of 3 or more units outside the sub-discipline (i.e., botany, zoology, microbiology).

(b) BIOL 600, Research in the Biological Sciences, to be completed during the first fall semester.

(c) At least one unit of graduate seminar (BIOL 605 or BIOL 605), completed during the first year.

(d) At least 18 of the units required for the degree in 600-level courses.

(e) Not more than 9 semester units of transfer and/or extension credit (correspondence courses and U.C. extension course work are not acceptable).

(f) Not more than 15 units taken before admission to classified status.

(g) Not more than 2 units of Independent Study (697) and 6 units of Master's Thesis (699).

2. Completion and final approval of an independent research project resulting in an acceptable thesis as specified by the student's Graduate Advisory Committee.

3. Presentation of a seminar based on the student's master's thesis research. This seminar will usually be given during the semester in which the student plans to complete the degree requirements.

4. Approval by the departmental graduate committee and the Graduate Coordinators Committee on behalf of the faculty of the University.

Graduate Requirement in Writing Proficiency:

Writing proficiency is a graduation requirement.

Biological sciences majors will demonstrate their writing competence through satisfactory completion of a designated portion of the qualifying examination required as a prerequisite for admission to candidacy.

Graduate Grading Requirements:

All courses in the major (with the exceptions of Independent Study - 697, Master's Project - 699P, and Master's Thesis - 699T) must be taken for a letter grade, except those courses specified by the department as ABC/No Credit (400/500-level courses), AB/No Credit (600-level courses), or Credit/No Credit grading only. A maximum of 10 units combined of ABC/No Credit, AB/No Credit, and Credit/No Credit grades may be used on the approved program (including 697, 699P, 699T and courses outside the major). While grading standards are determined by individual programs and instructors, it is also the policy of the University that unsatisfactory grades may be given when work fails to reflect achievement of the high standards, including high writing standards, expected of students pursuing graduate study.

Students must maintain a minimum 3.0 grade point average in each of the following three categories: all course work taken at any accredited institution subsequent to admission to the master's program; all course work taken at CSU, Chico subsequent to admission to the program; and all courses on the approved master's degree program.

Graduate Advising Requirement:

Advising is mandatory each semester for biological sciences majors. Consult the Graduate Coordinator for specifics.

The Master of Science in Botany

Note: The following is different from what appears in the printed catalog. The below information is current and correct.

Admissions to the Master of Science in Botany is currently suspended. Please contact the Biology Department or the Office of Graduate Studies to learn the current status of the program.

Course Requirements for the Master's Degree: 30 units

Continuous enrollment is required. A maximum of 9 semester units of transfer and/or CSU Chico Open University course work may be applied toward the degree.

Graduate Time Limit:

All requirements for the degree are to be completed within five years of the end of the semester of enrollment in the oldest course applied toward the degree. See "Graduate Education" in the University Catalog for complete details on general degree requirements.

Prerequisites for Admission to Conditionally Classified Status:

1. Satisfactory grade point average as specified in "Admission to Master's Degree Programs" in the University Catalog.

2. Approval by the department and the Office of Graduate Studies.

Prerequisites are the same as for the Master's degree in Biological Sciences.

Prerequisites for Admission to Classified Status:

In addition to any requirements listed above:

Prerequisites are the same as for the Master's degree in Biological Sciences.

Advancement to Candidacy:

Prerequisites are the same as for the Master's degree in Biological Sciences.

Requirements for the MS in Botany:

Requirements are the same as for the Master's degree in Biological Sciences.

Graduate Requirement in Writing Proficiency:

Writing proficiency is a graduation requirement.

Botany majors will demonstrate their writing competence through satisfactory completion of a designated portion of the qualifying examination required as a prerequisite for advancement to candidacy.

Graduate Grading Requirements:

All courses in the major (with the exceptions of Independent Study - 697, Master's Project - 699P, and Master's Thesis - 699T) must be taken for a letter grade, except those courses specified by the department as ABC/No Credit (400/500-level courses), AB/No Credit (600-level courses), or Credit/No Credit grading only. A maximum of 10 units combined of ABC/No Credit, AB/No Credit, and Credit/No Credit grades may be used on the approved program (including 697, 699P, 699T and courses outside the major). While grading standards are determined by individual programs and instructors, it is also the policy of the University that unsatisfactory grades may be given when work fails to reflect achievement of the high standards, including high writing standards, expected of students pursuing graduate study.

Students must maintain a minimum 3.0 grade point average in each of the following three categories: all course work taken at any accredited institution subsequent to admission to the master's program; all course work taken at CSU, Chico subsequent to admission to the program; and all courses on the approved master's degree program.

Graduate Advising Requirement:

Advising is mandatory each semester for all botany majors. Consult the Graduate Coordinator for specifics.

The Faculty

Jeffrey R. Bell, 1992, Professor, PhD, USC.
Kristopher A. Blee, 2001, Assoc Professor, PhD, Utah State U.
Jonathan R. Day, 2000, Assoc Professor, PhD, U Delaware.
Patricia L. Edelmann, 1976, Professor, PhD, UC Davis.
Tag N. Engstrom, 2004, Assist Professor, PhD, UC Davis.
Larry F. Hanne, 1983, Professor, PhD, U Texas.
Colleen A. Hatfield, 2005, Assist Professor, PhD, U New Mexico.
James L. Houpis, 2001, Dean, Professor, PhD, UC Berkeley.
Christopher Ivey, 2006, Assist Professor, PhD, U Georgia.
David M. Keller, 2008, Assist Professor, PhD, Oregon Health Sciences U.
John R. Mahoney, 1997, Assoc Professor, PhD, U Minnesota.
Michael P. Marchetti, 2000, Assoc Professor, PhD, UC Davis.
Beverly A. Marcum, 1982, Professor, PhD, U Virginia.
Ailsie B. McEnteggart, 1969, Chair, Professor, PhD, U Texas.
Donald G. Miller III, 2002, Assoc Professor, PhD, UC Berkeley.
James C. Pushnik, 1989, Professor, PhD, Utah State U.
Irene Salter, 2007, Assist Professor, PhD, UC San Francisco.
Kristina A. Schierenbeck, 1998, Professor, PhD, Washington State U.
Andrea White, 2006, Assist Professor, PhD, U Illinois.
Gordon V. Wolfe, 2000, Professor, PhD, U Washington.
David M. Wood, 1990, Professor, PhD, U Washington.


Emeritus Faculty

Michael A. Abruzzo, 1973, Professor Emeritus, PhD, Michigan State U.
Douglas G. Alexander, 1965, Professor Emeritus, PhD, U No Carolina.
Raymond J. Barnett, 1976, Professor Emeritus, PhD, Duke U.
Richard S. Demaree Jr, 1972, Professor Emeritus, PhD, Colorado State U.
Wesley H. Dempsey, 1954, Professor Emeritus, PhD, UC Davis.
William F. Derr, 1964, Professor Emeritus, PhD, U Wisconsin.
Robert I. Ediger, 1967, Professor Emeritus, PhD, Kansas State U.
Michael J. Erpino, 1968, Professor Emeritus, PhD, U Wyoming.
Robbins S. King, 1956, Professor Emeritus, PhD, Stanford U.
David H. Kistner, 1959, Professor Emeritus, PhD, U Chicago.
Donald T. Kowalski, 1964, Professor Emeritus, PhD, U Michigan.
Roger J. Lederer, 1972, Professor Emeritus, PhD, U Illinois.
Paul E. Maslin, 1970, Professor Emeritus, PhD, U Florida.
Robert Blackwood McNairn, 1967, Professor Emeritus, PhD, UC Davis.
Robert A. Schlising, 1973, Professor Emeritus, PhD, UC Berkeley.
William L. Stephens, 1963, Professor Emeritus, PhD, UC Davis.
Robert E. Thomas, 1966, Professor Emeritus, PhD, Kent State U.
Alan Roy Wilhelm, 1969, Professor Emeritus, PhD, U Wisconsin.

Biological Sciences Course Offerings

Please see the section on "Course Description Symbols and Terms" in the University Catalog for an explanation of course description terminology and symbols, the course numbering system, and course credit units. All courses are lecture and discussion and employ letter grading unless otherwise stated. Some prerequisites may be waived with faculty permission. Many syllabi are available on the Chico Web.

Some 400/500/600-level courses are on an alternate-year schedule. Check with Department of Biological Sciences Office for schedule.

BIOL 101 Concepts of Biology  **3.0 Fa/Spr**

Study of the nature and interaction of living things on the planet. Includes cell organization; diversity and structure of plants and animals; DNA and genetics; ecology; and evolution. Primarily for students without a strong high school biology or chemistry background. 1.0 hours lecture, 4.0 hours activity. (001105)

BIOL 103 Human Anatomy **4.0 Fa/Spr**


Study of the structure of the human body, to include muscles, bones, heart, brain, ear, eye, and other systems, as well as a short look at development of the fetus. Lab work entails dissection of the cat and study of the human skeleton. 3.0 hours laboratory, 3.0 hours lecture. This is an approved General Education course. Special fee required; see the Class Schedule. (001110)

BIOL 104 Human Physiology **4.0 Fa/Spr**


Basic functioning of the organ systems of the human body, including the brain and nervous system; vision and hearing; heart and circulation; blood and immunity; respiration, digestion and metabolism; muscles; excretory, endocrine, and reproductive systems. 3.0 hours laboratory, 3.0 hours lecture. This is an approved General Education course. (001114)

BIOL 105 Food, Fiber, and Drugs **3.0 Fa/Spr**

Designed specifically for non-majors. Emphasis on broad biological principles, as illustrated by plants, and the economic importance and role of plants in human ecology. 2.0 hours lecture, 3.0 hours laboratory. (001119)

BIOL 108 Principles of Biology  **3.0 Fa/Spr**

Prerequisites: High school biology and chemistry.
 Principles of Biology provides an understanding of the human ecosystem and the effects of human populations on ecosystem productivity; the theories of evolution and heredity; modern genetic technology; the biology of cancer and AIDS; and human reproduction. Laboratory consists of scientific investigations designed by students. Designed primarily for students in the sciences and related fields. 2.0 hours lecture, 3.0 hours laboratory. (001125)

BIOL 151 Principles of Cellular and Molecular Biology  **4.0 Fa/Spr**

Prerequisites: Recommend CHEM 111 or concurrent enrollment.
 Introduction to biological molecules, bioenergetics, cellular structure and function, elements of molecular biology and genetics, and mechanisms of macroevolution and systematics. 3.0 hours laboratory, 3.0 hours lecture. Special fee required; see the Class Schedule. (001122)

BIOL 152 Principles of Ecological, Evolutionary, and Organismal Biology  **4.0 Spring**

Prerequisites: BIOL 151 or faculty permission; recommend CHEM 112 or concurrent enrollment.
 Introduction to evolutionary history and biological diversity, microbes and protists, invertebrates, vertebrates, and plants. Form and function of plants and animals. Ecological principles. 3.0 hours laboratory, 3.0 hours lecture. Special fee required; see the Class Schedule. (001123)

BIOL 153 Principles of Physiology and Development **4.0 Fall**

Prerequisites: BIOL 151; CHEM 112 or concurrent enrollment recommended.
 Introduction to plant and animal physiology and development. Laboratory consists of small group independent investigations of biological questions that include student-devised experiments; application of biological techniques, data analysis, and peer reviewed presentation of results. 3.0 hours laboratory, 3.0 hours lecture. (020284)

BIOL 198 Special Topics **1.0-3.0 Fa/Spr**

This course is for special topics offered for 1.0-3.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. (001135)

BIOL 211 Allied Health Microbiology **4.0 Fa/Spr**

Prerequisites: A college course in biology and in general chemistry.
 Introduction to structure/function, metabolism, genetics, ecological interactions and pathogenic mechanisms of microorganisms. In addition, the roles of microorganisms in sanitation and in the food and biotechnology industries will be discussed. 3.0 hours laboratory, 3.0 hours lecture. Special fee required; see the Class Schedule. (001132)

BIOL 302 Evolution **3.0 Spring**

Prerequisites: BIOL 101 or BIOL 108 or equivalent.
 Analysis of the evidence for evolution and the nature of the process. Darwinism, neo-Darwinism, sociobiology, conflicts and misconceptions regarding evolution, creationism, and evolution of the human body and mind are considered. This is an approved General Education course. (001139)

BIOL 303 Human Genetics **3.0 Fa/Spr**

Prerequisites: One biological sciences course.
 The inheritance, expression, and evolution of the genetic material in humans. Topics include genetic engineering, gene therapy, prenatal diagnosis, cancer, the human genome project, genetic influences on human behavior, such as homosexuality and mental illness, and the social and ethical consequences of the new technologies. This is an approved General Education course. (001140)

BIOL 305 Museum Techniques **2.0 Inquire**

Prerequisites: Previous biological sciences course work is recommended.
 Techniques of preparing biological specimens for study and display, with emphasis on vertebrate specimens. Museum and taxidermy mounts, wet and dry skeletons, and other preservation and display techniques will be covered. Practical work will be stressed. 1.0 hours lecture, 3.0 hours laboratory. (001124)

BIOL 307 Microbes and Disease **3.0 Spring**

Prerequisites: BIOL 101 or BIOL 108. Not open for credit to students majoring in microbiology or who have taken, or are taking, BIOL 211.
 Overview of infectious diseases, immunological diseases, vaccines, and modern approaches to disease control. (001143)

BIOL 315 Human Biology 3.0 Spring

Prerequisites: One biological sciences course, preferably introductory biology. A study of human beings from a biological perspective, including their evolution, physiology, behavior, and ecology. (001147)

BIOL 318 Biology of Childhood 3.0 Fa/Spr


Prerequisites: One biological sciences course. Basic biological principles, including the scientific method, reproduction, development, physiology, and anatomy. The biological basis of childhood diseases, immunity, nutrition, issues of health and well-being, and the relevance of biological information in social, political, and ethical decision making regarding children. This is an approved General Education course. (001151)

BIOL 322 Science and Human Values  3.0 Spring

Prerequisites: BIOL 101 or BIOL 108. Critically examines scientific and humanistic world views and sensibilities, directly applying these approaches to contemporary social and personal problems. This is an approved General Education course. This course is also offered as PHIL 322. (001148)

BIOL 322H Science and Human Values - Honors 3.0 Fall


Prerequisites: Acceptance into the Honors Program, faculty permission. Critically examines scientific and humanistic world views and sensibilities, directly applying these approaches to contemporary social and personal problems. This is an approved General Education course. This course is also offered as PHIL 322H. (001149)

BIOL 334 Conservation Ecology  3.0 Fa/Spr

Prerequisites: BIOL 101 or equivalent. An examination of ecological principles and the impact of increasing population and technology upon the environment. This is an approved General Education course. (001156)

BIOL 341 Agricultural Entomology and Insect Control  3.0 Spring

Prerequisites: BIOL 101 or BIOL 108. Recognition, taxonomy, morphology, and life histories of agriculturally important insects. Control measures, including biological, cultural, and chemical. 2.0 hours discussion, 3.0 hours laboratory. (001157)

BIOL 342 Field Biology  3.0 Fa/Spr

Prerequisites: BIOL 101 or BIOL 108. Plant and animal morphology, classification, and ecological relationships examined through field and laboratory study. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule. (001158)

BIOL 345 Biology of Cancer 3.0 Fa/Spr

Prerequisites: One lower-division course in Biological Sciences. An introduction to cancer; what it is, what causes it, and how it is diagnosed and treated. This is an approved General Education course. (001165)

BIOL 350 Fundamentals of Ecology  3.0 Fa/Spr

Prerequisites: ENGL 130 (or its equivalent) with a grade of C- or higher; BIOL 152 or faculty permission. Some taxonomic background is recommended. Interrelationships among living organisms, field observations of such phenomena. Application of quantitative and qualitative methods to the interpretation of ecological phenomena. 2.0 hours discussion, 3.0 hours laboratory. This is a writing proficiency, WP, course; a grade of C- or better certifies writing proficiency for majors. Special fee required; see the Class Schedule. (001206)

BIOL 351 Introduction to Biological Literature 1.0 Fa/Spr

Prerequisites: ENGL 130 (or its equivalent) with a grade of C- or higher; junior standing; BIOL 152. Majors are expected to take this course prior to or concurrent with enrollment in any 200-level biology course. Principles of library research, scientific writing, and scientific data recording. (001168)

BIOL 360 Genetics 4.0 Fa/Spr

Prerequisites: BIOL 153 or permission of instructor. A detailed study of the principles of classical, molecular, and population/evolutionary genetics. Activities will include computer simulations of segregation, linkage, and population genetics, internet-based database searches for genetic diseases and cloned genes, and searches of the current genetic literature. 1.0 hours discussion, 3.0 hours lecture. (001173)

BIOL 369 Advanced Plant Biology 3.0 Fa/Spr

Prerequisites: BIOL 151, BIOL 152, and BIOL 153, or faculty permission. Advanced study of plant anatomy, morphology, physiology, ecology, and evolution. 2.0 hours lecture, 3.0 hours laboratory. Special fee required; see the Class Schedule. (020280)

BIOL 370 Advanced Zoology 3.0 Fa/Spr

Prerequisites: BIOL 151, BIOL 152, and BIOL 153, or faculty permission. Advanced study of animal anatomy, morphology, physiology, ecology, and evolution. 2.0 hours lecture, 3.0 hours laboratory. Special fee required; see the Class Schedule. (020281)

BIOL 371 Microbiology 4.0 Fa/Spr

Prerequisites: ENGL 130 (or its equivalent) with a grade of C- or higher; BIOL 151, BIOL 152, BIOL 153, or faculty permission. Introduction to the biology of prokaryotic and eukaryotic microorganisms, as well as viruses. Topics include cell structure, metabolism, genetics; ecological interactions; pathogenic mechanisms; and the roles of microorganisms in sanitation, food production, and biotechnology. The lab focuses on methods for growing and studying diverse microbes. 2.0 hours lecture, 6.0 hours laboratory. This is a writing proficiency, WP, course; a grade of C- or better certifies writing proficiency for majors. Special fee required; see the Class Schedule. (020279)

BIOL 380 Computer Applications in Biology 3.0 Spring

Prerequisites: BIOL 152 and a computer science course providing skills in programming. Recommended: MATH 120 or a statistics course. Models of biological processes and systems will be used to introduce the potentials for computing in biological research. 2.0 hours seminar, 3.0 hours laboratory. (001159)

BIOL 389 Clinical Laboratory Observation 1.0 Fa/Spr

Prerequisites: Microbiology/Clinical Laboratory Science majors with no previous clinical laboratory experience and who have completed BIOL 470 or CHEM 252; faculty permission. Students observe in a clinical hospital laboratory and in a private clinical laboratory. You may take this course more than once for a maximum of 15.0 units. Credit/no credit grading only. (001161)

BIOL 398 Special Topics 1.0-3.0 Fa/Spr


This course is for special topics offered for 1.0-3.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. (001166)

BIOL 399 Special Problems 1.0-3.0 Fa/Spr

This course is an independent study of special problems offered for 1.0-3.0 units. You must register directly with a supervising faculty member. Research in biology under direct supervision of faculty member. For majors only. This course counts toward the upper-division biology units required for the BS. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only. (001167)

BIOL 402 Microbial Ecology 4.0 Fall

Prerequisites: BIOL 152. Recommended: BIOL 371. The roles and interactions of viruses, bacteria, algae, protozoa, and fungi in the natural and human environment, stressing fundamental principles of ecology and evolution. 3.0 hours laboratory, 3.0 hours lecture. Special fee required; see the Class Schedule. (001225)

BIOL 404 Aquatic Ecology  4.0 Fall

Prerequisites: BIOL 152, CHEM 112. Physical, chemical, and biological factors influencing the ecology of inland waters. 3.0 hours laboratory, 3.0 hours lecture. Special fee required; see the Class Schedule. (001207)

BIOL 408 Principles of Evolution 3.0 Fall

Prerequisites: BIOL 360. A detailed study of the evolutionary process, including history, natural selection, population genetics, molecular evolution, speciation, coevolution, and macroevolution. (001201)

BIOL 409 Molecular Biology 4.0 Spring

Prerequisites: BIOL 153, BIOL 360. Detailed analysis of structure and related functions of cells with an emphasis on the molecular mechanisms of gene expression and gene regulation. Lectures and laboratory sessions focus on current theories and methodologies associated with cloning, nucleic acid analysis, gene expression, bioinformatics, and genomics. 2.0 hours lecture, 6.0 hours laboratory. Special fee required; see the Class Schedule. (020282)

BIOL 411 Cell Biology 4.0 Fall

Prerequisites: BIOL 153, BIOL 360. Detailed study of cellular function with an emphasis on intracellular and intercellular communication. Topics include protein structure and function, properties of biological membranes, signal transduction, protein trafficking pathways, vesicular transport, cell cycle, apoptosis and cancer. 3.0 hours discussion, 3.0 hours laboratory. (001169)

Biological Sciences

BIOL 412 Bacterial Physiology 4.0 Spring

Prerequisites: BIOL 371, BIOL 360, CHEM 270. CHEM 451 is recommended. Study of bacterial structure and function, modes of metabolism, regulatory responses to environmental change and stress, and microbial aspects of nutrition and growth. 2.0 hours discussion, 6.0 hours laboratory. (001222)

BIOL 414 Plant Physiology 4.0 Fa/Spr

Prerequisites: BIOL 108 or BIOL 153; CHEM 108 or CHEM 270; or faculty permission. Functions in higher plants; water and soil relations, photosynthesis, respiration, enzyme action, and growth. 3.0 hours discussion, 3.0 hours laboratory. (001181)

BIOL 416 Vertebrate Physiology 4.0 Fa/Spr

Prerequisites: BIOL 152, BIOL 153; CHEM 108 or CHEM 270. General features of vertebrate physiology. Function of muscular, nervous, respiratory, circulatory, excretory, and endocrine systems. 2.0 hours discussion, 6.0 hours laboratory. (001180)

BIOL 417 Cell Physiology 3.0 Spring

Prerequisites: BIOL 153; CHEM 108 or CHEM 270. Detailed study of cellular function, with emphasis on regulation of cellular processes, modern experimental techniques, and a chemical approach to the cell in general. 2.0 hours discussion, 3.0 hours laboratory. (001172)

BIOL 418 Neurophysiology 4.0 Spring

Prerequisites: BIOL 152, BIOL 153; CHEM 108 or CHEM 270. This course provides students with background and fundamental information necessary to pursue neuroscience at the graduate or professional level. Cellular and molecular mechanisms within mammalian central nervous system are emphasized. 3.0 hours laboratory, 3.0 hours lecture. Special fee required; see the Class Schedule. (001219)

BIOL 420 Invertebrate Zoology 4.0 EvnSp

Prerequisites: BIOL 152, BIOL 153. A survey of the basic biology of the principal invertebrate phyla. Emphasis placed both on morphology and contribution of each group to biological principles. 2.0 hours discussion, 6.0 hours laboratory. (001200)

BIOL 422 General Entomology 4.0 Spring

Prerequisites: BIOL 152 or faculty permission. Recommended: BIOL 153. The morphology, ecology, and physiology of insects. Economic entomology and medical entomology, and taxonomy. 2.0 hours discussion, 6.0 hours laboratory. Special fee required; see the Class Schedule. (001210)

BIOL 424 Parasitology 4.0 OddSp

Prerequisites: BIOL 152 or equivalent. Strongly recommended: BIOL 153. Biology of human and animal parasites, with emphasis on life cycles and control strategies. 3.0 hours discussion, 3.0 hours laboratory. (001177)

BIOL 426 Embryology 4.0 Spring

Prerequisites: BIOL 152, BIOL 153, or faculty permission. Principles and theories of animal development, emphasizing the vertebrate. 3.0 hours discussion, 3.0 hours laboratory. (001188)

BIOL 428 Animal Behavior 3.0 OddFa

Prerequisites: BIOL 153. Consideration of the basic problems in animal behavior, including orientation, social behavior, and the nature and organization of animal societies. 2.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule. (001205)

BIOL 430 Comparative Anatomy of the Vertebrates 4.0 Fall

Prerequisites: BIOL 152, BIOL 153. Explanation of the anatomical similarities and differences of selected vertebrates. The evolution and adaptive significance of various systems are considered. 2.0 hours discussion, 6.0 hours laboratory. (001171)

BIOL 432 Ichthyology 4.0 EvnSp

Prerequisites: BIOL 152, BIOL 153. Morphology, ecology, behavior, and systematics of California fishes, with an introduction to fisheries biology. 2.0 hours discussion, 6.0 hours laboratory. Special fee required; see the Class Schedule. (001208)

BIOL 433 Herpetology 4.0 OddSp

Prerequisites: BIOL 153. The morphology, evolution, physiology, behavior, ecology, and taxonomy of amphibians and reptiles. California amphibians and reptiles are emphasized, including field studies of local species. 3.0 hours laboratory, 3.0 hours lecture. Special fee required; see the Class Schedule. (001212)

BIOL 434 Ornithology 4.0 EvnSp

Prerequisites: BIOL 152, BIOL 153. The morphology, evolution, ecology, physiology, taxonomy, and behavior of birds, including field studies of local species. 2.0 hours discussion, 6.0 hours laboratory. Special fee required; see the Class Schedule. (001213)

BIOL 435 Mammalogy 3.0 Fall

Prerequisites: BIOL 152. Study of evolution, anatomy, physiology, ecology, and behavior of mammals. California mammals will be emphasized in lab. 2.0 hours discussion, 3.0 hours laboratory. (001215)

BIOL 440 Plant Development 4.0 Spring

Prerequisites: BIOL 153. Plant anatomical study with inclusion of modern genetic methods of analysis for a molecular understanding of plant development. Developmental concepts include biochemical signal, genetic control of cell division, cell differentiation and cell death in relationship to formation of the plant body and life cycle completion. 3.0 hours laboratory, 3.0 hours lecture. (001189)

BIOL 442 Plant Morphology 4.0 Fall

Prerequisites: BIOL 153. Comparative morphology of plant types, emphasizing evolution of structures and methods of reproduction. 3.0 hours discussion, 3.0 hours laboratory. (001191)

BIOL 446 Plant Pathology 4.0 Fall

Prerequisites: BIOL 153 or PSSC 101 or faculty permission. Study of plant pathology encompassing parasitism and disease in plants, pathogen attack strategies, diseased plant physiology, plant defense mechanisms, environmental effects on disease and descriptions of diseases and treatments. 3.0 hours laboratory, 3.0 hours lecture. (001194)

BIOL 448 Plant Diversity and Identification 4.0 Spring

Prerequisites: BIOL 152 or faculty permission. Principles of plant classification with field study of local flora, emphasizing the higher plants and their phylogenetic relationships. 2.0 hours discussion, 6.0 hours laboratory. Special fee required; see the Class Schedule. (001198)

BIOL 451 Plant Geography 3.0 Fall

Prerequisites: BIOL 152, BIOL 369. The composition and distribution of plant communities, emphasizing the ecological, environmental, and evolutionary processes that affect them. 2.0 hours lecture, 3.0 hours laboratory. Special fee required; see the Class Schedule. (020283)

BIOL 452 Phycology 3.0 Spring

Prerequisites: BIOL 152. Reproduction, morphology, taxonomy, and economic importance of the algae. Field and laboratory work with both freshwater and marine representatives. 2.0 hours discussion, 3.0 hours laboratory. (001192)

BIOL 454 Mycology 4.0 Inquire

Prerequisites: BIOL 152. A survey of the fungi, with emphasis upon structure and development, classification, and economic importance. 2.0 hours discussion, 6.0 hours laboratory. (001193)

BIOL 456 Field Botany 2.0 Summer

Prerequisites: BIOL 152. An examination of the ecological factors of plant distribution; taxonomy of the plants of biotic communities of northeastern California. Offered only at Eagle Lake Biological Field Station. 1.0 hours discussion, 3.0 hours laboratory. (001209)

BIOL 460 Histology 4.0 OddSp

Prerequisites: BIOL 152, BIOL 153. Microscopic analysis of tissues, organs, and organ systems of vertebrates emphasizing mammalian histophysiology. 3.0 hours discussion, 3.0 hours laboratory. (001170)

BIOL 462 Hematology 3.0 OddSp

Prerequisites: BIOL 153. Recommended: BIOL 424 and CHEM 270. The study of blood in normal and abnormal conditions. 2.0 hours discussion, 3.0 hours laboratory. (001174)

BIOL 464 Medical Genetics 3.0 Spring

Prerequisites: BIOL 360. Lectures on genetic diseases in humans, emphasizing the biochemical and molecular advances in diagnosis, treatment, gene therapy, and prevention. A significant portion of the course will deal with the molecular biology of cancer and the Human Genome Project. (001184)

BIOL 466 Immunology 4.0 Spring

Prerequisites: BIOL 153. The development and expression of the immune response, the basic principles of antigen-antibody reactions and their relevance to medicine, genetics, taxonomy, and evolution. 3.0 hours discussion, 3.0 hours laboratory. (001220)

BIOL 470 Medical Bacteriology 5.0 Fall

Prerequisites: BIOL 371, BIOL 466, CHEM 270. Immunization against tetanus and diphtheria required. Biological characteristics of medically important bacteria. Mechanisms of pathogenicity and host-resistance. Laboratory procedures for isolation and identification. 3.0 hours discussion, 6.0 hours laboratory. This is a writing proficiency, WP, course; a grade of C- or better certifies writing proficiency for majors. Special fee required; see the Class Schedule. (001182)

BIOL 472 Microbial Genetics 4.0 Fall


Prerequisites: BIOL 360. BIOL 371 is recommended. The molecular basis of mutation and recombination, mechanisms of gene transfer, transcription in bacteria and bacteriophages, genetics and biochemistry of regulation of bacterial operons, and bacteriophage development, and recombinant DNA application to genetic engineering. 3.0 hours discussion, 3.0 hours laboratory. (001224)

BIOL 474 Food and Industrial Microbiology 3.0 Spring

Prerequisites: BIOL 371, CHEM 270. Study of micro-organisms of industrial importance, emphasizing nutrition, metabolism, cultivation, and processing. (001186)

BIOL 476 General Virology 4.0 Spring


Prerequisites: BIOL 153. Recommended: BIOL 371. The physical, chemical, and biological properties of bacteria and animal viruses, and their interactions with the host at cellular and organismic levels. 3.0 hours discussion, 3.0 hours laboratory. Special fee required; see the Class Schedule. (001185)

BIOL 479 Zooarchaeology and Field Ecology  3.0 Summer

Prerequisites: Faculty permission. This comprehensive field course introduces students to zooarchaeology, vertebrate osteology, fragmentary bone identification, as well as vertebrate ecology and natural history through a spectrum of lectures, laboratory exercises and field activities. This course is offered at the Eagle Lake Biological Field Station. 1.0 hours lecture, 6.0 hours laboratory. This course is also offered as ANTH 479. (000603)

BIOL 480 Developmental Biology 3.0 EvnFa

Prerequisites: BIOL 153. Includes concepts of macro-molecular assembly, biochemical signals, genetic controls, and morphological processes involved during development of organisms. The experimentally oriented laboratory exercises cover cell differentiation in fungi, plants, and animals, cell movement and communication mechanisms, teratogenic effects on limb development, regeneration, and metamorphosis. 2.0 hours discussion, 3.0 hours laboratory. (001196)

BIOL 484 Field Ecology  3.0 Inquire

Prerequisites: BIOL 152. Principles of ecology illustrated in the context of biotic communities of northern California. Field studies using quantitative and qualitative approaches. Laboratory segment offered at Eagle Lake Biological Field Station. 1.0 hours discussion, 6.0 hours laboratory. (001203)

BIOL 485 Electron Microscopy 2.0 Spring

Prerequisites: PHYS 202A, PHYS 202B. Introduction to electron optics and electron microscope construction. Electron microscope operation by demonstration only. (001233)

BIOL 489 Internship 1.0-3.0 Fa/Spr

Prerequisites: Necessary background for the specific internship. This internship course is offered for 1.0-3.0 units. You must register with a supervising faculty member. The internship program is designed to provide students with direct field or laboratory research experience in occupational settings. You may take this course more than once for a maximum of 15.0 units. Credit/no credit grading only. (001228)

BIOL 492 Seminars in Biological Science 1.0 Fa/Spr

Prerequisites: Junior or senior standing or faculty permission. Analysis of seminars on various topics in the biological sciences. You may take this course more than once for a maximum of 6.0 units. Credit/no credit grading only. (001232)

BIOL 494 Senior Seminar in Biology 1.0 Fa/Spr

Prerequisites: Senior standing. Presentation and discussion of scientific reports based on current literature. You may take this course more than once for a maximum of 3.0 units. Credit/no credit grading only. (001230)

BIOL 496 Field Studies in Natural History 1.0-3.0 Inquire

This course is a field study offered for 1.0-3.0 units. You must register directly with a supervising faculty member. Concentrated field study of habitats or organisms in the field. Forty-five hours of field work for each unit of credit. 3.0 hours laboratory. You may take this course more than once for a maximum of 6.0 units. (001234)

BIOL 498 Special Topics 1.0-4.0 Fa/Spr

This course is for special topics offered for 1.0-4.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. Special fee required; see the Class Schedule. (001242)

BIOL 499H Honors Research in Biological Sciences 3.0-6.0 Inquire

Prerequisites: Faculty permission. An intensive 6-unit, one-year course in biological research. See department office for details. (Open only to students with at least a 3.0 GPA in the major.) The course will consist of participation in a team research effort. 18.0 hours laboratory. You may take this course more than once for a maximum of 6.0 units. (001244)

BIOL 600 Research in Biological Sciences 3.0 Fall

Prerequisites: Admission into the graduate program in biology or botany. Orientation to literature review and thesis research. Strategies and techniques used in molecular, cellular, organismic, and ecological research. Required of all biology/botany graduate students during their first fall semester and will include sign-up for the Graduate Qualifying Examination to be given the next semester. (001245)

BIOL 605 Biological Seminar 1.0 Spring

Presentation and discussion of reports based on current biological literature and special studies by graduate students. You may take this course more than once for a maximum of 6.0 units. (001249)

BIOL 609 Advanced Cellular/Molecular Biology 4.0 EvnFa

Prerequisites: BIOL 409 or CHEM 451. Theory and strategies used in prokaryotic and eukaryotic molecular biology. DNA manipulations, cloning systems, immunological assays, and protein purification and analytical techniques. 3.0 hours laboratory, 3.0 hours seminar. (001279)

BIOL 610 Topics in Cell/Molecular Biology 1.0-3.0 Fa/Spr


Prerequisites: BIOL 609. This course is a special topic offered for 1.0-3.0 units. Detailed discussion of selected topics in molecular and cellular biology. Extensive survey of current literature and analysis of research strategies. Topics are selected and advertised by instructor. Past topics have included molecular actions between plants and microbes; pathogenesis of disease; oncogenes and signal transduction. You may take this course more than once for a maximum of 9.0 units. (001281)

BIOL 611 Advanced Physiology/Cell Biology 4.0 OddFa


Prerequisites: BIOL 411 or BIOL 414 or BIOL 416 or BIOL 417. Examination of the underlying molecular and bio-chemical mechanisms which allow physiological adaptations, establishment of pattern formation and differentiation of eukaryotic organisms. 3.0 hours laboratory, 3.0 hours seminar. (001280)

BIOL 612 Topics in Physiological/Developmental Biology 1.0-3.0 Fa/Spr

Prerequisites: BIOL 611. This course is a special topic offered for 1.0-3.0 units. You must register directly with a supervising faculty member. Detailed discussion of selected contemporary topics in physiological and developmental biology. Topic will be selected and advertised by the instructor. You may take this course more than once for a maximum of 9.0 units. (001285)

BIOL 613 Population Ecology  4.0 EvnFa

Prerequisites: BIOL 350. Study and lecture/discussion of population ecology, with an emphasis on field methods used on local populations. 2.0 hours seminar, 6.0 hours laboratory. Special fee required; see the Class Schedule. (001303)

BIOL 614 Topics in Ecology and Systematics  1.0-3.0 OddSp

Prerequisites: BIOL 350. This course is a special topic offered for 1.0-3.0 units. You must register directly with a supervising faculty member. Detailed investigation of selected special topics in ecology, systematics, or evolutionary biology. Extensive survey of current literature. Topics will be selected and advertised by the instructor. You may take this course more than once for a maximum of 4.0 units. (001291)

Biological Sciences

BIOL 660 Landscape Ecology 3.0 Fall

Prerequisites: BIOL 350 or GEOG 444; MATH 314 or MATH 350 or GEOG 315. This course emphasizes spatial patterning in the landscape its causes, development, and importance for ecological and environmental processes. The course includes the study of ecological and anthropologic aspects of landscape pattern and change. The laboratory includes hands-on experience with tools used in landscape ecology. 2.0 hours lecture, 3.0 hours laboratory. This course is also offered as GEOG 660. (020295)

BIOL 662 Experimental Parasitology 3.0 Inquire

Prerequisites: BIOL 151, graduate standing. Laboratory and field studies of parasitic infections. Directed original investigations and experimentation on the parasites of humans, domestic animals, and natural infections of animals in the wild. 1.0 hours seminar, 6.0 hours laboratory. (001258)

BIOL 663 Social Insects 3.0 OddFa

Prerequisites: BIOL 422. An advanced course for studying the problems of phylogeny, behavior, social organization, ecology, and zoogeography of social insects. 2.0 hours seminar, 3.0 hours laboratory. (001310)

BIOL 668 Community and Ecosystem Ecology 3.0 OddSp

Prerequisites: BIOL 350 and a statistics course. The analysis, modeling, and computer simulation of the structure and function of communities and ecosystems, with emphasis on patterns of competition, predation, energy and nutrient flow and succession. 2.0 hours seminar, 3.0 hours laboratory. (001305)

BIOL 669 Topics in Limnology 4.0 OddSp

Prerequisites: BIOL 404. Study of the functional dynamics of aquatic ecosystems. 2.0 hours seminar, 6.0 hours laboratory. Special fee required; see the Class Schedule. (001306)

BIOL 670 Plant Molecular Biology 4.0 Fa/Spr

Prerequisites: BIOL 409. A consideration of the processes involved in plant growth and the development of form, with emphasis on higher plants and recent experimental approaches. 2.0 hours seminar, 6.0 hours laboratory. (001278)

BIOL 671 Advanced Systematics 4.0 OddSp

Prerequisites: BIOL 448. Examination of evolutionary principles and phylogenetic methods as they relate to systematic studies across all organismal groups. Combined seminar-lab oriented course in the application of molecular protocols used in systematics and population genetics studies. Emphasis is on data gathering, data analysis, and presentation of results. 3.0 hours laboratory, 3.0 hours seminar. (001290)

BIOL 672 Plant Ecology 4.0 EvnSp

Prerequisites: BIOL 350, BIOL 448, graduate standing. Autecology, emphasizing California vascular plants, with focus on current topics in behavioral and reproductive ecology. Field project work and detailed literature survey. 2.0 hours seminar, 6.0 hours laboratory. (001299)

BIOL 675 Ecological Plant Physiology 4.0 Spring

Prerequisites: BIOL 414. This course focuses on the way different plant species and functional types react in various locations and in all climatic zones. Emphasis is placed on mechanisms underlying plant physiological ecology at the levels of biochemistry, biophysics, molecular biology, and whole-plant physiology. 3.0 hours laboratory, 3.0 hours lecture. (001263)

BIOL 685 Electron Microscope Operation Laboratory 2.0 Spring

Prerequisites: May be taken concurrently with BIOL 485 and Introduction to the use of scanning and transmission electron microscopes, including daily operation, alignment, and routine maintenance. 6.0 hours laboratory. Special fee required; see the Class Schedule. (001317)

BIOL 686 Biological Preparations for Electron Microscopy 4.0 Inquire

Prerequisites: BIOL 411 or faculty permission. Preparation of biological specimens for scanning and transmission electron microscopes, using chemical and physical procedures. Emphasis is on preservation, localization, and identification of biological molecules. 2.0 hours seminar, 6.0 hours laboratory. (001318)

BIOL 697 Independent Study 1.0–4.0 Fa/Spr

This course is a graduate-level independent study offered for 1.0-3.0 units. You must register directly with a supervising faculty member. Survey and careful study of literature, experimentation, observation, and collection of data in field and laboratory. You may take this course more than once for a maximum of 6.0 units. (001319)

BIOL 699T Master's Thesis 1.0–6.0 Fa/Spr

This course is a master's study offered for 1.0-6.0 units. You must register directly with a supervising faculty member. You may take this course more than once for a maximum of 6.0 units. (001320)