BIOLOGICAL SCIENCES (BIOL)

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.

BIOL 102 Introduction to Living Systems **4 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, 3 hours discussion. (020372)
General Education: Laboratory (5C); Biological Science (5B)
Cross listing(s): SCED 102
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division

BIOL 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 (5C); Biological Science (5B)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division

BIOL 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 (5C); Biological Science (5B)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division

BIOL 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: Biological Science (5B)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division

BIOL 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

BIOL 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 (5C); Biological Science (5B)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division; Sustainable Course

BIOL 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 (5C); Biological Science (5B)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division; Sustainable Course

BIOL 163 Principles of Physiology and Development **4 Units GE**
Prerequisite: BIOL 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 (5C); Biological Science (5B)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Lower Division

BIOL 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

BIOL 211 Allied Health Microbiology **4 Units**
Prerequisite: CIVL 175; or BIOL 103, BIOL 104, BIOL 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

BIOL 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: GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
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 Physical/Biological Sciences (UD5); Race, Ethnicity, and Sovereignty Pathway; Science, Technology, and Society 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: GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
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 Physical/Biological Sciences (UD5); Race, Ethnicity, and Sovereignty Pathway; Science, Technology, and Society 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: GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
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 Physical/Biological Sciences (UD5); Equity, Ethics, and Policy Pathway; Science, Technology, and Society 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 English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
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 Physical/Biological Sciences (UD5); Health and Wellness 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 Requirement Course

BIOL 318 Biology of Childhood **3 Units GE**
Prerequisite: GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
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 Physical/Biological Sciences (UD5); 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: GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
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 Physical/Biological Sciences (UD5); Equity, Ethics, and Policy Pathway; Innovation, Design, and the Arts Pathway; Sustainability and Resilience Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course; Writing Course

BIOL 323 Biology of Sex **3 Units GE, USD**
Prerequisite: GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
Typically Offered: Fall and spring
This course explores sex, gender, sexual expression, and mating behavior in humans and non-humans from an evolutionary biological perspective. Why does sex exist? Why do genders exist? What are the alternatives? Why is sex expression so variable in nature? What explains the diversity of courtship and mating behaviors? The course emphasizes lessons gleaned from applying the principles of scientific inquiry toward the study of these and related questions. 3 hours lecture. (021160)
General Education: Upper-Division Physical/Biological Sciences (UD5); Gender and Sexuality Pathway; Race, Ethnicity, and Sovereignty Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; US Diversity Course

BIOL 330 California Wild Foraging **3 Units GE**
Prerequisite: GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
Typically Offered: Fall and spring
California Wild Foraging explores people/plant relationships through California history. We investigate the complex politics, economics, and diverse cultural traditions associated with plants in California. The course emphasizes: 1) traditional Native American gathering practices and uses, 2) introduced plants and traditions of immigrants, 3) the cross-cultural conversation of sharing plant knowledge, and 4) the emerging practices of people seeking to reconnect with using wild plants as food and "botanicals". Students discuss relevant literature and participate in hands-on exercises in plant identification, cultivation, ethical collecting, and representative preparation techniques. Special focus on Northern California, including the Mechoopda Maidu Indian Tribe of Chico Rancheria. 3 hours lecture. (022230)
General Education: Upper-Division Physical/Biological Sciences (UD5); California Studies Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 334 Conservation Ecology **3 Units GE**
Prerequisite: One biological sciences course; GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
Typically Offered: Fall and spring
An examination of ecological principles and the impact of increasing population and technology upon the environment. 3 hours discussion. (001156)
General Education: Upper-Division Physical/Biological Sciences (UD5); California Studies Pathway; Sustainability and Resilience Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course

BIOL 345 Health and Lifestyle Diseases **3 Units GE**
Prerequisite: One lower-division course in Biological Sciences; GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.
Typically Offered: Fall and spring
An evaluation of the most common major diseases that affect our society and the lifestyle choices that contributes to them. A major theme is that the risk of acquiring many diseases can be reduced through lifestyle changes. 3 hours discussion. (001165)
General Education: Upper-Division Physical/Biological Sciences (UD5); Health and Wellness Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 350W Fundamentals of Ecology (W) **3 Units W, GW**
Prerequisite: GE English Composition (1A); BIOL 161 or faculty permission.
Typically Offered: Fall and spring
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 hours discussion, 3 hours laboratory. (001206)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course; Writing Course; Graduation Writing Assessment Requirement Course

BIOL 360 Genetics **4 Units**
Prerequisite: BIOL 163 or faculty permission.
Typically Offered: Fall and spring
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 hour discussion, 3 hours lecture. (001173)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 369 Advanced Plant Biology **3 Units**
Prerequisite: BIOL 161, BIOL 162, and BIOL 163, or faculty permission.
Typically Offered: Fall only
Advanced study of plant anatomy, morphology, physicology, ecology, and evolution. 3 hours laboratory, 2 hours lecture. (020280)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 370 Advanced Zoology **3 Units**
Prerequisite: BIOL 161, BIOL 162, and BIOL 163, or faculty permission.
Typically Offered: Spring only
Advanced study of animal anatomy, morphology, physiology, ecology, and evolution. 3 hours laboratory, 2 hours lecture. (020281)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 371W Microbiology (W) **4 Units W, GW**
Prerequisite: GE English Composition (1A); BIOL 161, BIOL 162, BIOL 163, or faculty permission.
Typically Offered: Fall and spring
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)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division; Writing Course; Graduation Writing Assessment Requirement Course

BIOL 389 Clin Laboratory Observation **1 Unit**
Prerequisite: Microbiology/Clinical Laboratory Science majors with no previous clinical laboratory experience and who have completed BIOL 470W; faculty permission.
Typically Offered: Fall and spring
Students observe in a clinical hospital laboratory and in a private clinical laboratory. 1 hour discussion. (001161)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 15 units
Course Attributes: Upper Division

BIOL 398 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. (001166)
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Upper Division

BIOL 399 Special Problems **1-3 Units**
Typically Offered: Fall and spring
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. 9 hours supervision. (001167)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

BIOL 402 Microbial Ecology **4 Units**
Prerequisite: BIOL 161. Recommended: BIOL 371W.
Typically Offered: Fall only
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 hours laboratory, 3 hours lecture. (001225)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 404 Aquatic Ecology **4 Units**
Prerequisite: BIOL 161, CHEM 112.
Typically Offered: Fall only even years
Physical, chemical, and biological factors influencing the ecology of inland waters. 3 hours laboratory, 3 hours lecture. (001207)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division; Sustainable Course

BIOL 408 Principles of Evolution **3 Units**
Prerequisite: BIOL 360.
Typically Offered: Fall only
A detailed study of the evolutionary process, including history, natural selection, population genetics, molecular evolution, speciation, coevolution, and macroevolution. 3 hours discussion. (001201)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 409 Molecular Biology **4 Units**
Prerequisite: BIOL 163, BIOL 360.
Typically Offered: Spring only
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. 6 hours laboratory, 2 hours lecture. (020282)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 411 Cell Biology **4 Units**
Prerequisite: BIOL 163, BIOL 360.
Typically Offered: Fall only
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, apotopsis and cancer. 3 hours discussion, 3 hours laboratory. (001169)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 412W Bacterial Physiology (W) **4 Units W, GW**
Prerequisite: GE English Composition (1A); BIOL 360, BIOL 371W, CHEM 370.
Typically Offered: Spring only
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)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division; Writing Course; Graduation Writing Assessment Requirement Course

BIOL 414 Plant Physiology **4 Units**
Prerequisite: BIOL 163 or SCED 102; CHEM 108 or CHEM 270; or faculty permission.
Typically Offered: Spring only
Functions in higher plants; water and soil relations, photosynthesis, respiration, enzyme action, and growth. 3 hours discussion, 3 hours laboratory. (001181)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 416 Vertebrate Physiology **4 Units**
Prerequisite: BIOL 162, BIOL 163; CHEM 108 or CHEM 270.
Typically Offered: Fall and spring
General features of vertebrate physiology. Function of muscular, nervous, respiratory, circulatory, excretory, and endocrine systems. 2 hours discussion, 6 hours laboratory. (001180)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 418 Neurophysiology **4 Units**
Prerequisite: BIOL 161, BIOL 163; CHEM 108 or CHEM 270.
Typically Offered: Spring only
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 hours laboratory, 3 hours lecture. (001219)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 422 General Entomology **4 Units**
Prerequisite: BIOL 161 or faculty permission. Recommended: BIOL 163.
Typically Offered: Spring only
The morphology, ecology, and physiology of insects. Economic entomology and medical entomology, and taxonomy. 2 hours discussion, 6 hours laboratory. (001210)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 426 Developmental Biology **4 Units**
Prerequisite: BIOL 161, BIOL 163, or faculty permission.
Typically Offered: Fall only
Principles and theories of animal development, emphasizing the vertebrate. 3 hours discussion, 3 hours laboratory. (001188)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 428 Animal Behavior **3 Units**
Prerequisite: BIOL 163.
Typically Offered: Fall only odd years
Consideration of the basic problems in animal behavior, including orientation, social behavior, and the nature and organization of animal societies. 2 hours discussion, 3 hours laboratory. (001205)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 430 Comparative Anatomy of the Vertebrates **4 Units**
Prerequisite: BIOL 161, BIOL 163.
Typically Offered: Fall only odd years
Explanation of the anatomical similarities and differences of selected vertebrates. The evolution and adaptive significance of various systems are considered. 2 hours discussion, 6 hours laboratory. (001171)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 432 Biology of Fishes **4 Units**
Prerequisite: BIOL 161.
Typically Offered: Fall only odd years
Morphology, ecology, behavior, and systematics of California fishes, with an introduction to fisheries biology. 3 hours discussion, 3 hours laboratory. (001208)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 433 Herpetology **4 Units**
Prerequisite: BIOL 161.
Typically Offered: Spring only even years
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 hours laboratory, 3 hours lecture. (001212)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 434 Ornithology **4 Units**
Prerequisite: BIOL 161, BIOL 163.
Typically Offered: Spring only even years
The morphology, evolution, ecology, physiology, taxonomy, and behavior of birds, including field studies of local species. 2 hours discussion, 6 hours laboratory. (001213)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 435 Mammalogy **3 Units**
Prerequisite: BIOL 161.
Typically Offered: Fall only
Study of evolution, anatomy, physiology, ecology, and behavior of mammals. California mammals will be emphasized in lab. 2 hours discussion, 3 hours laboratory. (001215)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 436 Waterfowl Biology **3 Units**
Typically Offered: Fall only
This lecture, lab, and field course exposes students to the evolution, ecology, morphology, classification, and identification of North American waterfowl. Additionally, this course has a strong hands-on wetland management component, as well as extensive exposure to the primary literature. 3 hours laboratory, 2 hours lecture. (021105)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

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 446 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 even years
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 English Composition (1A); BIOL 371W, CHEM 270.
Typically Offered: Fall only
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 Requirement Course

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

BIOL 484W Field Ecology (W) **3 Units W, GW**
Prerequisite: GE English Composition (1A), BIOL 161, BIOL 350W.
Typically Offered: Spring only
Principles of ecology illustrated in the context of biotic communities. Field studies using quantitative and qualitative approaches. Laboratory segment offered at local field sites. 1 hour discussion, 6 hours laboratory. (001203)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course; Writing Course; Graduation Writing Assessment Requirement Course

BIOL 489 Internship in Biology **1-3 Units**
Prerequisite: Necessary background for the specific internship.
Typically Offered: Fall and spring
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. 9 hours supervision. (001228)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 15 units
Course Attributes: Upper Division

BIOL 490 Peer Mentoring in the Biological Sciences **2 Units**
Prerequisite: Faculty permission.
Typically Offered: Fall and spring
Lecture/discussions to train peer mentors for the biology majors' introductory courses laboratory sections. Peer mentors' laboratories are scheduled to coincide with a lab section for the course in which they are mentoring. Peer mentors assist the laboratory instructor in all phases of lab planning, set-up, and tear-down. In addition peer mentors become involved in laboratory instruction including explaining procedures, providing demonstrations, answering questions, and student evaluation. Peer mentors are encouraged to offer help during the scheduled lab period when first-year mentees inquire about class choices, studying, and other student issues. The peer mentoring program is a rewarding way to help first-year students become part of the university and community. 3 hours independent study, 1 hour lecture. (021033)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

BIOL 492 Seminars in Biological Science **1 Unit**
Prerequisite: Junior or senior standing or faculty permission.
Typically Offered: Fall and spring
Analysis of seminars on various topics in the biological sciences. 1 hour seminar. (001232)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

BIOL 494 Senior Seminar in Biology **1 Unit**
Prerequisite: Senior standing.
Typically Offered: Fall and spring
Presentation and discussion of scientific reports based on current literature. 1 hour seminar. (001230)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

BIOL 495 Science Teaching Experience **1 Unit**
Typically Offered: Fall and spring
Science teaching experience for undergraduate students with K-12 students from local schools. 3 hours laboratory. (021975)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 2 units
Course Attributes: Upper Division

BIOL 498 Special Topics **1-4 Units**
Typically Offered: Fall and spring
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. 0 hours seminar. (001242)
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Upper Division

BIOL 499 Special Problems **1-3 Units**
Prerequisite: Faculty permission.
Typically Offered: Fall and spring
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. 9 hours supervision. (001243)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

BIOL 499H Honors Research in Biological Sciences **3-6 Units**
Prerequisite: Faculty permission.
Typically Offered: Inquire at department
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. 9 hours supervision. (001244)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

BIOL 600 Research in Biological Sciences **3 Units**
Prerequisite: Admission into the graduate program in biology or botany.
Typically Offered: Fall only
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. 3 hours seminar. (001245)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Graduate Division

BIOL 601 Scientific Presentations **2 Units**
Prerequisite: BIOL 399, BIOL 499H, BIOL 697, or BIOL 699T.
Typically Offered: Spring only
Students will learn, develop, and practice the skills required to make effective oral presentations of scientific data. Presentation formats to be discussed will include the "elevator speech," chalk talk, poster presentation, and formal research presentations often given at scientific conferences. 2 hours lecture. (022157)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 2 units
Course Attributes: Graduate Division

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 procaryotic 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. 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. 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 668 Community and Ecosystem Ecology **3 Units**
Prerequisite: BIOL 350W and a statistics course.
Typically Offered: Spring only even years
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. (001299)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 4 units
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