BIOLOGICAL SCIENCES

Biological Sciences Department (http://www.csuchico.edu/biol/)
Holt Hall 285
530-898-5356
530-898-5060 (fax)
Email: biol@csuchico.edu
Chair: Kristopher Blee

Insight

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.

Experience

Students are strongly encouraged to become involved in faculty research projects in the laboratory and the field.

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 projects. Natural research sites such as Big Chico Creek Ecological Reserve provide year-round research opportunities to undergraduates and graduate students.

The department has many well-equipped teaching and research facilities including scanning electron, confocal, and fluorescence microscopy. Other resources include the natural history museum, herbarium, and several greenhouses.

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 combines coursework and satisfactory completion of an original thesis.

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/food processing companies. The 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.

Programs

Undergraduate

Bachelor’s

• Biological Sciences BA (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/biological-sciences/biological-sciences-ba/)
• Biological Sciences BS (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/biological-sciences/biological-sciences-bs/)
• Microbiology BS (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/biological-sciences/microbiology-bs/)

Minors

• Biological Sciences Minor (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/biological-sciences/biological-sciences-minor/)

Credentials

• Science with a Concentration in Biological Science Single Subject Matter Preparation Program (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/biological-sciences/science-concentration-biological-science-single-subject-matter-preparation-program/)

Pre-Professional

• Biology Pre-Professional Programs (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/biological-sciences/biology-pre-professional-programs/)

Graduate

Master’s

• Biological Sciences MS (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/biological-sciences/biological-sciences-ms/)
• Botany MS (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/biological-sciences/botany-ms/)

See Course Description Symbols and Terms (https://catalog.csuchico.edu/academic-standards-policies/course-description-symbols-terms/) for an explanation of course description terminology and symbols, the course numbering system, and course credit units.

Biological Sciences

BIOL 102 Introduction to Living Systems 3 Units GE
Typically Offered: Fall and spring
An integrated study of the nature and interactions of living things and their environments. This course is an introduction to the processes of evolution and speciation, ecology and ecosystem processes, cellular biology and organismal physiology. The course is primarily for students without a strong background in high school biology or chemistry. The course includes online content delivery, in-class discussion, and a hands-on activity session. 2 hours activity, 2 hours discussion. (020372)

General Education: Laboratory Activity (B3); Life Science (B2)
Cross listing(s): SCED 102
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division
BIOI 103 Human Anatomy 4 Units GE
Typically Offered: Spring, summer, fall
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. 2 hours activity, 3 hours lecture. (001110)
General Education: Laboratory Activity (B3); Life Science (B2)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division

BIOI 104 Human Physiology 4 Units GE
Typically Offered: Fall and spring
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. 2 hours activity, 3 hours lecture. (001114)
General Education: Laboratory Activity (B3); Life Science (B2)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division

BIOI 105 Food, Fiber, and Drugs 3 Units GE
Typically Offered: Fall and spring
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 hours activity, 2 hours lecture. (001119)
General Education: Laboratory Activity (B3); Life Science (B2)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division

BIOI 109 The Biological University Experience 1 Unit
Typically Offered: Fall and spring
A university success course for biology majors new to California State University, Chico. Appropriate for all incoming freshmen and transfer students. The course explores academic and social opportunities in addition to resources available to promote successful completion of the student's educational goals. Meets twice a week for the first half of the semester. 1 hour lecture. (021133)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 1 unit
Course Attributes: Lower Division

BIOI 161 Principles of Ecological, Evolutionary, and Organismal Biology 4 Units GE
Typically Offered: Fall and spring
Introduction to evolutionary history and biological diversity, microbes and protists, invertebrates, vertebrates, and plants. Form and function of plants and animals. Ecological principles. 3 hours laboratory, 3 hours lecture. (001123)
General Education: Laboratory Activity (B3); Life Science (B2)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division; Sustainable Course

BIOI 162 Principles of Cellular and Molecular Biology 4 Units GE
Prerequisite: CHEM 107 or CHEM 111; or department permission.
Typically Offered: Fall and spring
Introduction to biological molecules, bioenergetics, cellular structure and function, elements of molecular biology and genetics, and mechanisms of macroevolution and systematics. 3 hours laboratory, 3 hours lecture. (001122)
General Education: Laboratory Activity (B3); Life Science (B2)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division; Sustainable Course

BIOI 163 Principles of Physiology and Development 4 Units GE
Prerequisite: BIOI 162 or department permission.
Typically Offered: Fall and spring
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 hours laboratory, 3 hours lecture. (020284)
General Education: Laboratory Activity (B3); Life Science (B2)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division

BIOI 198 Special Topics 1-3 Units
Typically Offered: Fall and spring
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. 3 hours discussion. (001135)
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Lower Division

BIOI 211 Allied Health Microbiology 4 Units
Prerequisite: CIVL 175; or BIOI 103, BIOI 104, BIOI 162, or SCED 102 and CHEM 107, CHEM 108, or CHEM 111.
Typically Offered: Fall and spring
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 hours laboratory, 3 hours lecture. (001132)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division

BIOI 299 Special Problems 1-3 Units
Typically Offered: Fall and spring
This course is an independent study of special problems. You must register directly with a supervising faculty member. 0 hours supervision. (022467)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Lower Division
Biol 302 Evolution 3 units GE
Prerequisite: One biological sciences course; GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
Typically Offered: Fall and spring
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. 3 hours discussion. (001139)
General Education: Upper-Division Scientific Inq/Quant Reason (UDB); Health and Wellness Pathway; Sustainability and Climate Change Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

Biol 302W Evolution (W) 3 units GE, W
Prerequisite: One biological sciences course; GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
Typically Offered: Fall and spring
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. 1 hour discussion, 2 hours lecture. (021355)
General Education: Upper-Division Scientific Inq/Quant Reason (UDB); Health and Wellness Pathway; Sustainability and Climate Change Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division, Writing Course

Biol 303 Human Genetics 3 units GE
Prerequisite: One biological sciences course; GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
Typically Offered: Fall and spring
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. 3 hours discussion. (001140)
General Education: Upper-Division Scientific Inq/Quant Reason (UDB); Health and Wellness Pathway; Sustainability and Climate Change Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

Biol 311W Pandemics, Germs, and Society (W) 3 units GE, W, GW
Prerequisite: GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Life Sciences (B2); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
Typically Offered: Fall and spring
This course provides students with a general overview of microbes (bacteria, fungi, viruses) before introducing concepts related to 1) how novel pathogens emerge to cause pandemics, 2) the science of vaccines and information literacy related to making wise decisions about vaccination, and 3) how public health measures are implemented to restrict the spread of pathogens. In addition, students become familiar with the beneficial uses of microbes and their metabolites in agriculture, nutrition, and sustainable energy. 3 hours lecture. (022232)
General Education: Upper-Division Scientific Inq/Quant Reason (UDB); Health and Wellness Pathway; Sustainability and Climate Change Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Writing Course; Graduation Writing Assessment

Biol 318 Biology of Childhood 3 units GE
Prerequisite: One biological sciences course; GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
Typically Offered: Fall and spring
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. 3 hours discussion. (001151)
General Education: Upper-Division Scientific Inq/Quant Reason (UDB); Health and Wellness Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

Biol 322W Science and Human Values (W) 3 units GE, W
Prerequisite: One biological sciences course; GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
Typically Offered: Fall and spring
Critically examines scientific and humanistic world views and sensibilities, directly applying these approaches to contemporary social and personal problems. 3 hours lecture. (021254)
General Education: Upper-Division Scientific Inq/Quant Reason (UDB); Health and Wellness Pathway; Sustainability and Climate Change Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course; Writing Course
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>GE</th>
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<tbody>
<tr>
<td>BIOL 323</td>
<td>Biology of Sex</td>
<td>3</td>
<td>GE</td>
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<td>BIOL 330</td>
<td>California Wild Foraging</td>
<td>3</td>
<td>GE</td>
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<tr>
<td>BIOL 334</td>
<td>Conservation Ecology</td>
<td>3</td>
<td>GE</td>
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<tr>
<td>BIOL 345</td>
<td>Health and Lifestyle Diseases</td>
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<td>GE</td>
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<tr>
<td>BIOL 350W</td>
<td>Fundamentals of Ecology (W)</td>
<td>3</td>
<td>W, GW</td>
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<td>BIOL 360</td>
<td>Genetics</td>
<td>4</td>
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<td>BIOL 369</td>
<td>Advanced Plant Biology</td>
<td>3</td>
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<tr>
<td>BIOL 370</td>
<td>Advanced Zoology</td>
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<td>GE</td>
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**Prerequisite:**
- BIOL 161, BIOL 162, and BIOL 163, or faculty permission.
- GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.

**Typically Offered:**
- Fall and spring
- Fall and spring
- Fall and spring
- Fall and spring
- Fall only
- Spring only

**Course Attributes:**
- Upper Division
- Lower Division
- Upper-Division Scientific Inq/Quant Reason (UDB)
- Sustainable Course
- Writing Course
- Health and Wellness Pathway
- General Education
- Gender and Sexuality Pathway
- Race, Ethnicity, and Sovereignty Pathway
- Upper-Division Scientific Inq/Quant Reason (UDB); Health and Wellness Pathway
- Grade Basis: Graded
- Grade Basis: Graded
- Grade Basis: Graded
- Grade Basis: Graded

**Repeatability:**
- You may take this course for a maximum of 3 units
- You may take this course for a maximum of 3 units
- You may take this course for a maximum of 4 units
- You may take this course for a maximum of 3 units
- You may take this course for a maximum of 3 units
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Notes</th>
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<tbody>
<tr>
<td>BIOL 371W</td>
<td>Microbiology (W)</td>
<td>4</td>
<td>W, GW</td>
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<tr>
<td>Prerequisite: GE Written Communication (A2) requirement; BIOL 161, BIOL 162, BIOL 163, or faculty permission.</td>
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<tr>
<td>Typically Offered: Fall and spring</td>
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<td>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. 6 hours laboratory, 2 hours lecture. (020279)</td>
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<td>Grade Basis: Graded</td>
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<td>Repeatability: You may take this course for a maximum of 4 units</td>
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<td>Course Attributes: Upper Division; Writing Course; Graduation Writing Assessment</td>
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<tr>
<td>BIOL 398</td>
<td>Special Topics</td>
<td>1-3</td>
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<td>Prerequisite: microbiology/clinical laboratory science majors with no previous clinical laboratory experience and who have completed BIOL 470W, faculty permission.</td>
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<td>Typically Offered: Fall and spring</td>
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<td>Students observe in a clinical hospital laboratory and in a private clinical laboratory. 1 hour discussion. (001161)</td>
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<td>Grade Basis: Credit/No Credit</td>
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<tr>
<td>Repeatability: You may take this course for a maximum of 15 units</td>
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<td>Course Attributes: Upper Division</td>
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<td>BIOL 399</td>
<td>Clin Laboratory Observation</td>
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<tr>
<td>Prerequisite: microbiology/clinical laboratory science majors with no previous clinical laboratory experience and who have completed BIOL 470W, faculty permission.</td>
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<tr>
<td>Typically Offered: Fall and spring</td>
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<td>Students observe in a clinical hospital laboratory and in a private clinical laboratory. 1 hour discussion. (001161)</td>
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<td>Grade Basis: Credit/No Credit</td>
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<td>Repeatability: You may take this course for a maximum of 6 units</td>
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<td>Course Attributes: Upper Division</td>
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<tr>
<td>BIOL 402</td>
<td>Microbial Ecology</td>
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<td>Prerequisite: BIOL 161. Recommended: BIOL 371W.</td>
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<td>Study of bacterial structure and function, modes of metabolism, regulatory responses to environmental change and stress, and microbial aspects of nutrition and growth. 2 hours discussion, 6 hours laboratory. (001222)</td>
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<td>Typically Offered: Fall only</td>
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<td>Grade Basis: Graded</td>
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<td>Repeatability: You may take this course for a maximum of 4 units</td>
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<td>Course Attributes: Upper Division</td>
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<tr>
<td>BIOL 404</td>
<td>Aquatic Ecology</td>
<td>4</td>
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<td>Prerequisite: BIOL 161, CHEM 112.</td>
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<td>Study of aquatic ecosystems and the role of microorganisms in aquatic ecosystems. 3 hours laboratory, 3 hours lecture. (001207)</td>
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<td>Typically Offered: Fall and spring</td>
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<td>Repeatability: You may take this course for a maximum of 4 units</td>
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<td>Course Attributes: Upper Division; Sustainable Course</td>
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<tr>
<td>BIOL 408</td>
<td>Principles of Evolution</td>
<td>3</td>
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<tr>
<td>Prerequisite: BIOL 360.</td>
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<td>Study of eukaryotic organism evolution. 3 hours laboratory, 3 hours lecture. (001201)</td>
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<td>Typically Offered: Fall only</td>
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<td>Grade Basis: Graded</td>
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<td>Repeatability: You may take this course for a maximum of 3 units</td>
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<td>Course Attributes: Upper Division</td>
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<tr>
<td>BIOL 409</td>
<td>Molecular Biology</td>
<td>4</td>
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<tr>
<td>Prerequisite: BIOL 163, BIOL 360.</td>
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<td>Study of eukaryotic organism evolution. 3 hours laboratory, 3 hours lecture. (001201)</td>
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<td>Typically Offered: Spring only</td>
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<td>Repeatability: You may take this course for a maximum of 4 units</td>
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<td>Course Attributes: Upper Division</td>
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<tr>
<td>BIOL 411</td>
<td>Cell Biology</td>
<td>4</td>
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<tr>
<td>Prerequisite: BIOL 163, BIOL 360.</td>
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<td>Study of cellular function and development of microorganisms. 3 hours laboratory, 3 hours lecture. (001169)</td>
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<td>Typically Offered: Fall only</td>
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<td>Grade Basis: Graded</td>
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<td>Course Attributes: Upper Division</td>
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<tr>
<td>BIOL 412W</td>
<td>Bacterial Physiology (W)</td>
<td>4</td>
<td>W, GW</td>
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<tr>
<td>Prerequisite: GE Written Communication (A2) requirement; BIOL 360, BIOL 371W, CHEM 370.</td>
<td></td>
<td>Study of bacterial structure and function, modes of metabolism, regulatory responses to environmental change and stress, and microbial aspects of nutrition and growth. 2 hours discussion, 6 hours laboratory. (001222)</td>
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<td>Typically Offered: Spring only</td>
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<td>Grade Basis: Graded</td>
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### Biological Sciences

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<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Prerequisite</th>
<th>Typically Offered</th>
<th>Grade Basis</th>
<th>Repeatability</th>
<th>Course Attributes</th>
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<tbody>
<tr>
<td>BIOL 414</td>
<td>Plant Physiology</td>
<td>4</td>
<td>BIOL 163 or SCED 102; CHEM 108 or CHEM 270; or faculty permission.</td>
<td>Spring only</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Upper Division</td>
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<td>Functions in higher plants; water and soil relations, photosynthesis,</td>
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<td>respiration, enzyme action, and growth. 3 hours discussion, 3 hours</td>
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<td></td>
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<td>laboratory. (001181)</td>
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<tr>
<td>BIOL 416</td>
<td>Vertebrate Physiology</td>
<td>4</td>
<td>BIOL 162, BIOL 163; CHEM 108 or CHEM 270.</td>
<td>Fall only</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Upper Division</td>
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<td>General features of vertebrate physiology. Function of muscular, nervous,</td>
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<td>respiratory, circulatory, excretory, and endocrine systems. 2 hours</td>
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<td>discussion, 6 hours laboratory. (001180)</td>
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<td>BIOL 418</td>
<td>Neurophysiology</td>
<td>4</td>
<td>BIOL 161, BIOL 163; CHEM 108 or CHEM 270.</td>
<td>Spring only</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Upper Division</td>
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<td>This course provides students with background and fundamental information</td>
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<td>necessary to pursue neuroscience at the graduate or professional level.</td>
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<td>Cellular and molecular mechanisms within mammalian central nervous system</td>
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<td>are emphasized. 3 hours laboratory, 3 hours lecture. (001219)</td>
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<td>BIOL 422</td>
<td>General Entomology</td>
<td>4</td>
<td>BIOL 161 or faculty permission. Recommended: BIOL 163.</td>
<td>Spring only</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Upper Division</td>
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<td>The morphology, ecology, and physiology of insects. Economic entomology</td>
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<td>and medical entomology, and taxonomy. 2 hours discussion, 6 hours</td>
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<td>laboratory. (001210)</td>
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<td>BIOL 426</td>
<td>Developmental Biology</td>
<td>4</td>
<td>BIOL 161, BIOL 163;或 faculty permission.</td>
<td>Fall only</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Upper Division</td>
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<td></td>
<td>Principles and theories of animal development, emphasizing the vertebrae.</td>
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<td>3 hours discussion, 3 hours laboratory. (001188)</td>
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<td>BIOL 428</td>
<td>Animal Behavior</td>
<td>3</td>
<td>BIOL 163.</td>
<td>Fall only odd years</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
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<td>Consideration of the basic problems in animal behavior, including</td>
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<td>orientation, social behavior, and the nature and organization of animal</td>
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<td>societies. 2 hours discussion, 3 hours laboratory. (001205)</td>
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<td>BIOL 430</td>
<td>Comparative Anatomy of the Vertebrates</td>
<td>4</td>
<td>BIOL 161, BIOL 163.</td>
<td>Fall only</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Upper Division</td>
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<td>Explanation of the anatomical similarities and differences of selected</td>
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<td>vertebrates. The evolution and adaptive significance of various systems</td>
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<td>are considered. 2 hours discussion, 6 hours laboratory. (001171)</td>
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<td>BIOL 432</td>
<td>Biology of Fishes</td>
<td>4</td>
<td>BIOL 161.</td>
<td>Fall only odd years</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Upper Division</td>
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<td></td>
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<td></td>
<td>Morphology, ecology, behavior, and systematics of California fishes,</td>
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<td>with an introduction to fisheries biology. 3 hours discussion, 3 hours</td>
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<td>laboratory. (001208)</td>
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<td>BIOL 433</td>
<td>Herpetology</td>
<td>4</td>
<td>BIOL 161.</td>
<td>Spring only even years</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Upper Division</td>
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<td>The morphology, evolution, physiology, behavior, ecology, and taxonomy of</td>
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<td>amphibians and reptiles. California amphibians and reptiles are emphasized,</td>
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<td>including field studies of local species. 3 hours laboratory, 3 hours</td>
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<td>lecture. (001212)</td>
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<td>BIOL 434</td>
<td>Ornithology</td>
<td>4</td>
<td>BIOL 161, BIOL 163.</td>
<td>Spring only even years</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
<td>Upper Division</td>
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<td>The morphology, evolution, physiology, ecology, taxonomy, and behavior of</td>
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<td>birds, including field studies of local species. 2 hours discussion, 6</td>
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<td>hours laboratory. (001213)</td>
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<td>BIOL 435</td>
<td>Mammalogy</td>
<td>3</td>
<td>BIOL 161.</td>
<td>Fall only</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
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<td>Study of evolution, anatomy, physiology, ecology, and behavior of mammals.</td>
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<td>California mammals will be emphasized in lab. 2 hours discussion, 3 hours</td>
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<td>laboratory. (001215)</td>
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<td>BIOL 436</td>
<td>Waterfowl Biology</td>
<td>3</td>
<td>BIOL 161.</td>
<td>Fall only</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
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<td>This lecture, lab, and field course exposes students to the evolution,</td>
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<td>ecology, morphology, classification, and identification of North American</td>
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<td>waterfowl. Additionally, this course has a strong hands-on wetland</td>
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<td>management component, as well as extensive exposure to the primary literature. 3 hours laboratory, 2 hours lecture. (021105)</td>
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</tbody>
</table>
BIOL 442  Plant Morphology  4 Units
Prerequisite: BIOL 163.
Typically Offered: Fall only odd years
Comparative morphology of plant types, emphasizing evolution of structures and methods of reproduction. 3 hours discussion, 3 hours laboratory. (001191)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 444  Plant Pathology  4 Units
Prerequisite: BIOL 163 or PSSC 101 or faculty permission.
Typically Offered: Fall only
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 hours laboratory, 3 hours lecture. (001194)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 448  Plant Diversity and Identification  4 Units
Prerequisite: BIOL 161 or faculty permission.
Typically Offered: Spring only
Principles of plant classification with field study of local flora, emphasizing the higher plants and their phylogenetic relationships. 2 hours discussion, 6 hours laboratory. (001198)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 451  Plant Geography  3 Units
Prerequisite: BIOL 161, BIOL 369.
Typically Offered: Fall only
The composition and distribution of plant communities, emphasizing the ecological, environmental, and evolutionary processes that affect them. 3 hours laboratory, 2 hours lecture. (020283)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 460  Histology  4 Units
Prerequisite: BIOL 161, BIOL 163.
Typically Offered: Spring only odd years
Microscopic analysis of tissues, organs, and organ systems of vertebrates emphasizing mammalian histophysiology. 3 hours discussion, 3 hours laboratory. (001170)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 462  Hematology  3 Units
Prerequisite: BIOL 163. Recommended: CHEM 270.
Typically Offered: Fall and spring
The study of blood in normal and abnormal conditions. 2 hours discussion, 3 hours laboratory. (001174)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 466  Immunology  4 Units
Prerequisite: BIOL 163.
Typically Offered: Spring only
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 hours discussion, 3 hours laboratory. (001220)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 470W  Medical Bacteriology (W)  5 Units W, GW
Prerequisite: GE Written Communication (A2) requirement; BIOL 371W, CHEM 270.
Typically Offered: Fall only
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 hours discussion, 6 hours laboratory. (001182)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 5 units
Course Attributes: Upper Division; Writing Course; Graduation Writing Assessment

BIOL 472  Microbial Genetics  4 Units
Prerequisite: BIOL 162. Recommended: BIOL 360 and BIOL 371W.
Typically Offered: Fall only
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 hours discussion, 3 hours laboratory. (001224)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 476  General Virology  4 Units
Prerequisite: BIOL 162, BIOL 371W. Recommended: BIOL 360.
Typically Offered: Spring only
The physical, chemical, and biological properties of bacteria and animal viruses, and their interactions with the host at cellular and organismic levels. 3 hours discussion, 3 hours laboratory. (001185)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 482  Bioinformatics for Biologists  4 Units
Prerequisite: BIOL 360, MATH 315.
Typically Offered: Spring only
This is an introduction to some of the bioinformatics techniques and programs commonly used by biologists to analyze large datasets such as the human genome, microbiomes, proteomic datasets, etc. While not requiring any programming experience, this course includes writing simple queries using SQL and basic programming using Perl scripts. 3 hours laboratory, 3 hours lecture. (021658)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Prerequisite</th>
<th>Typically Offered</th>
<th>Grade Basis</th>
<th>Repeatability</th>
<th>Course Attributes</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Prerequisite</th>
<th>Typically Offered</th>
<th>Grade Basis</th>
<th>Repeatability</th>
<th>Course Attributes</th>
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<tbody>
<tr>
<td>BIOL 484W</td>
<td>Field Ecology (W)</td>
<td>3</td>
<td>GE Written Communication (A2) requirement, BIOL 161, BIOL 350W.</td>
<td>Spring only</td>
<td>Credit/No Credit</td>
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<td>BIOL 489</td>
<td>Internship in Biology</td>
<td>1-3</td>
<td>Junior or senior standing or faculty permission.</td>
<td>Spring only</td>
<td>Credit/No Credit</td>
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<td>BIOL 490</td>
<td>Peer Mentoring in the Biological Sciences</td>
<td>2</td>
<td>Faculty permission.</td>
<td>Fall and spring</td>
<td>Credit/No Credit</td>
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<td>BIOL 492</td>
<td>Seminars in Biological Science</td>
<td>1</td>
<td>Junior or senior standing or faculty permission.</td>
<td>Fall and spring</td>
<td>Credit/No Credit</td>
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<td>BIOL 494</td>
<td>Senior Seminar in Biology</td>
<td>1</td>
<td>Senior standing.</td>
<td>Fall and spring</td>
<td>Credit/No Credit</td>
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<td>BIOL 495</td>
<td>Science Teaching Experience</td>
<td>1</td>
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<td>Fall and spring</td>
<td>Graduated</td>
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<td>BIOL 498</td>
<td>Special Topics</td>
<td>1-4</td>
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<td>Fall and spring</td>
<td>Credit/No Credit</td>
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<td>BIOL 499</td>
<td>Special Problems</td>
<td>1-3</td>
<td>Faculty permission.</td>
<td>Fall and spring</td>
<td>Credit/No Credit</td>
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<td>BIOL 499H</td>
<td>Honors Research in Biological Sciences</td>
<td>3-6</td>
<td>Faculty permission.</td>
<td>Inquire at department</td>
<td>Graduated</td>
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<td>BIOL 600</td>
<td>Research in Biological Sciences</td>
<td>3</td>
<td>Admission into the graduate program in biology or botany.</td>
<td>Fall only</td>
<td>Graduate Graded</td>
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<td>BIOL 601</td>
<td>Scientific Presentations</td>
<td>2</td>
<td>BIOL 399, BIOL 499H, BIOL 697, or BIOL 699T.</td>
<td>Spring only</td>
<td>Graduate Graded</td>
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BIOL 602 Scientific Writing 2 Units
Prerequisite: Candidacy for MS in Biological Sciences.
Typically Offered: Spring only
Students will learn, discuss, and practice the characteristics and elements of effective scientific writing. Emphasis will be placed on completing a written research proposal or graduate thesis. 2 hours lecture. (022158)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 2 units
Course Attributes: Graduate Division

BIOL 605 Biological Seminar 1 Unit
Typically Offered: Fall and spring
Presentation and discussion of reports based on current biological literature and special studies by graduate students. 1 hour seminar. (001249)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Graduate Division

BIOL 609 Advanced Cellular/Molecular Biology 4 Units
Prerequisite: BIOL 409 or CHEM 451.
Typically Offered: Fall only even years
Theory and strategies used in prokaryotic and eucaryotic molecular biology. DNA manipulations, cloning systems, immunological assays, and protein purification and analytical techniques. 3 hours laboratory, 3 hours seminar. (001279)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Graduate Division

BIOL 610 Topics in Cell/Molecular Biology 1-3 Units
Prerequisite: BIOL 609.
Typically Offered: Inquire at department
This course is a special topic offered for 1.0-3.0 units. Topics are selected and advertised by instructor. Past topics have included molecular actions between plants and microbes; pathogenesis of disease; oncogenes and signal transduction. 1 hour discussion. (001281)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 9 units
Course Attributes: Graduate Division

BIOL 611 Advanced Physiology/Cell Biology 4 Units
Prerequisite: BIOL 411 or BIOL 414 or BIOL 416.
Typically Offered: Fall only odd years
Examination of the underlying molecular and bio-chemical mechanisms which allow physiological adaptations, establishment of pattern formation and differentiation of eucaryotic organisms. 3 hours laboratory, 3 hours seminar. (001280)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Graduate Division

BIOL 612 Topics in Physiological/Developmental Biology 1-3 Units
Prerequisite: BIOL 611.
Typically Offered: Inquire at department
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. 1 hour discussion. (001285)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 9 units
Course Attributes: Graduate Division

BIOL 613 Population Ecology 4 Units
Prerequisite: BIOL 350W.
Typically Offered: Spring only odd years
Study and lecture/discussion of population ecology, with an emphasis on field methods used on local populations. 6 hours laboratory, 2 hours seminar. (001303)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Graduate Division; Sustainable Course

BIOL 614 Topics in Ecology and Systematics 1-3 Units
Prerequisite: BIOL 350W.
Typically Offered: Fall only even years
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. 0 hours seminar. (001291)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Graduate Division; Sustainable Course

BIOL 616 Foundations of Ecology 3 Units
Typically Offered: Fall only
Course provides a historical overview of the development of the fields of ecology through study of foundational works and contemporary literature with applications of modern analytical tools and experimental design. 3 hours lecture. (022159)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Graduate Division

BIOL 617 Foundations of Evolutionary Biology 3 Units
Typically Offered: Spring only
This course provides a historical overview of the development of the field of evolutionary biology through study of foundational works and contemporary literature with applications of modern analytical tools and experimental design. 3 hours lecture. (022160)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Graduate Division

BIOL 618 Community and Ecosystem Ecology 3 Units
Prerequisite: BIOL 350W and a statistics course.
Typically Offered: Spring only
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. 3 hours laboratory, 2 hours seminar. (001305)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Graduate Division; Sustainable Course
BIOL 672  Plant Ecology  4 Units
Prerequisite: BIOL 350W, BIOL 448, graduate standing.
Typically Offered: Spring only odd years
Autecology, emphasizing California vascular plants, with focus on current topics in behavioral and reproductive ecology. Field project work and detailed literature survey. 6 hours laboratory, 2 hours seminar. (001259)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 1 unit
Course Attributes: Graduate Division, Sustainable Course

BIOL 692  Advanced Biology Seminar Series  1 Unit
Typically Offered: Fall and spring
Experts in various fields of Biology present their research each week. Following each presentation students are required to write a paper that summarizes and critiques the presentation. 1 hour lecture. (021960)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Graduate Division

BIOL 697  Independent Study  1-4 Units
Typically Offered: Fall and spring
This course is a graduate-level independent study. 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. 9 hours supervision. (001319)
Grade Basis: Report in Progress: Graded
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Graduate Division

BIOL 699P  Master's Project  1-6 Units
Prerequisite: Faculty permission.
Typically Offered: Inquire at department
This course is a master's project offered for 1.0-6.0 units. You must register directly with a supervising faculty member. 0 hours supervision. (022562)
Grade Basis: Report in Progress: CR/NC
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Graduate Division

BIOL 699T  Master's Thesis  1-6 Units
Typically Offered: Fall and spring
This course is a master's study offered for 1.0-6.0 units. You must register directly with a supervising faculty member. 3 hours supervision. (001320)
Grade Basis: Report in Progress: CR/NC
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Graduate Division

Environmental Literacy
ENVL 105  Environmental Literacy  3 Units GE
Typically Offered: Fall and spring
This course introduces students to the issue and practices of environmental literacy. Environmental literacy is the capacity to perceive and interpret the relative health of environmental systems and to connect the environment to human physical, mental, and social health. Students are encouraged to recognize that their lives depend upon the environment, and that their personal decisions affect the environment. 3 hours lecture. (003723)
General Education: Lifelong Learning and Self-Development (E)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division; Sustainable Course

ENVL 105W  Environmental Literacy (W)  3 Units GE, W
Typically Offered: Fall and spring
This course introduces students to the issue and practices of environmental literacy. Environmental literacy is the capacity to perceive and interpret the relative health of environmental systems and to connect the environment to human physical, mental, and social health. Students are encouraged to recognize that their lives depend upon the environment, and that their personal decisions affect the environment. 3 hours lecture. (021259)
General Education: Lifelong Learning and Self-Development (E)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division; Sustainable Course; Writing Course

ENVL 389  Internship  1-3 Units
Typically Offered: Fall and spring
This course is an internship offered for 1.0-3.0 units. You must register with a supervising faculty member. 0 hours supervision. (021061)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 15 units
Course Attributes: Upper Division

Biological Sciences Department
The Faculty
Juan C Araujo Sarinana  2010
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Ricky D Wittsell  2004
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