

BIOLOGY

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Biology is in the midst of revolutionary changes that are reshaping how we study and understand life. The Biology Department embraces these changes, which are reflected in our curriculum.

Our mission is to provide the highest quality education to our students so they achieve their greatest potential. We endeavor to give students relevant, authentic experiences and to encourage their development as scientists. We highly value mentoring undergraduate researchers and student involvement in civic engagement and outreach. Although we serve many pre-health professions students, we care deeply about providing a broad biology education in a liberal arts context

Program Learning Outcomes

Our curriculum is guided by these goals:

1. Students will demonstrate deep understanding of five core concepts in biology: evolution; pathways and transformations of energy and matter; information flow, exchange, and storage; structure and function; and biological systems.
2. Students will use the standard skills and methodologies of biology to answer scientific questions.
3. Students will apply the scientific method, reasoning and appropriate mathematics to describe, explain and understand biological systems.
4. Students will use interdisciplinary approaches (applying chemistry, physics, and mathematics to biology) to work on biological problems.
5. Students effectively will read, write, speak and understand scientific material.
6. Students will collaborate and communicate within biology and across disciplines.
7. Students will apply science to issues facing our society.

Students may not receive a degree in both biology and environmental science with a biology emphasis.

Biology: Requirements for the Major

Though not a requirement for a Biology major, it is strongly recommended that Biology majors include CS 130; a statistics course and independent research is highly recommended for students planning to pursue graduate studies in biology.

Take all of the following:

BIOL 200	Intro Biology: Flow of Energy	4 credits	36 credits
BIOL 200 L	Intro Biology: Flow of Energy Lab	0 credits	
BIOL 201	Intro Biology: Flow of Biology Information	4 credits	
BIOL 201 L	Intro Biology: Flow of Biology Information	0 credits	
BIOL 312	Genetics and Evolution	4 credits	
BIOL 313	Cell and Molecular Biology	4 credits	
BIOL 314	Molecular Genetics Lab	2 credits	
BIOL 490	Senior Capstone Experience	2 credits	
BIOL 489	Advanced Research Methods	4 credits	
CHEM 220	General Chemistry I	4 credits	
CHEM 230	General Chemistry II	4 credits	
CHEM 300	Organic Chemistry	4 credits	

Take eight credits from the following:

BIOL 365 & 366	Adv Galapagos and Ecuador		8 credits
BIOL 404	Ecology		
BIOL 415	Principles of Development		
BIOL 420	Vertebrate Zoology		
BIOL 425	Animal Behavior		
BIOL 426	Plant Animal Interactions		
BIOL 435	Animal Communication		
BIOL 444	Evolution		
BIOL 470	Animal Physiology		

Take eight additional upper-division BIOL credits (excluding BIOL 475)

Up to 2 credits of BIOL 495 may be used toward elective credits.

Up to 4 credits of CHEM 380, ENV 325, or ENV 301 may be used toward elective credits.

8 credits

Take one course from each of the following pairs:

PHY 202	Introductory Physics I	4 credits	8 credits
OR			
PHY 232	General Physics I: Workshop Physics I	4 credits	
OR			
PHY 204	Introductory Physics II	4 credits	
OR			
PHY 242	General Physics II: Workshop Physics II	4 credits	

TOTAL:

60 credits

Restrictions: Upper division biology coursework taken during study abroad may be applied to the major but must be approved by the department.

Biology: Requirements for the Minor

BIOL 200	Intro Biology: Flow of Energy	4 credits
BIOL 200 L	Intro Biology: Flow of Energy Lab	0 credits
BIOL 201	Intro Biology: Flow of Biology Information	4 credits
BIOL 201 L	Intro Biology: Flow of Biology Information	0 credits
CHEM 220	General Chemistry I	4 credits
CHEM 230	General Chemistry II	4 credits
Biology electives		12 credits

Three additional upper-division biology classes (excluding BIOL 475, 490 and 495), including at least one upper division lab. Up to 4 credits of CHEM 380, ENV 325, or ENV 301 may be used toward elective credits.

TOTAL: 28 credits

Restrictions: To receive a Biology minor from Pacific University, a student must complete three upper-division courses toward the biology minor on campus.

COURSES

BIOL-145 Marine Biology for Nonscience Majors

An introduction to organisms and processes in the marine environment. Organismal adaptations and interactions of organisms with the environment are stressed. Includes some aspects of environmental and economic issues as they relate to biology of the ocean. Some weekend field trips required. Additional fee required. Does not count toward a Biology major or minor. 4 credits.

BIOL-155 Special Topics

Go to <https://www.pacificu.edu/about-us/centers-institutes/advising-center/new-topics-travel-class-descriptions> or see the Advising Center.

BIOL-160 Selected Topics for Non-Science Majors

Study of a particular field of biology selected by the instructor and approved by the Biology department. Lab activities may be a part of the course. This course is designed for non-science majors. Some topics may require the instructor's consent. Refer to the online course schedule to verify if instructor consent is required for the offered topic. May be repeated for credit when topic varies. 2 or 4 credits.

BIOL-165 Natural History Galapagos & Ecuador Prep

Preparation course for a January travel class to explore and study the Galapagos Islands and Ecuador - some of the most biologically diverse regions in the world. Students will study the biodiversity, adaptations, and natural history of species in Galapagos and the Andes cloud forest. Students will read introductory and popular science literature that will introduce them to the biological, ecological, and environmental issues specific to the regions that will be visited in January, and will begin to develop skills in observation and field drawing. Instructor's Consent required. Offered alternate years. 2 credits.

BIOL-166 Natural History Galapagos/Ecuador Travel

Travel class to explore and study the Galapagos Islands and Ecuador - some of the most biologically diverse regions in the world. Students will study the biodiversity, adaptations, and natural history of species in Galapagos and the Andes cloud forest. During the travel course, students will apply knowledge from introductory and popular science literature to experiences with the biological, ecological, and environmental issues of the regions visited, while continuing to develop skills in observation and field drawing. This course has additional fees associated with winter term travel to Galápagos and Ecuador. Prerequisite: BIOL 165. Counts toward core requirement: International Perspectives. Offered alternate years. 2 credits.

BIOL-170 Human Genetics

This course introduces students to the study of inheritance in all of its manifestations, from the distribution of human traits in a family pedigree to the biochemistry of the genetic material in our chromosomes, DNA. The course examines the inheritance of traits in individuals and families, how traits evolve and are maintained in human populations, the molecular basis for those traits, and the Human Genome Project. Does not count toward a Biology major or minor. 4 credits.

BIOL-195 Independent Study

See department for details. Independent study contract required.

BIOL-200 Intro Biology: Flow of Energy

This course will emphasize the flow of energy in biological systems, and integrate across all levels of biological organization. Topics include: macromolecules, thermodynamics and energy, metabolism, photosynthesis and cellular respiration, homeostasis, physiology, ecology and trophic interactions, and ecosystem dynamics. Math placement into Calculus I is required to take this course in the freshman year. Corequisite: BIOL 200L. 4 credits.

BIOL-200L Intro Biology: Flow of Energy Lab

This laboratory will examine concepts from BIOL 200 in a laboratory setting. Corequisite: BIOL 200. 0 credits.

BIOL-201 Intro Biology: Flow of Information

This course explores the flow of information in biological systems, integrating across all levels of biological organization. Topics include: animal behavior, endocrine and nervous systems, signal transduction between and within cells, and the molecular language and processes necessary for storing and transmitting biological information. Information flow between generations will be covered along with mutations, microevolution, and macroevolution. Math placement into Calculus I is required to take this course in the freshman year. Corequisite: BIOL 201L. 4 credits.

BIOL-201L Intro Biology: Flow of Info Lab

This laboratory will examine concepts from BIOL 201 in a laboratory setting. Corequisite: BIOL 201. 0 credits.

BIOL-255 Special Topics

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BIOL-275 Internship

See department for details. Internship contract required.

BIOL-295 Independent Study

See department for details. Independent study contract required.

BIOL-307 Cancer Biology

An overview of the field of cancer biology with emphasis in the cellular and molecular mechanisms of tumor progression. Topics discussed include environmental carcinogens, current treatments and therapies, disease frequencies and epidemiology, drug discovery and design, and cancer prevention. Prerequisites: BIOL 200 and BIOL 201 with a minimum grade of C-, CHEM 220, and CHEM 230 (may be taken concurrently). 4 credits.

BIOL-308 Microbiology

A study of the structure, biochemistry, physiology, energy generation, genetics and diversity of prokaryotic organisms. Includes a laboratory experience. Prerequisite: BIOL 200 and BIOL 201 with a minimum grade of C-, CHEM 220, and CHEM 230 (may be taken concurrently). 4 credits.

BIOL-312 Genetics and Evolution

Examines the flow of information from within and between cells, organisms, and populations over evolutionary time. Topics will include transmission genetics, molecular genetics, genomics, population genetics, microevolution, and macroevolution. Prerequisites: BIOL 200 and BIOL 201 with a minimum grade of C-, CHEM 220, and CHEM 230 (may be taken concurrently). 4 credits.

BIOL-313 Molecular Biology of the Cell

Explores the molecular aspects of cellular biology. Topics will include molecular and cellular events in eukaryotic cells: membrane dynamics, the endomembrane system, signal transduction, regulation of the cell cycle, intracellular transport, and intercellular adhesion. An understanding of the molecular biology of a cell can be used as a basis for understanding biology at the organismal, population, and ecosystem levels. Prerequisites: BIOL 200 and BIOL 201 with a minimum grade of C-, CHEM 220, and CHEM 230 (may be taken concurrently). 4 credits.

BIOL-314 Molecular Genetics Laboratory

Includes experimentation that utilizes molecular genetics techniques, such as genetic sequencing, bioinformatics, DNA extractions, polymerase chain reaction (PCR), gel electrophoresis, genetic crosses, and microscopy. The hands-on work illustrates principles presented in BIOL 312 and/or BIOL 313 lecture and teaches students elements of experimental design as well as the analysis and presentation of scientific results. Prerequisites: BIOL 200 and BIOL 201 with a minimum grade of C-, CHEM 220, and CHEM 230 (may be taken concurrently). 2 credits.

BIOL-325 Conservation Biology

Examines the historical and ethical background of the conservation movement and trace the development of the science of conservation biology. We will be making connections between society and the natural world, relating human impacts on plants and wildlife to the goals of the practicing conservation biologist. We will learn quantitative methods to determine and predict the status of plant and animal populations. This is a lab/field course with opportunities to learn from conservation efforts around the Portland metropolitan area. Also listed as ENV 325. Prerequisite: BIOL 200 and BIOL 201 with a minimum grade of C-. 4 credits.

BIOL-355 Special Topics

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BIOL-360 Selected Topics in Biology

Study of a particular field in biology selected by the instructor and approved by the Biology Department. May or may not include a lab. Some topics may require the instructor's consent. Refer to the online course schedule to verify if instructor consent is required for the offered topic. May be repeated for credit when topic varies. Prerequisite: BIOL 312, BIOL 313, BIOL 314. Additional prerequisites may apply depending on the topic. 2-4 credits.

BIOL-365 Adv Nat History Galapagos & Ecuador Prep

Preparation course for a January travel class to explore and study the Galapagos Islands and Ecuador - some of the most biologically diverse regions in the world. Students will study the biodiversity, adaptations, and natural history of species in Galapagos and the Andes cloud forest. During the fall course, students will read both original research articles and popular science literature that will advance their understanding of the biological, ecological, and environmental issues specific to the regions that will be visited in January, and will refine observational skills and develop skills in field drawing. Prerequisite: BIOL 312 and BIOL 314. Instructor's Consent required. Offered alternate years. 2 credits.

BIOL-366 Adv Nat Hist Galapagos/Ecuador Travel

Travel class to explore and study the Galapagos Islands and Ecuador - some of the most biologically diverse regions in the world. Students will study the biodiversity, adaptations, and natural history of species in Galapagos and the Andes cloud forest. During the travel course, students will apply knowledge from original research articles and popular science literature to experiences with the biological, ecological, and environmental issues of the regions visited, while continuing to develop skills in observation and field drawing. This course has additional fees associated with winter term travel to Galapagos and Ecuador. Prerequisite: BIOL 365. Counts toward core requirement: International Perspectives. Offered alternate years. 2 credits.

BIOL-385 Junior Seminar

The Junior Seminar is designed to introduce majors to the primary biological literature, improve their oral communication skills, and highlight recent advances in the field. Students will read, present and discuss primary research papers in the biological sciences. Topics will vary each semester but have an interdisciplinary theme. Prerequisites: Junior standing or above (60 or more completed credits), one upper division BIOL course (4 credits) with a minimum grade of C- and declared Biology major. 1 credit.

BIOL-395 Independent Study

See department for details. Independent study contract required.

BIOL-404 Ecology

A study of the relationships between organisms and their environment. Major topics include population dynamics, species interactions, community structure/function, and ecosystem ecology. This course introduces quantitative tools used by ecologists, and explores many applications of ecological principles to conservation and society. Weekend field trips usually part of the course. Includes a laboratory experience. Prerequisite: BIOL 312 and BIOL 314. 4 credits.

BIOL-405 Immunology

A study of the mammalian immune system covering the molecules and mechanisms used to fight infection. The development of B and T cells and their role in the human immune response will be emphasized. The relationship of the immune system to human biology will also be covered, for example infectious disease, vaccines, allergies, and autoimmune disorders. Prerequisite: BIOL 312, BIOL 313, and BIOL 314. 4 credits.

BIOL-415 Principles of Development

A study of molecular and cellular mechanisms underlying development of selected invertebrates and vertebrates, from fertilization through early organ formation. Gene regulation and experimental approaches are emphasized. Includes a laboratory experience. Prerequisite: BIOL 312, BIOL 313, and BIOL 314. 4 Credits.

BIOL-420 Vertebrate Zoology

A study of vertebrate organismal biology, with an emphasis on trends in vertebrate evolution. Topics include the origin of major groups, morphology and physiology, life history, locomotion, feeding, behavior, and conservation. Includes laboratory experience. Some weekend field trips required. Prerequisite: BIOL 312, BIOL 313, and BIOL 314. 4 credits.

BIOL-425 Animal Behavior

A study of the ecology and evolution of animal behavior, including such topics as foraging strategies, predator-prey interactions, contests, mating systems, sexual selection, communication and the application of animal behavior to conservation. Mechanisms of animal behavior (including endocrinology, genetics and neurobiology) are also discussed. Includes a laboratory experience. Prerequisites: BIOL 312, BIOL 313, and BIOL 314. 4 credits.

BIOL-426 Plant Animal Interactions

Plant-animal interactions are fundamentally important to the ecology and evolution of natural ecosystems, to conservation (e.g., management of invasive species), and to agriculture and food production. In this class, we will study the major antagonistic and mutualistic plant-animal interactions, including pollination, herbivory, fruit and seed dispersal, and plant protection mutualisms. Using these topics, we will explore basic and applied concepts related to ecology, evolution, and plant biology. Readings from the primary literature will be an integral component of the course, while labs will focus on authentic investigations of topics such as plant defenses, associational effects, pollination biology, or seed dispersal. Prerequisites: BIOL 312, BIOL 313, and BIOL 314. Offered alternate years. 4 credits.

BIOL-435 Animal Communication

An investigation into the biology underlying different modes of animal communication, including visual, acoustic, chemical, and tactile signaling behavior. The course will focus on the evolutionary and ecological significance of animal signals and discuss how communication is controlled by different mechanisms (endocrinology, genetics, neuroscience) and how these behaviors are impacted by anthropogenic interactions. Includes a laboratory experience. Prerequisite: BIOL 312, BIOL 313, and BIOL 314. 4 credits.

BIOL-444 Evolution

Examines evidence for evolution and explanations for patterns of diversity and the apparent fit of organisms to the environment. Topics include the basis for evolutionary change, population level processes, natural selection, sexual selection, speciation mechanisms, and long-term macroevolutionary patterns. Includes a laboratory experience. Prerequisite: BIOL 312, BIOL 313, and BIOL 314. 4 credits.

BIOL-445 Marine Biology

A study of life and processes in the marine environment. Organismal adaptations and interactions of organisms with the environment are stressed, along with field trips to the marine intertidal zones. Includes some aspects of environmental issues as they relate to biology of the ocean. Some weekend field trips required. Includes a laboratory experience. Prerequisite: BIOL 312, BIOL 313, and BIOL 314. 4 Credits.

BIOL-455 Special Topics

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BIOL-466 Genome Analysis Workshop

A study of the structure and function of the genome. Students will use various software tools to identify genes in a bacterial genome sequence and to study the gene products. Microbial metagenomes from environmental samples will be analyzed. Includes a laboratory experience. Prerequisite: BIOL 312, BIOL 313, and BIOL 314. 4 credits.

BIOL-470 Animal Physiology

The study of physiological function (molecular, cellular, and organ systems) in animals. The focus will be on the diversity of mechanisms used by animals for: water and solute regulation, gas exchange and transport, temperature regulation and tolerance, circulation, digestion, metabolism, excretion, neural control and integration, and locomotion. Includes a laboratory experience. Prerequisite: BIOL 312, BIOL 313, and BIOL 314. 4 credits.

BIOL-475 Internship

See department for details. Internship contract required.

BIOL-489 Advanced Research Methods

Teams of students carry out original research in collaboration with a member of the Biology faculty. Course involves critically reading, analyzing, and synthesizing primary literature in the research area; generating a novel data set (via experiments, studies, or data mining of large public data sets); and analyzing and interpreting the data. Research area will vary, and depends on faculty expertise. Prerequisites: BIOL 312, BIOL 313, BIOL 314, 8 additional upper division BIOL credits and declared biology major. Instructor's Consent required. 2 or 4 credits.

BIOL-490 Senior Capstone Experience

Designed for senior Biology majors. Students will complete a capstone paper and present their capstone project publicly. The course requires that students integrate information from the primary and secondary biological literature as well as from their knowledge of biology. All topics must be approved by the Biology Department. Prerequisite: Senior standing, BIOL 385 or BIOL 489 (may be taken concurrently). Must be a declared BIOL major. Pass/No Pass grading only when taken for 0 credits. 2 credits.

BIOL-495 Research

Faculty supervised, student-conducted, individual research project. Prerequisite: BIOL 312, BIOL 313, and BIOL 314. Instructor's consent required. May be repeated for credit. 1-6 credits.