Biology

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The Biology Department provides unique educational experiences for students in biology and related fields. The faculty has particular expertise in ecology, molecular biology, genetics, animal physiology, marine biology, developmental biology, anatomy, vertebrate zoology, animal behavior, immunology, and microbiology. Field courses provide direct experience through field trips to Henry Boidgett Arboretum and other habitats throughout Oregon. Faculty members have contacts at Oregon Health & Science University so that students can arrange to do laboratory research at those locations.

We have designed biology courses to provide the basic knowledge, skills and training necessary for students who intend to pursue professional study in the health sciences, graduate study in biological sciences or professional employment in some field of biology.

We encourage students to obtain additional experience in the specialized area of their choice, through career internships or through independent research projects.

The Biology Department sponsors the Omicron Xi Chapter of Beta Beta Beta, a national biological honor society, whose purpose is to promote student interest and participation in research.

The Department also sponsors the Biology Club to promote student interest in biology and to provide biology students with opportunities to socialize outside of class.

In successfully completing a major in biology, students must demonstrate:

- an understanding of the basic principles and concepts of biology
- an in-depth knowledge of three areas of biology:
  1. cell/molecular/genetics
  2. structure/function/systematics
  3. ecology/evolution/behavior
- the ability to think critically and to synthesize information from a variety of sources
- the ability to communicate effectively in the discipline, both orally and in writing
- the ability to use the scientific method to ask questions, collect data and interpret results

Students may not receive a degree in both biology and in 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 planning graduate work include a statistics course and independent research.

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 202</td>
<td>General Biology I</td>
<td>4</td>
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<tr>
<td>BIOL 204</td>
<td>General Biology II</td>
<td>4</td>
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<tr>
<td>BIOL 304</td>
<td>Research Methods</td>
<td>4</td>
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<tr>
<td>BIOL 385</td>
<td>Junior Seminar</td>
<td>1</td>
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<tr>
<td>BIOL 490</td>
<td>Senior Capstone Experience</td>
<td>2</td>
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<tr>
<td>BIOL 308</td>
<td>Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 320</td>
<td>Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 330</td>
<td>Genetics</td>
<td>4</td>
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<tr>
<td>BIOL 400</td>
<td>Molecular Biology</td>
<td>4</td>
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<tr>
<td>BIOL 466</td>
<td>Genome Analysis Workshop</td>
<td>4</td>
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<tr>
<td>BIOL 316</td>
<td>Plant Biology</td>
<td>4</td>
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<tr>
<td>BIOL 350</td>
<td>Principles of Development</td>
<td>4</td>
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<td>BIOL 420</td>
<td>Vertebrate Zoology</td>
<td>4</td>
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<tr>
<td>BIOL 430</td>
<td>Plant Systematics</td>
<td>4</td>
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<tr>
<td>BIOL 470</td>
<td>Animal Physiology</td>
<td>4</td>
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<tr>
<td>BIOL 305</td>
<td>Ecology</td>
<td>4</td>
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<tr>
<td>BIOL 325</td>
<td>Conservation Biology</td>
<td>4</td>
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<tr>
<td>BIOL 340</td>
<td>Animal Behavior</td>
<td>4</td>
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<tr>
<td>BIOL 345</td>
<td>Marine Biology</td>
<td>4</td>
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<tr>
<td>BIOL 450</td>
<td>Tropical Rainforest Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 390</td>
<td>General Chemistry I</td>
<td>4</td>
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<tr>
<td>BIOL 391</td>
<td>General Chemistry II</td>
<td>4</td>
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<tr>
<td>BIOL 300</td>
<td>Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CS 130</td>
<td>Introduction to Software Tools</td>
<td>2</td>
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Two additional upper-division BIOL courses (excluding BIOL 475) (Up to 3 credits of BIOL 495 may be used toward elective credits. Up to 4 credits of CHEM 390 or ENV 301 may be used toward elective credits.)

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<tbody>
<tr>
<td>CHEM 220</td>
<td>General Chemistry I</td>
<td>4</td>
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<tr>
<td>CHEM 230</td>
<td>General Chemistry II</td>
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<tr>
<td>CHEM 300</td>
<td>Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CS 130</td>
<td>Introduction to Software Tools</td>
<td>2</td>
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</table>
One of the following 2-course clusters: 8 credits total
CS 150 Introduction to Computer Science I
CS 250 Introduction to Computer Science II
OR
MATH 226 Calculus I
MATH 301 Mathematical Modeling
OR
PHY 202 Introductory Physics I OR PHY 232 General Physics I: Workshop Physics I

AND
PHY 204 Introductory Physics II OR PHY 242 General Physics II: Workshop Physics II

TOTAL: 57-61 credits

Biology: Requirements for the Minor

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<td>BIOL 204</td>
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</tr>
<tr>
<td>CHEM 220</td>
<td>General Chemistry I</td>
<td>4 credits</td>
</tr>
<tr>
<td>CHEM 230</td>
<td>General Chemistry II</td>
<td>4 credits</td>
</tr>
<tr>
<td>Biology electives</td>
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<td>12 credits total</td>
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Three additional upper-division biology classes (excluding BIOL 304, 385, 475, 490 and 495). At least one of these courses must include a lab. Up to 4 credits of CHEM 380 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
See department for course description. Credits: 1.00 - 18.00

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. 2-4 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. Credits: 1.00 - 18.00

BIOL-202 General Biology I
A survey of ecology, evolution, the diversity of life on earth, and the structure of plants and animals. Laboratory is integrated with lecture. NOTE: There are no prerequisites for this course. However BIOL 204, has prerequisites of CHEM 220, CHEM 230, and BIOL 202 all with a minimum grade of C-. 4 credits.

BIOL-204 General Biology II
Basic principles of cell and molecular biology for both prokaryotes and eukaryotes. The course includes cell structures and functions, metabolism, classical genetics, and molecular genetics. Laboratory experiences are integrated in the course. Prerequisite: BIOL 202, CHEM 220, and CHEM 230 all with a minimum grade of C-. 4 credits.

BIOL-224 Human Anatomy
An examination of gross and histological structure of the systems of the human body. Laboratory is an integrated part of the course. Prerequisite: BIOL 202 with a minimum grade of C-. 4 credits.

BIOL-230 Human Anatomy & Physiology I
Human Anatomy and Physiology is a year-long course that explores the structure and function of the human body in an integrated fashion. We will cover the 11 anatomical systems and understand how the structure of the human body relates to and defines its function. Emphasis will be placed on integration of systems and information flow. Human Anatomy and Physiology I introduces cytology and histology while
surveying the skeletal, nervous, muscular, endocrine and reproductive systems. Prerequisite: BIOL 202 with a minimum grade of C-. 4 credits.

BIOL-231 Human Anatomy & Physiology II
Human Anatomy and Physiology is a year-long course that explores the structure and function of the human body in an integrated fashion. We will cover the 11 anatomical systems and understand how the structure of the human body relates to and defines its function. Emphasis will be placed on integration of systems and information flow. Human Anatomy and Physiology II emphasizes sensory physiology, circulatory, lymphatic, immune, respiratory, digestive and urinary systems. Prerequisite: BIOL 230 with a minimum grade of C-. 4 credits.

BIOL-240 Human Physiology
A study of the physiological phenomena of the human body from the molecular level of cellular metabolic functions to the operation of primary and specialized organ systems. Laboratory experiences are integrated in the course. Prerequisite: BIOL 224 with a minimum grade of C-. 4 credits.

BIOL-255 Special Topics
See department for course description. Credits: 1.00 - 6.00

BIOL-275 Internship
See department for details. Internship contract required. Credits: 1.00 - 4.00

BIOL-295 Independent Study
See department for details. Independent study contract required. Credits: 1.00 - 16.00

BIOL-304 Research Methods
This course utilizes a hands-on, application-oriented approach to enhance student understanding of: framing scientific questions based on primary scientific literature; designing appropriate experiments; analyzing data statistically and graphically; writing technical reports; and presenting seminars. Course culminates in a student proposed, designed, and conducted independent research project. Prerequisite: Sophomore standing or above (30 or more completed credits), BIOL 204 with a minimum grade of C-. and declared Biology major. 4 credits.

BIOL-305 Ecology
An introduction to the basic principles and fundamentals influencing interactions between plants and animals and their environment. Includes laboratory and field experiences. Includes a required three day field trip. Additional fee required. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-308 Microbiology
A study of the structure, biochemistry, physiology, energy generation, genetics and diversity of prokaryotic organisms. Laboratory experiences are integrated into the course. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-316 Plant Biology
Fundamental principles of plant biology with emphasis on morphology, anatomy, taxonomy, physiology and evolution of algae, non-vascular and vascular plants. Includes laboratory and field experiences. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-320 Cell Biology
A study of the functions of biological systems from the molecular to the tissue level. The molecular biology of cells and the regulatory mechanisms for physiological processes are emphasized. Laboratory experiences are integrated in the course. Prerequisite: BIOL 204 and organic chemistry (CHEM 240/241 or CHEM 320/321 or CHEM 300) all with a minimum grade of C-. 4 credits.

BIOL-325 Conservation Biology
This course will examine 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 204 with a minimum grade of C-. CS 130 or MATH 226 recommended. 4 credits.

BIOL-330 Genetics
A study of the principles of heredity with emphasis upon transmission genetics, quantitative inheritance, the molecular basis of inheritance, and population genetics. Laboratory experiences are integrated in the course. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-335 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. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-340 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. Investigative laboratory and field experiences are integrated in the course. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.
BIOL-345 Marine Biology
A study of life and processes in the marine environment. Organismal adaptations and interactions of organisms with the environment are stressed, 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. Laboratory experiences are integrated in the course. Additional fee required. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-350 Principles of Development
A study of molecular and cellular aspects of development and embryological differentiation of selected species. Laboratory experiences are integrated in the course. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-355 Special Topics
See department for course description. Prerequisite: BIOL 204 with a minimum grade of C-. Credits: 1.00 - 6.00

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. Prerequisite: BIOL 204 with a minimum grade of C-; additional prerequisites may apply depending on the topic. Some topics may require the instructor's consent. Refer to the online course schedule to verify instructor consent if required for the offered topic. May be repeated for credit when topic varies. 2-4 credits.

BIOL-385 Junior Seminar
Taken after successful completion of BIOL 304, 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), BIOL 304 with a minimum grade of C-, one upper division BIOL course or CHEM 380 with a minimum grade of C- (both may be taken concurrently) and declared Biology major. 1 credit.

BIOL-395 Independent Study
See department for details. Independent study contract required. Credits: 1.00 - 8.00

BIOL-400 Molecular Biology
A laboratory-intensive course focusing on nucleic acid biology, recombinant DNA and biotechnology. Prerequisite: BIOL 204 and organic chemistry (CHEM 249/241 or CHEM 320/321 or CHEM 300) all with a minimum grade C-. 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-204 with a minimum grade of C-. Alternate years. 4 credits.

BIOL-410 Invertebrate Zoology
A study of invertebrate organisms including their systematics, morphology and ecology. Laboratory experiences are integrated in the course. Some weekend field trips required. Additional fee required. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-420 Vertebrate Zoology
A study of the vertebrates, including their systematics, life histories, morphological and physiological adaptations, behavior and conservation. Laboratory work (including investigative and observational studies as well as taxonomy and comparative morphology) and field experiences (to local wetlands, streams and forests) are integrated in the course. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-430 Plant Systematics
Identification and classification of the vascular plants represented in the flora of the Pacific Northwest. Includes laboratory and field experiences. Some weekend field trips required. Additional fee required. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-444 Evolution
An introduction to the history, methods, and current questions in evolutionary biology. This course will examine the evidence for evolution beginning with Darwin and ending with our current understanding of the human genome. The course will cover the theory of natural selection, the basis of heredity and variation, population structures and genetics, and the mechanisms of speciation. Special topics include human evolution, molecular evolution, and the relationship of evolution to society, philosophy, and religion. Prerequisite: BIOL 204 with a minimum grade of C-. 4 credits.

BIOL-450 Tropical Rainforest Biology
A study of tropical rainforest ecology and natural history, and current biological research in tropical rainforests. The course meets once a week during the Fall semester for two credits, during which students gain the background required for the field component held in Costa Rica during Winter term for two credits. Additional fee required. Prerequisite: BIOL 204 with a minimum grade of C-. Instructor's consent required. Offered alternate years. 2 credits.

BIOL-455 Special Topics
See department for course description. Credits: 1.00 - 3.00
BIOL-466 Genome Analysis Workshop
The course investigates the genetic information at the gene and genome level. Analysis of the complete genome is an important new tool in understanding the biology of organisms. Students learn to use computer programs to identify and study genes in a bacterial genome. The course is part of a collaboration between JGI (Joint Genome Institute) and colleges nationwide to annotate microbial genomes that provide data to public databases. Prerequisite: BIOL 204 with minimum grade C-. 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, feeding and digestion, metabolism, excretion, neural control and integration, senses, and locomotion. Laboratory experiences are integrated in the course. Prerequisite: BIOL 204 with a minimum grade of C-; and CHEM 240, CHEM 300, or CHEM 310 with a minimum grade of C- (or concurrent enrollment). 4 credits.

BIOL-475 Internship
See department for details. Internship contract required. Credits: 1.00 - 14.00

BIOL-490 Senior Capstone Experience
This course is designed for senior Biology majors in which students develop a capstone paper and present a capstone seminar on an approved topic of their choice. The course requires that students integrate information from the primary and secondary biological literature as well as from their biological knowledge. Research, internship, and literature review options are offered. Students will present on Senior Projects Day. Prerequisite: Senior standing (90 or more completed credits), declared Biology major, and BIOL 304, BIOL 385, and at least two additional upper division Biology lecture (with or without lab) courses each with a minimum grade of C-. 2 credits.

BIOL-495 Research
Faculty supervised, student-conducted, individual research project. Prerequisite: BIOL 204 with a minimum grade of C- and declared Biology major. Instructor's consent required. May be repeated for credit. 1-6 credits.