

## BIOLOGY EDUCATION— (BIO)

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Biology Education combines a slightly modified traditional major in Biology with a corollary major in Education that will provide certification in grades 8-12. The description below specifies the requirements and electives that are needed to complete the Biology major as modified to meet certification needs; please see Education for a description of the requirements for the corollary major in Education.

The department offers a range of introductory and advanced courses in the areas of zoology, botany, microbiology, cell and molecular biology, and ecology. The department, through its curriculum, helps students to achieve this preparation by requiring students to demonstrate:

- an understanding of the purpose of science and the place biology has among the sciences and society, in general;
- an understanding of the scientific method: construction of hypotheses, data collection and analysis techniques, and formulation of conclusions;
- a comprehension and appreciation of the basic concepts of biological science including: the unity and diversity of life, biological molecules, the cell as a functioning structure, mechanisms of inheritance, principles of ecology, and processes of evolution;
- skills for effective verbal communication to peers in scientific settings;
- skills to write clear scientific research and review papers; and
- an understanding of the process of scientific publication and the ability to understand and critique primary scientific literature.

The mission of the biology department is to provide a well-rounded education for its majors that includes understanding core biological principles at the molecular, cellular, organismal, population, and ecosystem levels. The department also seeks to cultivate the analytical skills and curiosity about the biological world that will enable students to be successful professionals, thoughtful citizens, and caretakers of the world.

### ***Major***

(B.S. degree) **Fifty-three hours required.** A minimum of thirty-eight hours in Biology including BIO 111, 212, 214, 305, 305L, 311, 314, 335, 402, one field course, and one capstone course. Field courses include:

BIO300, 316, 320, 327, or 470 field topics. Capstone courses include: BIO 421, BIO 423, BIO/ENV 433, BIO 435. Two hours of electives to be selected from 300-400 level courses in Biology (excluding BIO306). In addition, the required allied hours are MAT111, CHE111, 112, and 113, and PHY 105 or 211. The four courses in the biology core (BIO111, 212, 214, 314) are preferably taken in the freshman and sophomore years; all should be completed by the end of the junior year. BIO 260 and BIO 270 do not count towards the major.

**100. Science of Life.** (3 hours) A general course designed for students other than biology or environmental science majors or minors. Laboratory.  
Fall and Spring

**111. Biological Principles.** (4 hours) An introduction to the major themes of biology: organismal diversity, evolution and ecology, and the cellular, genetic, and metabolic basis of life. Laboratory. Fall and Spring

**212. Cellular and Molecular Biology.** (4 hours) An introduction to cell biology, metabolism, genetics, gene expression, and diversity of unicellular organisms. Laboratory. Prerequisite: BIO 111. Spring

**214. Organismal Diversity.** (4 hours) An introduction to the biology of multicellular organisms. Lecture topics include reproduction and early development, control of gene expression in development, homeostatic systems of plants and animals, signaling and coordination in plants and animals, and the history of multicellular life. Lab will emphasize the diversity and evolution of multicellular organisms. Laboratory. Prerequisite: BIO111. Fall

**260. Preceptorship in Health Sciences or Veterinary Science.** (1 hour) On-site supervised experience in the medical, dental, pharmacy, or veterinary sciences. Prerequisite: Junior classification with a minimum GPA of 3.0 or permission of instructor. BIO305 recommended. (Pass/Fail only) Fall and Spring

**270. Special Topics in Biology.** (.5-4 hours) Research and instructional topics in the biological sciences. Prerequisites: BIO111 and consent of instructor. As needed

**300. Marine Biology.** (3 hours) An introduction to marine science with an emphasis on the ecology of marine life and marine ecosystems. Required off-campus field trip. Prerequisite: One course from BIO212, 214, or 314. Even Springs

**305. Human Physiology I.** (3 hours) The function of the human body with emphasis on cellular and tissue-level structure and function. Topics include cellular physiology and the physiology of the musculoskeletal, cardiovascular, and respiratory systems. Prerequisite: BIO212. Fall

**305L. Human Physiology I Lab: Electrophysiology.** (1 hour) This lab is designed to introduce students to the properties of cells in the respiratory, skeletal muscle, and cardiovascular systems. Most labs will examine the electrical properties of cells, including electroencephalography, electrocardiography, and electromyography. Corequisite: BIO305. Fall

**306. Human Physiology II.** (3 hours) A continuation of BIO305. The physiology of the brain and sensory organs, and of the endocrine, digestive, immune, and urogenital systems, with emphasis on cell and tissue structure and function. Prerequisite: BIO 305. Spring

**306L. Human Physiology II Lab: Histology.** (1 hour) This lab is designed to introduce students to the microscopic study of cellular/tissue structure and function. All of the major organ systems will be examined in this lab. Corequisite: BIO306. Spring

**311. General Microbiology.** (4 hours) Introduction to the diversity, cell biology, physiology, genetics, ecology, and medical impact of microorganisms and viruses. Laboratory. Prerequisite: BIO212. Fall and Spring

**312. Immunology and Pathogenesis.** (4 hours) A study of the bacteria pathogenic to humans and the mechanisms of infection and immunity. Methods of isolation, growth, and identification of the pathogens and serology are emphasized. Laboratory. Prerequisite: BIO212; BIO311 recommended. Odd Springs

**314. Evolution and Ecology.** (4 hours) Study of populations, communities, and ecosystems, and the evolutionary forces that shape them. Laboratory. Prerequisites: BIO111; MAT111 recommended. Spring

**316. Plant Taxonomy and Spring Flora.** (4 hours) Principles of classification, identification, and nomenclature of vascular plants. Field-oriented laboratory emphasizes collection and identification techniques, as well as on-sight recognition of local flora in winter and spring conditions. Prerequisite: BIO214. Odd Springs

**320. Vertebrate Ecology.** (4 hours) An investigation of vertebrate animals emphasizing their ecology, biogeography, and conservation. Special emphasis is placed on life history strategies. Field-oriented laboratory activities include the collection and identification of animals, as well as the gathering and analysis of baseline population data. Prerequisite: BIO214. Odd Falls

**325. Vertebrate Anatomy and Embryology.** (4 hours) A course on the organization, development, and function of the vertebrate body, with emphasis on understanding why vertebrates, including humans, are built

as they are. Laboratory includes detailed dissection of sharks and cats and microscopic study of frog and chick embryos. This course provides a strong foundation for the study of medical or veterinary gross anatomy, but it is not intended solely for pre-medical and pre-veterinary students. Laboratory. Prerequisite: BIO214 or BIO305. Spring

**327. Freshwater Biology.** (4 hours) Freshwater systems and the nature and interactions of their physical and biotic components. Includes taxonomic identification, emphasizing the algae, invertebrates, and vertebrates. Laboratory. Prerequisite: BIO214. Even Falls

**335. Genetics and Molecular Biology.** (4 hours) Introduction to both classical and molecular genetics using microbial, plant, and animal systems. Modern recombinant DNA techniques and their applications are also discussed. Laboratory. Prerequisite: BIO212. Fall and Spring

**337. Cell Biology.** (4 hours) Relationships of intricate cell structures to specialized cell function, including mechanisms associated with growth, differentiation, biochemical activity, physiological behavior. Laboratory. Prerequisite: BIO212. Even Springs

**421. Developmental Biology.** (3 hours) The genetic and cellular mechanisms underlying the development of multicellular organisms. Topics include control of gene expression, pattern formation, and selected topics in animal and plant development. Emphasis on reading and discussion of current research literature. Prerequisites: BIO214; BIO335 recommended. Odd Falls

**423. Neurobiology.** (3 hours). Selected topics in the function of neurons and brain systems, with an emphasis on reading and discussion of current research literature. Topics include membrane potential and synaptic transmission, mechanisms of synaptic plasticity and memory, visual perception, and the neural basis of consciousness. This course satisfies the senior seminar requirement for the Biology major. Prerequisites: BIO 212 and 451; BIO 305 recommended. Odd Springs

**433. Environmental Science and Natural Resources.** (3 hours) See ENV433 Even Springs

**435. Conservation Biology.** (3 hours) Examination of the major anthropogenic threats to biological diversity and solutions for preserving this diversity. Topics include the rationale for preserving biodiversity, threats that arise at population community and ecosystem levels, and *in-* and *ex-situ* conservation strategies. Prerequisites: BIO314 and BIO451 or permission of the instructor. As needed

**440. Independent Study.** (1-3 hours) An independent research project supervised by a member of the department. Prerequisites: BIO214 and

consent of supervising professor.

Fall and Spring

**402. Seminar I.** (2 hours) A topical capstone course which draws upon skills, knowledge, and experiences students have gained throughout their years of college study, particularly in biology. Emphasizes library research, scientific writing, oral presentations, discussion, and critical thinking. Prerequisite: Junior classification and completion of two of the following with a C or better (BIO212, 214, 314) or permission of instructor. Spring

**460. Internship.** (1-3 hours) Students may receive graduation credit for internships with appropriate disciplinary content that meet the faculty-approved criteria for academic internships. Such experiences include a significant reflective component and must be supervised by a full-time member of the Georgetown College faculty. Prerequisites: BIO 111. As needed

**470. Advanced Topics in Biology.** (1-4 hours) Significant topics in biology. Course content varies. Not offered on a regular basis; students should consult the current class schedule. Prerequisites: Consent of instructor. As needed