

# California State University, Long Beach 2025-2026 Undergraduate and Graduate Catalog

## Courses

[Contract All Courses](#) |

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## Biology

### **BIOL 533 - Developmental Biology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 433

### **BIOL 535 - Pharmacology and Toxicology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(Undergraduates enroll in BIOL 435; graduates enroll in BIOL535.) 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 435

### **BIOL 540 - Advanced Molecular Cell Biology and Physiology**

(3 units)

Prerequisites: Graduate standing and consent of instructor.

In depth discussion of cellular processes and their regulation and how they relate to organismal physiology. Includes critical reading and discussion of primary journal articles on pertinent topics.

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

## **BIOL 542 - Physiology at the Limit**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 442

## **BIOL 543 - Endocrinology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 443

## **BIOL 544 - Reproductive Biology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 444

## **BIOL 546 - Biochemical and Physiological Responses to Climate Change**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences. (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). Not repeatable for credit. Double Numbered with: BIOL 446.

## **BIOL 548 - Principles of Neurobiology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 448

## **BIOL 550 - Plant Ecology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 450

## **BIOL 551 - Wetlands and Mangrove Ecology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(Undergraduates enroll in [BIOL 451](#)

; graduates enroll in BIOL 551.) 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. Includes wetland management concepts and approaches worldwide.

Letter grade only (A-F). (Lecture 2 hrs., laboratory and field 3 hrs.) Double Numbered with: BIOL 451

## **BIOL 552 - Behavioral Ecology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 452

## **BIOL 553 - Visual Ecology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 453

## **BIOL 554A - Research in Tropical Marine Ecology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 454A

## **BIOL 554B - Research in Tropical Terrestrial Ecology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 454B

## **BIOL 555 - Ecology of Marine Communities**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 455

## **BIOL 556 - Population Ecology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(Undergraduates enroll in BIOL 456 ; graduates enroll 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 456

## **BIOL 557 - Field Methods in Ecology**

(4 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(Undergraduates enroll in [BIOL 457](#)

; graduates enroll 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 457

## **BIOL 559 - Conservation Biology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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.

Letter grade only (A-F). (Lecture 3 hrs.) 20 hrs. per semester service learning for undergraduates,

extra research paper for graduates. Double Numbered with: BIOL 459

## **BIOL 560 - Advanced Statistics for Biologists**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

Data analysis techniques applied to problems in biology. Topics covered include analysis of variance, linear and nonlinear regression, mixed-effects models, randomization tests, generalized linear models, and principles of experimental design.

Letter grade only (A-F). (Lecture 2 hrs., laboratory 3 hrs.) Not repeatable for credit.

## **BIOL 561 - Fundamentals of Data Visualization**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences. Biostatistics recommended.

General principles underlying compelling data visualizations. Topics covered include data management, the layered grammar of graphics, basic and advanced plot types, exploratory data analysis, and figure-preparation workflow.

Letter grade only (A-F). (Lecture 3 hrs.) Not repeatable for credit.

## **BIOL 562 - Bioethics and Public Policy**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 462

## **BIOL 563 - Computer Modeling in Biology**

(4 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

History, modeling theory, different modeling approaches, theoretical, empirical and quantitative modeling. Laboratory uses modeling software and focuses on model construction and quantitative simulation. Applicable to ecology, microbiology, physiology, environmental sciences, etc.

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

## **BIOL 564 - Aquatic Toxicology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 464

## **BIOL 571 - Bacterial Physiology**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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.) Not open for credit to students with credit in MICR 571.

Double Numbered with: [BIOL 471](#)

## **BIOL 573 - Molecular Genetics**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 473

## **BIOL 574 - Bioinformatics**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 474

## **BIOL 577 - Biotechnology: Applications of Molecular Techniques and Bioinformatics**

(4 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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: BIOL 477

## **BIOL 580 - Seminars**

(1 unit)

Prerequisites: Graduate standing in the 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 480

## **BIOL 590 - Selected Topics in Biology**

(1-3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 490

## **BIOL 590L - Selected Topics in Biology, Laboratory**



(1-2 units)

Prerequisites: Graduate standing in the Department of Biological Sciences.

(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 490L

## **BIOL 592A - 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 consent 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 492A](#)

## **BIOL 661 - Seminar in Microbiology**

(2 units)

Prerequisite: Consent of instructor.

Critical evaluation of literature in this field, including oral and/or written presentation of critiques.

Letter grade only (A-F). (Seminar 2 hours). May be repeated to a maximum of 4 units with different topics.

## **BIOL 663 - Seminar in Cell and Molecular Biology**

(2 units)

Critical evaluation of field's primary literature, including oral and/or written presentation of critiques.

Letter grade only (A-F) (Seminar 2 hrs.) May be repeated to a maximum of 4 units with different topics.

### **BIOL 664 - Seminar in Marine Biology**

(2 units)

Critical evaluation of field's primary literature, including oral and/or written presentation of critiques.

Letter grade only (A-F) (Seminar 2 hrs.) May be repeated to a maximum of 4 units with different topics.

### **BIOL 665 - Seminar in Ecology**

(2 units)

Critical evaluation of field's primary literature, including oral and/or written presentation of critiques.

Letter grade only (A-F) (Seminar 2 hrs.) May be repeated to a maximum of 4 units with different topics.

### **BIOL 666 - Seminar in Physiology**

(2 units)

Critical evaluation of field's primary literature, including oral and/or written presentation of critiques.

Letter grade only (A-F) (Seminar 2 hrs.) May be repeated to a maximum of 4 units with different topics.

### **BIOL 696A - Research Design and Ethics**

(3 units)

Prerequisites: Graduate standing in the Department of Biological Sciences and departmental permission.

Research design, experimental ethics, statistics, literature searches, and thesis proposal writing. Required for all first semester graduate students.

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

## **BIOL 696B - Scientific Communication**

(3 units)

Prerequisite: [BIOL 696A](#)

with a grade of "B" or better.

Presentation/publication skills for communicating biological research to professional and lay audiences: scientific writing, data presentation (posters and oral).

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

## **BIOL 696C - Thesis Workshop**

(1 unit)

Prerequisites: BIOL 696A and 696B with a grade of "B" or better, or permission of graduate advisor. Advancement to candidacy required.

This course is designed to provide students with structured writing time and peer-review opportunities to reinforce best practices in scientific writing for theses and scientific manuscripts.

Letter grade only (A-F). (Lecture 1 hr.) Not repeatable for credit.

## **BIOL 697 - Directed Research**

(1-6 units)

Prerequisite: Consent of instructor.

Research on specific topic approved and directed by a faculty member in the biological sciences.

Written report required.

Both grading options. May be repeated for a letter grade and degree credit to a maximum of six units.

## **BIOL 698 - Thesis**

(1-6 units)

Prerequisites: Advancement to Candidacy for the Master of Science in Biology, and consent of the chair of the thesis committee and the departmental graduate advisor.

Planning, preparation, writing, defense, oral presentation, and completion of a research thesis in the biological sciences.

Letter grade only (A-F).

