Courses

Contract All Courses |

Biology

BIOL 101 - Introduction to Human Disease

(3 units)

Prerequisite/Corequisite: Course that fulfills the 1A GE requirement.

Introduction to the study of human disease including moral/ethical and economic issues.

Both grading options. (Lecture 3 hrs.) Not open for credit to students with credit in MICR 101.

BIOL 153 - Introduction to Marine Biology

(3 units)

Prerequisites/Corequisites: Completion of GE Area 2 and at least one course in GE Subject Area 1 (1A or 1B or 1C).

Scientific approach to the study of marine organisms and their relationships to the environment. Emphasis on human interaction with marine ecosystems.

Both grading options. Field trips may be required outside of scheduled class time. (Lecture 2 hrs., laboratory and field 3 hrs.)

BIOL 153L - Introduction to Marine Biology Laboratory

(1 unit)

Prerequisite: Open only to students who have successfully completed the equivalent of the lecture portion of BIOL 153
at another accredited institution and have consent of the Department of Biological Sciences.
Identical to the laboratory portion of BIOL 153
. Students enrolled in BIOL 153L will take it in the same room and at the same time as students enrolled in BIOL 153
.

Both grading options. (Laboratory 3 hrs.) Not open for credit to students with credit in BIOL 153
.

BIOL 200 - General Biology

(4 units)

Prerequisites: Completion of GE Area 2 and at least one course in GE Subject Area 1 (1A or 1B or 1C). Brief survey of major areas of biology including cell biology, genetics, evolution, phylogeny, plant and animal anatomy and physiology, ecology, and behavior. Designed for non-science majors.

Both grading options. Course fee may be required. (Lecture 3 hrs., laboratory 3 hrs.)

BIOL 200L - General Biology Laboratory

(1 unit)

Prerequisite: Open only to students who have successfully completed the equivalent of the lecture portion of BIOL 200
at another accredited institution and have consent of the Department of Biological Sciences.
BIOL 200L is identical to the laboratory component of BIOL 200
. Students enrolled in BIOL 200L will take it in the same room and at the same time as students enrolled in BIOL 200
.

Both grading options. Course fee may be required. (Laboratory 3 hrs.) Not open for credit to students with credit in BIOL 200
.

BIOL 201 - General Microbiology for Health Professionals

(4 units)

Prerequisites: CHEM 111A
or CHEM 140
with a grade of "C" or better and GE Foundation requirements.
Microbiology for those planning careers in nursing, health care and education, and foods and nutrition. Introduction to microorganisms, including structure, function, metabolism, growth, genetics, diversity, and applied aspects. Special emphasis on human health.

Both grading options. Course fee may be required. (Lecture 2 hrs., laboratory 6 hrs.) Not open for credit to majors in the biological sciences.

BIOL 205 - Human Biology

(4 units)

Prerequisites: Completion of GE Area 2 and at least one course in GE Subject Area 1 (1A or 1B or 1C). Brief survey of human biology focusing on anatomy, physiology, and development of cells, tissues, organs, and organ systems; including molecular biology, genetics, ecology, evolution, and diversity. Designed for non-science majors.

Both grading options. Course fee may be required. (Lecture 3 hrs., laboratory 3 hrs.)

BIOL 205L - Human Biology Laboratory

(1 unit)

Prerequisites: Open only to students who have successfully completed the equivalent of the lecture portion of BIOL 205
at another accredited institution and have consent of the Department of Biological Sciences. Identical to the laboratory portion of BIOL 205
. Students enrolled in BIOL 205L will take it in the same room and at the same time as students enrolled in BIOL 205
.

Both grading options. Course fee may be required. (Laboratory 3 hrs.) Not open for credit to students with credit in BIOL 205
. Students pursuing a major and/or a minor in this department may receive unit credit for courses marked with the symbol '##' as a general elective but may not apply the units toward the specific or elective requirements for any degree or option in this department. Majors in this department may, however, take, for general education purposes, interdisciplinary courses offered by this department. All other courses in this department are open to majors and minors but by letter grade only (A-F).

BIOL 207 - Human Physiology

(4 units)

Prerequisites: Completion of GE Area 2 and at least one course in GE Subject Area 1 (1A or 1B or 1C). General introduction to the functional integration of human body systems. Designed for majors in biomedical engineering, physical education, and the allied health fields.

Both grading options. Course fee may be required. (Lecture 3 hrs., laboratory 3 hrs.)

BIOL 208 - Human Anatomy

(4 units)

Prerequisites: Grade of "C" or better in one of the following: ART 372
, BIOL 201, BIOL 205
, BIOL 207
, BIOL 212
, BIOL 311
, CHEM 140

, DANC 261
, or MICR 200.
Gross anatomy of humans from the cellular to the systemic levels. Intensive laboratory experience including the use of human cadavers. Designed for majors in kinesiology and the allied health fields.

Both grading options. Course fee may be required. (Lecture 3 hrs., laboratory 3 hrs.)

BIOL 211 - Introduction to Evolution and Diversity

(5 units)

Prerequisite/Corequisite: CHEM 111A
or CHEM 112A
with a grade of "C" or better.

Intended for natural science majors. First of three semester introductory sequence. Evolution as a process responsible for biological diversity at all levels: molecular, cellular, organismal, population, and community. Phylogenetic and taxonomic survey of life. Science as method of inquiry. Failure of either the lecture or the laboratory component will result in a failing grade for the entire course.

Letter grade only (A-F). Course fee may be required. (Lecture 3 hrs., laboratory 3 hrs., discussion 1 hr.)

BIOL 211L - Introduction to Evolution and Diversity Laboratory

(1 unit)

Prerequisites: Open only to students who have successfully completed the equivalent of the lecture component of BIOL 211
at another accredited institution and have consent of the Department of Biological Sciences.
Phylogenetic and taxonomic survey of life emphasizing the principles of evolution and science as a method of inquiry. Identical to the laboratory component of BIOL 211
. Students enrolled in BIOL 211L will take it in the same room and at the same time as students enrolled in BIOL 211
.

Letter grade only (A-F). Course fee may be required. (Laboratory 3 hrs.)

BIOL 212 - Introduction to Cell and Molecular Biology

(4 units)

Prerequisites: BIOL 211
and either CHEM 111A
or CHEM 112A
with grades of "C" or better.
Prerequisite/Corequisite: CHEM 111B
or CHEM 112B
.

The second of a three semester introductory sequence. Introduction to macromolecular and cellular structure and function and to fundamental genetic principles. Failure of either the lecture or laboratory component will result in a failing grade for the entire course.

Letter grade only (A-F). Course fee may be required. (Lecture 3 hrs., laboratory 3hrs.)

BIOL 212L - Introduction to Cell and Molecular Biology Laboratory

(1 unit)

Prerequisites: Open only to students who have successfully completed the equivalent of the lecture component of BIOL 212 at another institution and have consent of the Department of Biological Sciences.
Introduction to methods for studying macromolecular and cellular structure and function and fundamental genetic analyses. Identical to the laboratory component of BIOL 212
. Students enrolled in BIOL 212L will take it in the same room and at the same time as students enrolled in BIOL 212
.

Letter grade only (A-F). Course fee may be required. (Laboratory 3 hrs.)

BIOL 213 - Introduction to Ecology and Physiology

(4 units)

Prerequisites: BIOL 211
; BIOL 212
; and either CHEM 111B
or CHEM 112B
, each with a grade of "C" or better.
Introduction to the structure and function of organ systems across a variety of taxa, and the ecological interactions among organisms and their environment. Failure of either the lecture or the laboratory component will result in failing grade for the entire course.

Letter grade only (A-F). Course fee may be required. (Lecture 3 hrs., laboratory 3 hrs.)

BIOL 213L - Introduction to Ecology and Physiology Laboratory

(1 unit)

Prerequisites: Open only to students who have successfully completed the equivalent of the lecture component of BIOL 213
at another institution and have consent of the Department of Biological Sciences.
Introduction to methods for studying plant and animal structure and function and the interactions among organisms and their environments. Identical to the laboratory component of BIOL 213
. Students enrolled in BIOL 213L will take it in the same room and at the same time as students enrolled in BIOL 213
.

Letter grade only (A-F). Course fee may be required. (Laboratory 3 hrs.)

BIOL 260 - Biostatistics

(3 units)

Prerequisites: BIOL 201 or BIOL 211
or BIOL 207
or MICR 200; MATH 111
or MATH 113
or MATH 119A
or MATH 122
all with a grade of "C" or better.
Probability and statistics used in the description and analysis of biological data.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory 3 hrs.)

BIOL 296 - Introduction to Undergraduate Directed Research

(1 unit)

Prerequisite: Consent of instructor.
Introduction to research in biology approved and directed by a faculty member in the Department of Biological Sciences. Designed primarily to introduce lower division students to research before taking BIOL 496
.

Credit/No Credit only. (Conference 1 hr., laboratory 3 hrs.) May be repeated to a maximum of 3 units in different semesters. Not open for credit to students with credit in MICR 296. Students who have completed one or more units of BIOL 496
/MICR 496 may not enroll in this course.

BIOL 300 - Human Immunology: In Self-Defense

(3 units)

Prerequisites: Completion of the four GE Foundation courses and upper-division standing.
Mechanisms and cells responsible for protecting the human body from disease. Normal and abnormal functions of immune system are discussed. Topics also include immunodeficiency, autoimmunity, vaccines, allergy, transplantation and cancer immunology. Designed for non-biology majors.

Both grading options. (Lecture 3 hrs.) Not open for credit to majors and minors in the Biological Sciences. Not open for credit to students with credit in BIOL 430.

BIOL 301 - Biology of Human Aging

(3 units)

Prerequisites: Completion of the four GE Foundation courses and upper-division standing. Biological processes associated with aging in humans. Emphasis on both cellular and organ aging. Designed for non-biology majors.

Both grading options. (Lecture 3 hrs.) Not open to students with "C" or better in BIOL 401. Not open for credit to majors and minors in the Biological Sciences.

BIOL 311 - General Microbiology

(4 units)

Prerequisites: BIOL 211
, BIOL 212
; and either CHEM 111B
, or
CHEM 112B
, all with a grade of "C" or better.
Introduction to biology of microorganisms, including structure, function, metabolism, growth, genetics, diversity, host-parasite relationships, and applied aspects.

Letter grade only (A-F). Course fee may be required. (Lecture 3 hrs., laboratory 3 hrs.) Not open for credit to students with credit in MICR 211.

BIOL 312 - Evolutionary Biology

(3 units)

Prerequisites: BIOL 211
, BIOL 212
, BIOL 213
, BIOL 260
all with a grade of "C" or better.
Survey of evolutionary biology including population genetics, speciation, origin of life, and phylogenetic analysis. Main emphasis is evolutionary mechanisms and methods of analysis on specific of the evolutionary history of life.

Letter grade only (A-F). (Lecture 3 hrs.)

BIOL 313 - Invertebrate Zoology

(4 units)

Prerequisites: BIOL 211
, BIOL 212
, BIOL 213
, all with a grade of "C" or better, and consent of instructor.
Systematics, morphology, and natural history of invertebrate animals, with emphasis on local marine

forms.

Letter grade only (A-F). Course fee may be required. weekend field trips may be required. Lecture 2 hrs., laboratory and field 6 hrs.

BIOL 316 - General Entomology

(4 units)

Prerequisites: BIOL 211
, BIOL 212
, BIOL 213
all with grade of "C" or better.
Characteristics, structure, habits, and life cycles of insects; importance of insects to humans and other organisms.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory 6 hrs.)

BIOL 320 - Bacterial Pathogenesis

(3 units)

Prerequisite: BIOL 311
or MICR 211 with a grade of "C" or better. Recommended: BIOL 320L
.
Nature of host-pathogen interactions in health and disease. Emphasis upon pathogenic bacteria of humans and animals; topics include bacterial ultrastructure, epidemiology, and mechanisms of pathogenesis, host defense mechanisms, and antibiotic therapy.

Letter grade only (A-F). (Lecture 3 hrs).

BIOL 320L - Medical Microbiology Laboratory

(3 units)

Prerequisite: BIOL 311
with a grade of "C" or better. Recommended: BIOL 320.
Classical and modern laboratory techniques in culturing and identification of bacterial, fungal and viral pathogens. Additional topics include antimicrobial chemotherapy, evaluation of disinfectants, and public health microbiology.

Letter grade only (A-F). Course fee may be required. (Lecture 1 hr., Laboratory 6 hrs)

BIOL 322 - Parasitic Diseases

(4 units)

Prerequisites: BIOL 213 or BIOL 311
, all with a grade of “C” or better.
Survey of parasitic diseases of humans; emphasis on identification using microscopy and topics including life cycles of protozoa and helminths, pathogenesis, host-parasite interactions, parasite-vector relationships, epidemiology, prevention, and control.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory 6 hrs.)

BIOL 324 - Vertebrate Zoology

(4 units)

Prerequisites: BIOL 211
, BIOL 212
, BIOL 213
all with grade of “C” or better.
Phylogenetic survey of vertebrates (craniates). Lecture concentrates on origin and radiation of vertebrates and their functional morphology. Laboratory concentrates on skeletal and internal anatomy and taxonomy to the ordinal and familial level of living vertebrates.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory 6 hrs.)

BIOL 325 - Emerging Infectious Diseases

(3 units)

Prerequisites: BIOL 311
with a grade of “C” or better.
Explores changes in technology, infectious disease organisms and other factors contributing to emerging and re-emerging infectious diseases, including immunodeficiency, antibiotic and insecticide abuses, climate change, travel and commerce, human demographic and behavioral changes, land use, and breakdown of public health.

Letter grade only (A-F). (Lecture 3 hrs.)

BIOL 340 - Molecular Cell Biology

(3 units)

Prerequisites: BIOL 211
, BIOL 212
, all with a grade of “C” or better.
Detailed study of the organization and functioning of cells and cellular organelles at the molecular level; emphasis on experimental approaches and structural/functional relationships.

Letter grade only (A-F). (Lecture 3 hrs.)

BIOL 342 - Human/Mammalian Physiology

(3 units)

Prerequisites: BIOL 211
, BIOL 212
, BIOL 213
all with grade of "C" or better.
Function of various mammalian body systems, primarily of humans. Emphasis on integration of homeostatic mechanisms of nervous, muscular, endocrine, cardiovascular, respiratory, renal, digestive, and reproductive systems.

Letter grade only (A-F). (Lecture 3 hrs.) Not open for credit to students with credit in BIOL 345
.

BIOL 342L - Laboratory in Human/Mammalian Physiology

(1 unit)

Prerequisite/Corequisite: BIOL 342
with a grade of "C" or better.

Experiments and exercises designed to provide experience in, and illustration of, physiological principles and mechanisms of interaction among various body systems.

Letter grade only (A-F). Course fee may be required. (Laboratory 3 hrs.) Not open for credit to students with credit in BIOL 345L
.

BIOL 345 - Comparative Animal Physiology

(3 units)

Prerequisites: BIOL 211
, BIOL 212
, BIOL 213
all with grade of "C" or better.
Comparison of fundamental physiological processes of major animal phyla.

Letter grade only (A-F). (Lecture 3 hrs.) Not open for credit to students with credit in BIOL 342
.

BIOL 345L - Laboratory in Comparative Animal Physiology

(1 unit)

Prerequisite/Corequisite: BIOL 345
with a grade of "C" or better.

Laboratory course acquaints students with direct observation and measurement of physiological processes in various animal groups, both invertebrate and vertebrate.

Letter grade only (A-F). Course fee may be required. (Laboratory 3 hrs.) Not open for credit to students with credit in BIOL 342L
.

BIOL 350 - General Ecology

(3 units)

Prerequisites: BIOL 211
, BIOL 212
, BIOL 213
, BIOL 260
; MATH 119A
or MATH 122
all with a grade of "C" or better.
Relationships of plants and animals to their physical and biological environment; structure and function of populations, communities and ecosystems.

Letter grade only (A-F). (Lecture 3 hrs.)

BIOL 353 - Marine Biology

(3 units)

Prerequisites: BIOL 153
, BIOL 211
, BIOL 212
, BIOL 213
, BIOL 260
all with grade of "C" or better.
Study of pelagic and benthic marine ecosystems, including food resources, mariculture, and pollution. Weekend field trips may be required.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory and field 3 hrs.)

BIOL 355 - Microbial Ecology

(3 units)

Prerequisites: BIOL 311
or BIOL 211
, BIOL 212
, BIOL 213
; BIOL 260
, all with a grade of "C" or better.

Explores relationships of microorganisms to their environment. Emphasis placed on ecological basis for diversity of prokaryotic forms, metabolic functions and community interactions.

Letter grade only (A-F). (Lecture 3 hrs.)

BIOL 355L - Microbial Ecology Laboratory

(2 units)

Prerequisite/Corequisite: BIOL 355
.

Provides an understanding of microbes in the environment. Sample and analyze microbes from field trips to different habitats. Analytical techniques learned include enrichment culture methods and modern molecular biology methods to study the diversity and community dynamics of microbes.

Letter grade only (A-F). Course fee may be required. (Laboratory 6 hrs.)

BIOL 370 - General Genetics

(4 units)

Prerequisites: BIOL 211
, BIOL 212
and either BIOL 260
or CHEM 251
all with a grade of "C" or better.
Detailed study of classical transmission genetics and introduction to modern molecular genetics. Includes current observations and concepts of nature, organization, function, and regulation of genetic expression.

Letter grade only (A-F). Course fee may be required. (Lecture 3 hrs., laboratory 3 hrs.)

BIOL 370L - General Genetics Laboratory

(1 unit)

Prerequisites: Requires consent of the Department of Biological Sciences.

Students are expected to have successfully completed the equivalent of the lecture portion of CSULB BIOL 370 at another accredited institution.
Detailed study of classical transmission genetics and introduction to modern molecular genetics. Includes current observations and concepts of nature, organization, function, and regulation of genetic expression.

Identical to the laboratory component of BIOL 370. Students enrolled in BIOL 370L will take it in the same room and at the same time as students enrolled in BIOL 370.

Letter grade only (A-F). Course fee may be required. (Laboratory 3 hrs.) Not repeatable for credit. Not

open for students with existing credit in BIOL 370.

BIOL 371 - Microbial Genetics

(3 units)

Prerequisite: BIOL 311
with a grade of "C" or better.
Genetic analysis of biological processes in microbes. Includes gene structure, regulation, and function; isolation/analysis of mutations in haploid/diploid organisms; gene function from mutants; genetic exchange; regulation of host-pathogen interactions; bacteriophages; cloned genes; and genomics.

Letter grade only (A-F). (Lecture 3 hrs.)

BIOL 372 - Methods in Microbial Genetics

(2 units)

Prerequisite: BIOL 311
with a grade of "C" or better. Recommended: BIOL 371
.
Laboratory study of microbial genetics, using classical (nonmolecular) and contemporary (molecular) approaches. Includes genetic engineering techniques; microbial genomics.

Letter grade only (A-F). Course fee may be required. (Laboratory 6 hrs.)

BIOL 411 - Marine Mammalogy

(3 units)

Prerequisites: BIOL 345
, BIOL 350
, and BIOL 353
, all with grade of "C" or better, and consent of instructor. (Undergraduates enroll in BIOL 411; graduates enroll in BIOL 511
.)
Fundamental biological, ecological, and physiological concepts of marine mammals, including cetaceans, pinnipeds, walruses, sirenians, and polar bears. Information concerning taxonomy, distribution, morphology, physiology, reproduction, and feeding through readings and scientific literature. Fieldtrips may include weekends and spring recess.

Letter grade only (A-F). (Lecture 2 hrs., laboratory and fieldtrips 3 hrs.) Double Numbered with: BIOL 511

BIOL 415 - Marine Microbiology

(3 units)

Prerequisite: BIOL 353
or BIOL 355
with a grade of "C" or better. (Undergraduates enroll in BIOL 415; graduates enroll in BIOL 515
.)
Designed to familiarize microbiology and marine biology students with the role of microorganisms in the marine environment. Topics will include ecology, physiology, biogeochemistry and diversity of marine microbes. Laboratory/field component will emphasize examination and cultivation of local marine microbes. Weekend field trip may be required.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory and field 3 hrs.) Double Numbered with: BIOL 515
.

BIOL 416 - Virology

(3 units)

Prerequisite: BIOL 320
or BIOL 340
with a grade of "C" or better. (Undergraduates enroll in BIOL 416; graduates enroll in BIOL 516
.)
Virology at molecular level including viral replication and molecular basis for viral pathogenesis; survey of human, animal, and plant viral diseases. Current trends for prevention and treatment of viral diseases.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 516
.

BIOL 418 - Biological Oceanography

(4 units)

Prerequisite(s): BIOL 353 or BIOL 355 with a grade of "C" or better. (Undergraduates enroll in BIOL 418, graduates enroll in BIOL 518.)
Biological oceanography explores the evolution, ecology, and physiology of marine biota and the interactions between these organisms and the environment. Labs will cover oceanographic methods with a focus on the California Bight ecosystem and provide ocean-going and independent research opportunities.

Letter grade only (A-F). (Lecture 3 hrs., laboratory and field 3 hrs.) Not repeatable for credit. Double Numbered with: BIOL 518

BIOL 419 - Ichthyology

(3 units)

Prerequisites: BIOL 211
, BIOL 212
, BIOL 213
, BIOL 260
and at least 6 additional units of upper division biological science, all with a grade of " C" or better. Recommended: BIOL 350
, BIOL 353
, and BIOL 370
.
Systematics, morphology, genetics, and ecology of fishes. Emphasis on local marine forms. Weekend field trips may be required.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory 3 hrs.,)

BIOL 420 - Fisheries Ecology and Conservation

(3 units)

Prerequisites: BIOL 260
, BIOL 350
, BIOL 353
all with grade of "C" or better. (Undergraduates enroll in BIOL 420; graduates enroll in BIOL 520
.)
Prerequisites/Corequisites: BIOL 419
.

Advanced aspects of fish and invertebrate biology and behavior; fisheries economics and conservation; emphasis on state-of-art field/laboratory techniques and contemporary concepts and their application in fishery management.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 520
.

BIOL 421 - Herpetology

(4 units)

Prerequisites: BIOL 260
, BIOL 350
, and one additional upper division biology course, all with a grade of "C" or better. Recommended: BIOL 312
, BIOL 324
, or BIOL 370
.
Taxonomy, natural history, ecology and distribution of amphibians and reptiles, emphasis on local forms. Off campus field trips
required.

Letter grade only (A-F). (Lecture 2 hrs., laboratory and field 6 hrs.)

BIOL 422 - Elasmobranch Biology

(3 units)

Prerequisites: BIOL 345
, BIOL 350
, BIOL 353
.
Prerequisite/Corequisite: BIOL 419
.

Diversity, evolution, ecology and behavior of elasmobranch fishes; emphasis on research design and contemporary concepts related to conservation and management.

Letter grade only (A-F). (Lecture 3 hrs.) Not repeatable for credit. Double Numbered with: BIOL 522.

BIOL 423 - Mammalogy

(3 units)

Prerequisites: At least one of BIOL 312
, BIOL 324
, or BIOL 350
, with a grade of "C" or better.
Explores the biology and diversity of the world's living mammals. Lecture emphasizes radiation of orders; their morphology, physiology, evolutionary history, ecology and behavior. Laboratory emphasizes external and skeletal morphology of these same taxa, identification of California species, and a focus on techniques in mammalogy.

Letter grade only (A-F). (Lecture 2 hrs., laboratory 3 hrs.)

BIOL 424 - Ornithology

(3 units)

Prerequisites: BIOL 211
, BIOL 212
, BIOL 213
, BIOL 260
and three units of upper division BIOL, all with a grade of " C" or better.

Recommended: BIOL 350
.
Ecology, morphology, physiology, behavior, and taxonomy of birds from an evolutionary perspective, also factors influencing recent increase in their extinction risk. Species identification techniques (emphasis on the local avifauna) and methods of surveying avian populations.

Letter grade only (A-F) Course fee may be required. Double Numbered with: BIOL 524

BIOL 425 - Phycology

(4 units)

Prerequisite: BIOL 353
with a grade of "C" or better.
Taxonomy, phylogeny, and physiology of algae, including the physiological ecology of marine macroalgae; emphasis on local marine forms.

Letter grade only (A-F). (Lecture 3 hrs., laboratory and field 3 hrs.)

BIOL 427 - Vascular Plant Systematics

(4 units)

Prerequisite: BIOL 312
or BIOL 370
with a grade of "C" or better.
Principles and methods of plant systematics, including phylogenetics, different types of systematic data, evolutionary history and diversification of vascular plants. Laboratory emphasizes retrieving and analyzing systematic data, using phylogenetic methods, and identifying vascular plants of Southern California.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory and field 6 hrs.)

BIOL 430 - Immunology

(3 units)

Prerequisite: BIOL 340;
and either BIOL 370
or
BIOL 371
, all with a grade of "C" or better.
Study of cellular and molecular components of immune system, including how immune system recognizes pathogens, how it functions in various types of immune responses, mechanisms of vaccines, immunodeficiencies, transplantation, allergy, and autoimmunity.

Letter grade only (A-F). (Lecture 3 hrs.) Not open for credit to students with credit in MICR 430.

BIOL 431 - Biology of Cancer

(3 units)

Prerequisites: BIOL 340
, BIOL 370
with a grade of "C" or better.
(Undergraduates enroll in BIOL 431, graduates enroll in BIOL 531
.) Examination of cancer, tumor progression, and treatment at the cellular, molecular, and genetic levels.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 531

BIOL 432 - Stem Cell Biology

(3 units)

Prerequisites: BIOL 340
and BIOL 370
with a grade of "C" or better.
(Undergraduates enroll in BIOL 432; graduates enroll in BIOL 532
.) Current literature on advances in stem cell research, translational research, and clinical applications of stem cells to alleviate human disease.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 532

BIOL 433 - Developmental Biology

(3 units)

Prerequisites: BIOL 340
; BIOL 370
or BIOL 371
or MICR 371, both with a grade of "C" or better. (Undergraduates enroll in BIOL 433; graduates enroll in BIOL 533
.)

Experimental approaches to development in model organisms, mostly animal, at the molecular, genetic, cellular, and tissue levels. Topics include gametogenesis, fertilization, early cleavage, gastrulation, pattern formation, and organogenesis.

Letter grade only (A-F). (Lecture/discussion 3 hrs.) Double Numbered with: BIOL 533

BIOL 434 - Hematology

(3 units)

Prerequisite: BIOL 340
with a grade of "C" or better.
(Undergraduates enroll in BIOL 434; graduates enroll in BIOL 534.) Study of blood and coagulation system. Normal cell structure and function and physiological and morphological changes in inflammation, leukemias, and anemias discussed. Clinical, diagnostic, and research techniques for observing blood and pathologic case-studies included. Useful for students interested in medical professions. Required for clinical laboratory science (medical technology) internship.

Letter grade only (A-F). Course fee may be required. (Lecture 3 hrs.) Double Numbered with: BIOL 534

BIOL 435 - Pharmacology and Toxicology

(3 units)

Prerequisites: BIOL 340
; CHEM 220A
or CHEM 227
, both with a grade of "C" or better. Recommended: BIOL 342
or BIOL 345
, BIOL 370
, CHEM 448
. (Undergraduates enroll in BIOL435; graduates enroll in BIOL 535
.)
Overview of the administration, fate and elimination of pharmaceuticals, common pharmaceutical molecular targets and their cellular outcomes and the study of or potential causes of pharmaceutically related toxicity.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 535

BIOL 439 - Plant Morphology

(4 units)

Prerequisite: BIOL 312
or BIOL 350
or BIOL 370

with a grade of “C” or better.
Survey of land plant morphology including function of plant structures, tissues, and cells. Topics also include common life cycles, evolution of morphological forms, and the statistical analysis of shape.

Letter grade only (A-F). Course fee may be required. (Lecture 3 hrs., laboratory 3 hrs.)

BIOL 440L - Molecular Cell Biology Laboratory

(4 units)

Prerequisites: BIOL 340
, BIOL 370
, both with a grade of “C” or better.
Intensive course of modern laboratory techniques used in both cell and molecular biology. Topics include tissue culture, genomics, bioinformatics, proteomics, microscopy, and/or purification and functional characterization of recombinant proteins. Provides extensive laboratory experience for students.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory 6 hrs.)

BIOL 442 - Physiology at the Limit

(3 units)

Prerequisites: BIOL 342
or BIOL 345
with a grade of “C” or better.
(Undergraduates enroll in BIOL 442; graduates enroll in BIOL 542
.) Survey of biochemical and physiological adaptations of organisms under extreme environmental conditions or performance. Topics include adaptive responses to hypoxia, high-altitude, deep-sea diving, outer space, micro-gravity, exercise, flight, swimming, salt stress, and extreme temperatures. Examples from vertebrates and invertebrates.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 542

BIOL 443 - Endocrinology

(3 units)

Prerequisites: BIOL 340
; BIOL 342
or BIOL 345
, all with a grade of “C” or better.
(Undergraduates enroll in BIOL 443; graduates enroll in BIOL 543
.) Role of endocrine systems in vertebrate and invertebrate adjustment to changes in internal and external environment.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 543

BIOL 444 - Reproductive Biology

(3 units)

Prerequisite: BIOL 342
or BIOL 345
with a grade of "C" or better.
(Undergraduates enroll in BIOL 444; graduates enroll in BIOL 544
.) Topics in comparative reproductive biology from molecular, cellular, organismal, and population levels. Hormones and reproduction, gamete/gonad biology, reproductive lifespan, mating system/strategies, environmental influence on reproductive capabilities, contraception/in vitro fertilization. Scientific communication discussed including scientific articles and scientific writing.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 544

BIOL 446 - Biochemical and Physiological Responses to Climate Change

(3 units)

Prerequisites: BIOL 342
or BIOL 345
with a grade of "C" or better; BIOL 312 - Evolutionary Biology
CHEM 448 or CHEM 441A is recommended. (Undergraduates enroll in BIOL 446; graduates enroll in BIOL 546
.)
Study basic data on climate change and its biological consequences. Emphasis on the role of biochemical, physiological and molecular responses through evolutionary adaptation and/or organismal acclimatization. Climate variables to be discussed include temperature, pH, oxygen and salinity.

Letter grade only (A-F). (Lecture 3 hrs) Not repeatable for credit. Double Numbered with: BIOL 546

BIOL 447 - Molecular Plant Physiology

(3 units)

Prerequisites: BIOL 340
, BIOL 370
, both with grade of "C" or better.
A Writing Intensive Capstone. Molecular approaches to classical topics including water relations, plant development and photosynthesis. Weekly writing assignments and editing.

Letter grade only (A-F). (Lecture 3 hrs.)

BIOL 448 - Principles of Neurobiology

(3 units)

Prerequisites: BIOL 340
; BIOL 342
or BIOL 345
, all with a grade of "C" or better.
(Undergraduates enroll in BIOL 448; graduates enroll in BIOL 548
.) Study of the principles of anatomy, physiology, and function of the nervous system. Topics covered include neuroanatomy, physiology of neuronal signaling (excitable membranes and action potentials), synaptic transmission, neurotransmitters and their receptors, pain processing, special senses, reflexes, and neural circuits.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 548

BIOL 450 - Plant Ecology

(3 units)

Prerequisites: BIOL 260
, BIOL 350
with a grade of "C" or better. Recommended: BIOL 427
, BIOL 447
.
(Undergraduates enroll in BIOL 450; graduates enroll in BIOL 550
.) Relationship of plants to their environment and principles of plant distribution.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory and field 3 hrs.) Double Numbered with: BIOL 550

BIOL 451 - Wetlands and Mangrove Ecology

(3 units)

Prerequisites: BIOL 260
, BIOL 350
both with a grade of "C" or better.
(Undergraduates enroll in BIOL 451; graduates enroll in BIOL 551
.) A comprehensive look at wetland ecology and management. Focuses on physical, biogeochemical, and ecological aspects of major wetland ecosystems with an emphasis on local urban wetlands. Also includes wetland management concepts and approaches worldwide.

Letter grade only (A-F). (Lecture 2 hrs., laboratory and field 3 hrs.) Double Numbered with: BIOL 551

BIOL 452 - Behavioral Ecology

(3 units)

Prerequisites: BIOL 312
or BIOL 350
.
(Undergraduates enroll in BIOL 452; graduates enroll in BIOL 552
.) Primary objectives are to understand how animal behavior affects survival and reproduction and introduce students to current methodologies to study behavior of animals in lab and field conditions. Emphasizes ecological and evolutionary consequences of behavior across taxa.

Letter grade only (A-F). (Lecture 2 hrs., laboratory / field 3 hrs.) Double Numbered with: BIOL 552

BIOL 453 - Visual Ecology

(3 units)

Prerequisites: BIOL 312 OR BIOL 350, all with a grade of "C" or better.
(Undergraduates enroll in BIOL 453, graduates enroll in BIOL 553.)
Sensory ecology concepts with emphasis on the visual system and ways animals communicate through visual signals. Evolutionary processes associated with biology of the eye, animal phenotypes, and visual perception.

Letter grade only (A-F). Not repeatable for credit. Double Numbered with: BIOL 553

BIOL 454A - Research in Tropical Marine Ecology

(3 units)

Prerequisites: BIOL 350
, BIOL 353
, and one 400-level marine biology major course, all with grade of "C" or better, and consent of instructor.
(Undergraduates enroll in BIOL 454A; graduates enroll in BIOL 554A
.) Field and laboratory studies, lectures, and individual research on tropical marine biological problems. Designed to engage students in experimental research, including: recognizing a problem, designing and carrying out a project, statistical data analysis, and oral and written report presentation. Eight-day field trip to Hawaii required during spring recess at student expense. Enrollment is limited.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., 8 day field trip.) Double Numbered with: BIOL 554A

BIOL 454B - Research in Tropical Terrestrial Ecology

(3 units)

Prerequisites: BIOL 350
with a grade of "C" or better; and consent of instructor.
(Undergraduates enroll in BIOL 454B; graduates enroll in BIOL 554B
.) Field-based comparison of tropical lowland deciduous forest and lowland rainforest incorporating basic ecology methodology. Forest structure and diversity of animals emphasized. Students maintain field notebook, submit final paper, and give oral presentation. Nine-day fieldtrip to Costa Rica required during spring recess at student expense. Enrollment is limited.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hr., 9 day field trip.) Double Numbered with: BIOL 554B

BIOL 455 - Ecology of Marine Communities

(3 units)

Prerequisites: BIOL 260
, BIOL 350
, BIOL 353
all with a grade of "C" or better.
(Undergraduates enroll in BIOL 455; graduates enroll in BIOL 555
.) Field studies on ecological principles related to marine communities discussed. Includes individual field research project and two class projects.

Letter grade only (A-F). (Lecture 2 hrs., field 3 hrs.) Double Numbered with: BIOL 555

BIOL 456 - Population Ecology

(3 units)

Prerequisites: BIOL 260; BIOL 350
; MATH 119A or MATH 122
all with a grade of "C" or better. (Undergraduates enroll in BIOL 456; graduates in BIOL 556
.)
This course explores the structure of populations with focus on understanding how reproduction and mortality schedules shape population distribution and dynamics across environments. Emphasis will be placed on the use of population models to address specific questions in demography.

Letter grade only (A-F). (Lecture 2 hrs., Laboratory 3 hrs.) Double Numbered with: BIOL 556.

BIOL 457 - Field Methods in Ecology

(4 units)

Prerequisites: BIOL 260
, BIOL 350

both all with a grade of “C” or better.
(Undergraduates enroll in BIOL 457; graduates in BIOL 557
.) Theory and application of techniques used by biologists to investigate organisms and ecosystems in the field. Design of research projects, data analyses, and presentations. Fieldtrips may be required outside of class hours.

Letter grade only (A-F). (Lecture 2 hrs., laboratory and field 6 hrs.) Double Numbered with: BIOL 557

BIOL 459 - Conservation Biology

(3 units)

Prerequisites: BIOL 260
, BIOL 350
both with a grade of “C” or better. Recommended: BIOL 370
.
(Undergraduates enroll in BIOL 459; graduates enroll in BIOL 559
.) Conservation biology concepts including population dynamics, extinction processes, population viability analyses, metapopulations, community-level interactions, island biogeography, biological diversity patterns, habitat fragmentation, reserve design, and landscape-level conservation. Lecture includes group discussions of case studies and relevant primary literature. 20 hrs. per semester service learning for undergraduates, extra research paper for graduates.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 559

BIOL 462 - Bioethics and Public Policy

(3 units)

Prerequisite: BIOL 340
with a grade of “C” or better.
(Undergraduates enroll in BIOL 462; graduates enroll in BIOL 562
.) History of bioethics, scientific and medical bases of key bioethical issues, current legislation and appropriations, including legal, social, and ethical implications of stem cell research and other biotechnological advances.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 562

BIOL 464 - Aquatic Toxicology

(3 units)

Prerequisite(s): BIOL 340
; BIOL 350
or BIOL 353
; CHEM 220A
or CHEM 227

, all with a grade of “C” or better.
(Undergraduates enroll in BIOL 464; graduates enroll in BIOL 564
.) Study of pollution-based impacts on aquatic ecosystems. Topics include the origin and fate of pollutants in freshwater and marine environments, chemical detection of pollutants and quantification of toxicity from molecular to population levels of organization. Field trips may be required outside of scheduled class time.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 564

BIOL 471 - Bacterial Physiology

(3 units)

Prerequisites: BIOL 320
, CHEM 441A
or CHEM 448
; both with a grade of “C” or better.
(Undergraduates enroll in BIOL 471; graduates enroll in BIOL 571
.) Cellular physiology at molecular level as related to bacterial growth, reproduction, nutrition, metabolism, and ecology.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 571
.

BIOL 473 - Molecular Genetics

(3 units)

Prerequisites: BIOL 370
or BIOL 371
or MICR 371; CHEM 220A
, CHEM 220B
and CHEM 223A
, CHEM 223B
, or CHEM 227
, all with a grade of “C” or better.
(Undergraduates enroll in BIOL 473; graduates enroll in BIOL 573
.) Contemporary molecular genetic analysis of model organisms (mouse, worm, flies, yeasts) used in study of human disease, basic biological processes, gene regulation, and global analysis of genomes and proteomes.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 573

BIOL 474 - Bioinformatics

(3 units)

Prerequisites: BIOL 260
and one of the following; BIOL 340
, BIOL 370
or BIOL 371
, all with a grade of "C" or better.
(Undergraduates enroll in BIOL 474; graduates enroll in BIOL 574
.) Survey of biological sequences and prokaryotic genomes. Investigation of DNA, RNA, and protein sequences using statistics and computer science techniques. Computer-based laboratory will familiarize students with bioinformatics tools and programming.

Letter grade only (A-F). (Lectures 2 hrs., laboratory 3 hrs). Double Numbered with: BIOL 574

BIOL 477 - Biotechnology: Applications of Molecular Techniques and Bioinformatics

(4 units)

Prerequisite: BIOL 340
or BIOL 370
or both CHEM 441A
and CHEM 441B
all with a grade of "C" or better. (Undergraduates enroll in BIOL 477; graduates enroll in BIOL 577.)

Theory and techniques for isolating, amplifying, and analyzing genes, genomes, transcripts, and proteins. Data-mining, the use of computers in experimental design and/or functional analysis, use of current molecular techniques for drug development and other applications in the biotechnology workplace.

Letter grade only (A-F). (Lecture 3 hrs., activity 2 hrs.) Double Numbered with: Double-numbered with BIOL 577.

BIOL 480 - Seminars

(1 unit)

Prerequisites: Filed to graduate or Consent of Department of Biological Sciences.
(Undergraduates and classified post-baccalaureates enroll in BIOL 480; graduates enroll in BIOL 580
). Undergraduates must have filed for graduation and be in their last semester. Graduates must have been admitted to the department as a graduate student. Classified post-baccalaureates must have been admitted to a second baccalaureate or a certificate. Weekly meetings with professional biologists presenting results of their research. Requires participation in organization and critical evaluation of these presentations.

Letter grade only (A-F). (Seminar 1 hr.) May not be repeated for credit towards any single degree. Double Numbered with: BIOL 580

BIOL 490 - Selected Topics in Biology

(1-3 units)

Prerequisite(s): BIOL 211
; BIOL 212
; BIOL 213
 or BIOL 311
, all with a grade of "C" or better, and consent of instructor.
(Undergraduates enroll in BIOL 490; graduates enroll in BIOL 590
.) Topics from selected areas of biology. Course content varies from section to section.

Letter grade only (A-F). (Lecture 1-3 hrs.) May be repeated to a maximum of 6 units with different topics. Topics announced in the *Schedule of Classes*. Double Numbered with: BIOL 590

BIOL 490L - Selected Topics in Biology, Laboratory

(1-2 units)

Prerequisite(s): BIOL 211
; BIOL 212
; BIOL 213
 or BIOL 311
, all with a grade of "C" or better, and consent of instructor.
(Undergraduates enroll in BIOL 490L; graduates enroll in BIOL 590L
.) Topics from selected areas of biology. Course content varies from section to section.

Letter grade only (A-F). (Laboratory 3 or 6 hrs.) May be repeated to a maximum of 4 units with different topics. Topics announced in the *Schedule of Classes*. Double Numbered with: BIOL 590L

BIOL 492A - Stem Cell Research Internship

(12 units)

Prerequisites: BIOL 432
/BIOL 532
, BIOL 432L/BIOL 532L, BIOL 440L
, BIOL 462
/BIOL 562
, BIOL 473
/BIOL 573
, BIOL 477
/BIOL 577
, all with a grade of "C" or better, and permission of the director of the CSULB Biotechnology Certificate Program, and acceptance in the Stem Cell Training Option within the Biotechnology Certificate. (Undergraduates enroll in BIOL 492A; graduates enroll in BIOL 592A
) CIRM-approved institutions train interns in their stem cell research laboratories.

Credit/No Credit grading only. (Laboratory 36 hrs.) Must be repeated once for credit. Double Numbered with: BIOL 592A

BIOL 494 - Undergraduate Internship in Biological Sciences

(1-3 units)

Prerequisites: Consent of instructor.
Internship with community agencies, organizations, or companies in the field of biology. Students must arrange an internship prior to registering for the course. Please contact the course instructor for details prior to the semester of intended enrollment. 45 hours of internship per unit.

Both grading options. May be repeated for a letter grade up to a maximum of 3 units; units beyond the three will be taken credit/no credit. Students may only use a total of 3 units of BIOL 494, BIOL 495, or BIOL 496 combined for major requirements. Not available to graduate students.

BIOL 495 - Instruction in Laboratory Teaching

(1 unit)

Prerequisites: Consent of instructor, an "A" or "B" in the course in which the student elects to do BIOL 495 (another course with laboratory may be substituted with consent of instructor), and an overall GPA of at least 3.0.

Individual instruction in organization and techniques of teaching a biological sciences laboratory.

Both grading options. (Conference 1 hr., laboratory 3 hrs. per unit.) May be repeated for a letter grade up to a maximum of 3 units; units beyond the three will be taken credit/no credit. Students may only use a total of 3 units of BIOL 494, BIOL 495, or BIOL 496 combined for major requirements. Not available to graduate students.

BIOL 496 - Undergraduate Directed Research

(1-3 units)

Prerequisites: BIOL 211
, BIOL 212
; one of BIOL 213
, BIOL 296
, BIOL 311
; consent of instructor; and consent of appropriate undergraduate advisor.
Research in a specific topic in biological sciences approved and directed by a faculty member in Department of Biological Sciences.

Both grading options. May be repeated for a letter grade up to a maximum of 3 units; units beyond the three will be taken credit/no credit. Students may only use a total of 3 units of BIOL 494, 495, or 496 combined for major requirements. Not available to graduate students.

BIOL 511 - Marine Mammalogy

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.
(Undergraduates enroll in BIOL 411
; graduates enroll in BIOL 511.) Fundamental biological, ecological, and physiological concepts of marine mammals, including cetaceans, pinnipeds, walruses, sirenians, and polar bears. Information concerning taxonomy, distribution, morphology, physiology, reproduction, and feeding through readings and scientific literature. Fieldtrips may include weekends and spring recess.

Letter grade only (A-F). (Lecture 2 hrs., lab and fieldtrips 3 hrs.) Double Numbered with: BIOL 411

BIOL 515 - Marine Microbiology

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.
(Undergraduates enroll in BIOL 415
; graduates enroll in BIOL 515.) Designed to familiarize microbiology and marine biology students with the role of microorganisms in the marine environment. Topics will include ecology, physiology, biogeochemistry and diversity of marine microbes. Laboratory/field component will emphasize examination and cultivation of local marine microbes. Weekend field trip may be required.

Letter grade only (A-F). Course fee may be required. (Lecture 2 hrs., laboratory and field 3 hrs.) Not open for credit to students with credit in MICR 415 or 515. Double Numbered with: BIOL 415

BIOL 516 - Virology

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.
(Undergraduates enroll in BIOL 416
; graduates enroll in BIOL 516.) Virology at molecular level including viral replication and molecular basis for viral pathogenesis; survey of human, animal, and plant viral diseases. Current trends for prevention and treatment of viral diseases.

Letter grade only (A-F). (Lecture 3 hrs.) Not open for credit to students with credit in MICR 416 or 516. Double Numbered with: BIOL 416

BIOL 518 - Biological Oceanography

(4 units)

Prerequisite(s): Graduate standing in the Department of Biological Sciences.
(Undergraduates enroll in BIOL 418, graduates enroll in BIOL 518.)
Biological oceanography explores the evolution, ecology, and physiology of marine biota and the

interactions between these organisms and the environment. Labs will cover oceanographic methods with a focus on the California Bight ecosystem and provide ocean-going and independent research opportunities.

Letter grade only (A-F). (Lecture 3 hrs., laboratory 3 hrs.) Not repeatable for credit. Double Numbered with: BIOL 418

BIOL 520 - Fisheries Ecology and Conservation

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.
(Undergraduates enroll in BIOL 420
; graduates enroll in BIOL 520.) Advanced aspects of fish and invertebrate biology and behavior; fisheries economics and conservation; emphasis on state-of-art field/laboratory techniques and contemporary concepts and their application in fishery management.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 420
.

BIOL 522 - Elasmobranch Biology

(3 units)

Prerequisites: BIOL 345
, BIOL 350
, BIOL 353
.
Prerequisite/Corequisite: BIOL 419
.

Diversity, evolution, ecology and behavior of elasmobranch fishes; emphasis on research design and contemporary concepts related to conservation and management.

Letter grade only (A-F). (Lecture 3 hrs.) Not repeatable for credit. Double Numbered with: Double-numbered with: BIOL 422.

BIOL 524 - Ornithology

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.
Ecology, morphology, physiology, behavior, and taxonomy of birds from an evolutionary perspective, also factors influencing recent increase in their extinction risk. Species identification techniques (emphasis on the local avifauna) and methods of surveying avian populations.

Letter grade only (A-F) Course fee may be required. (Lecture 2 hrs., laboratory/field 3 hrs.) Double

Numbered with: BIOL 424

BIOL 531 - Biology of Cancer

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.
(Undergraduates enroll in BIOL 431
, graduates enroll in BIOL 531.) An examination of cancer, tumor progression, and treatment at the cellular, molecular, and genetic levels.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 431

BIOL 532 - Stem Cell Biology

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.
(Undergraduates enroll in BIOL 432
; graduates enroll in BIOL 532.) Current literature on advances in stem cell research, translational research, and clinical applications of stem cells to alleviate human disease.

Letter grade only (A-F). (Lecture 3 hrs.) Double Numbered with: BIOL 432