

BIO. BIOLOGY

BIO-105. THE BIOLOGICAL WORLD

Credits: 3

This course presents concepts and modern ideas pertaining to the natural world and the life sciences. Each semester, a selected topic will be addressed and explored from an investigative set of perspectives. While the scientific method will be emphasized in each offering, the range of topics, identified as a subtitle in the course offering data, will include, for example, 1) Genetics, Evolution, and Ecology: Implications for a Changing Society, 2) Human Biology, 3) Contemporary Issues in the Life Sciences, and others. This course is intended for students who are not majoring in science, engineering, pre-pharmacy, and nursing, or pursuing B.S. programs in mathematics or computer science. Fall semesters: Human Biology—two hours of lecture and two hours of laboratory per week. Dissections of specimens may be required in the laboratory component. Spring semesters: Contemporary Issues in the Life Sciences—three hours of lecture each week.

[Click here for course fee.](#)

BIO-113. MICROBIOLOGY

Credits: 4

This course presents the basic principles of bacteriology and the relationship of micro-organisms to disease and its prevention, control, and treatment. It considers the effects of microbes within the body and the body's reaction to them. Lecture, three hours per week; laboratory, three hours per week. Offered every spring semester.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-115]] or permission of the instructor.

BIO-115. ANATOMY & PHYSIOLOGY I

Credits: 4

Terms Offered: Fall

This course provides a general study of the human body, its structure and normal function. It provides an appreciation of the complex nature of the human body with relation to the promotion of a healthy organism. Dissections of specimens are required in the laboratory portion of these courses. Lecture, three hours per week; laboratory, three hours per week.

[Click here for course fee.](#)

BIO-116. ANATOMY & PHYSIOLOGY II

Credits: 4

Terms Offered: Spring

This course is a continuation of [[BIO-115]] and provides a general study of the human body, its structure and normal function. It provides an appreciation of the complex nature of the human body with relation to the promotion of a healthy organism. Dissections of specimens are required in the laboratory portion of these courses. Lecture, three hours per week; laboratory, three hours per week.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-115]] or permission of instructor.

BIO-121. PRINCIPLES OF MODERN BIOLOGY I

Credits: 4

Terms Offered: Fall

An introduction to concepts of modern biology for students majoring in biology and other sciences. Topics covered include the origin of life, basic biochemistry, cell structure and function, energetics, reproduction and heredity, molecular genetics, and evolution. Four hours of lecture and three hours of laboratory per week. Offered every fall semester. Required of all Biology majors.

[Click here for course fee.](#)

Co-Requisites

[[CHM-115]]

BIO-122. PRINCIPLES OF MODERN BIOLOGY II

Credits: 4

Terms Offered: Spring

An introduction to biological diversity and mammalian structure and function for science majors, usually taken as a continuation of [[BIO-121]]. Topics include organismal classification, a survey of biological diversity (including characteristics, ecology, phylogenetic relationships, and economic and biomedical uses) of microbes, plants, and animals, and an overview of the mammalian body addressing the form and function of key organ systems. Dissections of specimens are required in the laboratory portion of this course. Four hours of lecture and three hours of laboratory per week. Offered every spring semester. Required of all Biology majors.

[Click here for course fee.](#)

BIO-198. TOPICS

Credits: 1-3

A study of topics of special interest not extensively treated in regularly offered courses.

[Click here for course fee.](#)

Pre-Requisites

Will vary according to the specific topics course.

BIO-225. POPULATION AND EVOLUTIONARY BIOLOGY

Credits: 4

Terms Offered: Fall

This course emphasizes the patterns and processes of evolutionary change in living systems in an ecological context. It reviews the basic characteristics and dynamics of populations and the relevance of population ecology and population genetics to the evolution of species. Human evolutions, sociobiology, and other controversial issues are also covered. Laboratory exercises emphasize an experimental approach to more in-depth study of specific topics covered in lecture. Four hours of lecture and three hours of laboratory per week. Offered every fall semester. Required of all Biology majors.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]] and [[BIO-122]].

Biology

BIO-226. CELLULAR AND MOLECULAR BIOLOGY

Credits: 4

Terms Offered: Spring

Fees:

Cell structure in relation to function. Biochemistry and physiology of animal, plant, and bacterial cells and their viruses are presented in a molecular biology context. Cell division and development are examined. Four hours of lecture and three hours of laboratory per week. Offered every spring semester. Required of all Biology majors.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]] and [[BIO-122]].

BIO-254. SUPERLAB

Credits: 3

Superlab is a research-oriented course in which students carry out laboratory and field-based investigations into research areas such as ecotoxicology, plant physiology, ecology, phylogenetics, molecular biology, and cancer biology. In this course, students have one hour of classroom instruction per week during the regular semester followed by ten days (over a period of two weeks) of intensive laboratory work after the end of the semester. During that second phase of the course, students design and implement experiments and carry out research discussed during the first phase with the aid of their instructors. Offered each year.

Pre-Requisites

[[BIO-225]], [[BIO-226]] or [[BIO-226]] as co-requisite.

BIO-298. TOPICS

Credits: 1-3

A study of topics of special interest not extensively treated in regularly offered courses.

[Click here for course fee.](#)

Pre-Requisites

Will vary according to the specific topics course.

BIO-306. INVERTEBRATE BIOLOGY

Credits: 4

This course is a study of the major invertebrate phyla with respect to their taxonomy, evolution, morphology, physiology, and ecology. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]] - [[BIO-122]], [[BIO-225]] - [[BIO-226]], or permission of the instructor.

BIO-311. COMPARATIVE PHYSIOLOGY

Credits: 4

Comparative Physiology encompasses the study of organ functions and organ system functions in different animal groups. Emphasis is on the systemic physiology of vertebrate animals. Three hours of lecture and three hours of laboratory per week. Offered every spring semester. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-312. PARASITOLOGY

Credits: 4

Parasitology is the study of organisms that live on or within other organisms and the relationship of these organisms to their hosts. This course deals with the common parasites that infect humans and other animals. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-314. COMPARATIVE VERTEBRATE ANATOMY

Credits: 4

This course deals with the evolution and anatomy of the organ systems of vertebrates. Lectures survey the comparative anatomy of the vertebrate classes. Laboratory dissections include the lamprey, shark, mud puppy, and cat in detail. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]].

BIO-321. MAMMALIAN PHYSIOLOGY

Credits: 4

This course examines the function of mammalian systems with regard to homeostasis, metabolism, growth and reproduction. Normal physiological processes as well as some pathophysiological situations are covered. While the emphasis is on human physiology, other mammalian systems are discussed to demonstrate physiological adaptability to various environmental situations. Laboratory exercises include physiological experimentation in living systems and in computer simulations. Three hours of lecture and three hours of laboratory per week. Offered in alternate years. This course satisfies the requirement for a course with an emphasis in quantitative biology.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-226]], or permission of the instructor.

BIO-323. FUNCTIONAL HISTOLOGY**Credits:** 4

This course emphasizes the microscopic examination of mammalian tissues from morphological and physiological perspectives. Reference is made to organ embryogenesis to support the understanding of organ form and function. Tissue preparation for histological examination is included. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-324. MOLECULAR BIOLOGY**Credits:** 4**Terms Offered:** Spring

This course introduces students to modern concepts and techniques in molecular biology through a genuine research experience in using cell and molecular biology to learn about a fundamental problem in biology. Rather than following a set series of lectures, we study a problem and see where it leads us. We use the information given in lectures and reading assignments to solve research problems and, in the process, learn a lot of molecular biology. Offered every spring.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]]- [[BIO-226]], [[CHM-231]]- [[CHM-232]].

BIO-325. ENDOCRINOLOGY**Credits:** 4

This course focuses on the structure, biochemistry, and function of mammalian hormones and endocrine glands.

Avian, amphibian, and invertebrate hormones are also discussed, where relevant. Clinical pathologies resulting from excess or insufficient hormones are discussed, as this is essential to mastering an understanding of Endocrinology. Laboratory exercises include experimentation in living systems and computer simulations. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of instructor.

BIO-326. IMMUNOLOGY AND IMMUNOCHEMISTRY**Credits:** 4

This course is concerned with the biological mechanisms and chemistry of reactants and mediators associated with natural and acquired states of immunity, tissue and blood serum responses to infection and immunization. Related pathophysiological alternations of hypersensitivity phenomena in vertebrate animals and man are also discussed. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-327. MEDICAL MICROBIOLOGY**Credits:** 4

Medical Microbiology provides a professional level introduction to microbiology that is focused on application of microbiology to the study of infectious disease etiology and epidemiology. The laboratory covers techniques used in isolation and identification of micro-organisms. Three hours of lecture and three hours of laboratory per week. Cross-listed with [[PHA-327]].

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[CHM-231]]- [[CHM-232]].

BIO-328. DEVELOPMENTAL BIOLOGY**Credits:** 4

A course dealing with the principles of animal development from descriptive, experimental, and evolutionary perspectives. Laboratory work includes both descriptive and experimental embryology, including molecular techniques. Three hours of lecture and three hours of laboratory per week. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-329. VIROLOGY**Credits:** 3

Virology provides an introduction to the biology of animal viruses. Description of viral molecular architecture and genome organization is followed by a survey of strategies employed for multiplication and regulation of gene expression. Pathogenesis of viral infections is considered from perspectives of viral reproduction strategies and host defense.

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], [[CHM-231]]- [[CHM-232]], [[CHM-233]]- [[CHM-234]].

BIO-330. INTRODUCTION TO BIOINFORMATICS APPLICATIONS**Credits:** 3**Terms Offered:** Fall

An introduction to the ways computers are used to make sense of biological information, especially the data generated by the human genome project. Topics covered include databases and data mining, pair-wise, and multiple sequence alignment, molecular phylogeny, finding genes in raw DNA sequences, predicting protein and RNA secondary and tertiary structures, generating and analyzing transcriptomic data, rational drug design, metabolic simulation and artificial intelligence. Offered online every fall, with one assignment each week. This course satisfies the requirement for a course with an emphasis in quantitative biology.

Pre-Requisites

[[BIO-225]]- [[BIO-226]], [[CHM-231]]- [[CHM-232]], [[MTH-150]], or permission of the instructor.

Biology

BIO-338. BIOLOGY OF CANCER

Credits: 3

This lecture course is designed to explore the various concepts and mechanisms associated with the origins, elaborations, and future developments in cellular transformation and carcinogenesis. Emphasis is placed on the molecular biology and physiology of these processes; therefore, a solid background in basic biology is required. Oncogenes, tumor suppressor genes, and the disruption of homeostasis are covered in detail, while the medical phenomena typically receive a more general level of coverage.

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-226]], [[CHM-231]]- [[CHM-232]].

BIO-340. CONSERVATION BIOLOGY

Credits: 3

This course covers the major topics of conservation biology including an introduction to biodiversity, threats to biodiversity, and solutions to diminish extinctions and population declines. Lecture: three hours per week. Offered each year.

Pre-Requisites

[[BIO-225]]- [[BIO-226]] or permission of the instructor.

BIO-341. FRESHWATER ECOSYSTEMS

Credits: 3

A study of the biological and ecological aspects of streams, lakes, and wetlands from a watershed perspective. An initial introduction to physical, chemical, and geological principles of limnology is followed by a focus on freshwater biology. Laboratories include field-based watershed investigations and lake management assessments using geographic information systems techniques. Two hours of lecture and three hours of laboratory per week. Offered in alternate years. Cross-listed with [[EES-341]].

[Click here for course fee.](#)

Pre-Requisites

[[GEO-211]] or [[EES-240]] or [[BIO-121]]- [[BIO-122]] or consent of the instructor.

BIO-342. THE ARCHOSAURS: BIRDS, DINOSAURS, AND CROCODYLIANS

Credits: 4

An examination of the biology of the Archosaurs. Major topics include evolutionary history, morphology, physiology, behavior, ecology, and conservation of archosaurs. Laboratory is largely field-based with an emphasis on identifying local fauna and population estimation methods. Laboratory also includes dissection, histology, and a field trip to a museum. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]] or permission of the instructor.

BIO-343. MARINE ECOLOGY

Credits: 3

An examination of the biology of marine life within the context of modern ecological principles. The structure and physiology of marine organisms are studied from the perspectives of adaptation to the ocean as habitat, biological productivity, and interspecific relationships. Emphasis is placed on life in intertidal zones, estuaries, surface waters, and the deep sea. Two hours of lecture and three hours of laboratory per week. Offered in alternate years. Cross-listed with [[EES-343]].

[Click here for course fee.](#)

Pre-Requisites

[[EES-230]] and [[BIO-121]]- [[BIO-122]]. Students must have formal course experiences in oceanography and biology at the science major level or have completed their sophomore year as a biology major.

BIO-344. ECOLOGY

Credits: 4

An examination of contemporary ecological thinking as it pertains to the interrelationships of organisms and their environments. Interactions at the population and community level are emphasized. Three hours of lecture and three hours of laboratory per week. Offered in alternate years. Cross-listed with [[EES-344]]. This course satisfies the requirement for a course with an emphasis in quantitative biology.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]] or permission of the instructor

BIO-345. GENETICS

Credits: 4

This course presents a detailed treatment of genetics beyond the introductory level in the areas of both transmission and molecular genetics. It includes discussion of the role of genetics in such areas as developmental medicine. Three hours of lecture and three hours of lab per week. Offered every fall semester.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-346. ANIMAL BEHAVIOR

Credits: 4

A course emphasizing behavior as the response of animals to physical and social environmental change. It covers the processes that determine when changes in behavior occur and what form the changes take. Laboratories, using local fauna, demonstrate principles discussed in lecture. Three hours of lecture and three hours of laboratory per week. Offered in alternate years. This course satisfies the requirement for a course with an emphasis in quantitative biology.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-347. BIostatistics AND EXPERIMENTAL DESIGN**Credits:** 4

This course reviews the statistical paradigms and techniques involved in analyzing biological phenomena. Frequentist and Bayesian methods are employed when appropriate with an emphasis on applied statistics and experimental design. Laboratory exercises include designing, analyzing, and communicating experiments. Computation and computer coding is employed in laboratory exercises. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]], [[MTH-150]], or permission of the instructor.

BIO-348. FIELD ZOOLOGY**Credits:** 3

The goals of this summer course are to introduce field methods of zoology and increase familiarity with Pennsylvania's animals. Taxa covered include turtles, snakes, birds, fish, arthropods, and mammals. Topics covered include conservation issues, population estimation, and sampling methods. Time distributed between lecture, lab, and fieldwork.

Offered annually.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]]- [[BIO-226]] or permission of the instructor.

BIO-352. PATHOPHYSIOLOGY**Credits:** 4

Pathophysiology provides a series of lectures, exercises, and problem-solving sessions integrating the concepts of functional anatomy with human disease. Problem-based learning is encouraged by reviewing illustrative clinical cases and using interactive audio-visual media. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]]- [[BIO-226]] or permission of the instructor.

BIO-361. PLANT FORM AND FUNCTION**Credits:** 4

An introduction to the morphology, anatomy, cytology, and physiology of vascular plants. Structural and functional aspects of plants are interpreted in relation to each other and within ecological and evolutionary contexts. Offered in a workshop format of two three-hour sessions per week. Offered every other fall semester.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-362. PLANT DIVERSITY**Credits:** 4

A comprehensive survey of algae, bryophytes, and vascular plants emphasizing their structure, reproductive biology, natural history, evolution, and importance to humans. Offered in a workshop format of two three-hour sessions per week. Offered every other fall semester.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]]- [[BIO-226]], or permission of the instructor.

BIO-363. HEMP BIOLOGY AND ANALYSIS**Credits:** 4

This course is an introduction to hemp biology and analysis. Topics include an overview of hemp, hemp phylogeny, subspecies, plant structure, development, reproduction, water uptake, transport, uses for hemp, hemp pathogens and pests, and ways to improve hemp production using biotechnology.

[Click here for course fee.](#)

Pre-Requisites

Sophomore or pharmacy P-1 standing or instructor permission.

BIO-366. FIELD BOTANY**Credits:** 3

A specialized summertime field course that emphasizes a taxonomic, phylogenetic, and ecological survey of vascular plants indigenous to Northeastern Pennsylvania. Course includes field trips to a diverse array of habitats in Northeastern Pennsylvania. Cross-listed with [[EES-366]]. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-121]]- [[BIO-122]] or permission of the instructor.

BIO-368. MEDICAL BOTANY**Credits:** 3

A specialized summertime course that provides a scientifically based overview of the ways in which plants affect human health. Topics include cultural and historical perspectives of plants and medicine, plants that cause human ailments, plants used to treat human ailments, and psychoactive plants. Two hours of lecture per day for five weeks. Offered in alternate years.

Pre-Requisites

[[BIO-121]]- [[BIO-122]], [[BIO-225]], [[CHM-231]]- [[CHM-232]], or permission of the instructor.

Biology

BIO-369. PLANT PHYSIOLOGY

Credits: 4

This course introduces students to modern concepts and techniques in plant physiology through a genuine research experience using the techniques of plant physiology to learn about a problem in plant biology. Rather than following a set series of lectures, we study a problem and see where it leads us. We use the information given in lectures and reading assignments to solve research problems and, in the process, learn a lot of plant physiology. Offered in alternate years.

[Click here for course fee.](#)

Pre-Requisites

[[BIO-225]]- [[BIO-226]], [[CHM-231]]- [[CHM-232]], or permission of the instructor.

BIO-391. SENIOR RESEARCH I

Credits: 1

Terms Offered: Fall

The student pursues independent research as a member of a team of senior biology majors. Each team is responsible for the identification of an original research problem, a thorough literature review of the problem, a detailed prospectus prepared in the format of a grant proposal, and formal oral presentations. Senior research is required of all biology majors seeking a four-year degree in Biology. Open only to senior Biology majors.

[Click here for course fee.](#)

Pre-Requisites

Biology major senior standing

BIO-392. SENIOR RESEARCH II

Credits: 2

Terms Offered: Spring

A continuation of [[BIO-391]]. The student pursues independent research as a member of a team of senior biology majors. Each team is responsible for the execution of their research project, a formal oral presentation, a poster, and a final manuscript prepared in standard journal format. Senior research is required of all biology majors seeking a four-year degree in Biology. Open only to senior Biology majors, or with permission of instructor.

[Click here for course fee.](#)

Pre-Requisites

Biology major senior standing, or with permission of instructor.

BIO-394. BIOLOGICAL FIELD STUDY

Credits: 1-3

Pre-Requisites

[[BIO-121]]- [[BIO-122]] or permission of the instructor.

BIO-395. INDEPENDENT RESEARCH

Credits: 1-3

This course involves independent study and research for advanced students in the field of the major under the direction of a staff member. A research paper at a level significantly beyond a term paper is required; it must also be presented orally at an appropriate off-campus science meeting.

Requirements:

Written approval of the department chairperson is required.

Candidates for Independent Research must have a minimum GPA of 3.00 and be of upper class standing.

BIO-396. INDEPENDENT RESEARCH

Credits: 1-3

This course involves independent study and research for advanced students in the field of the major under the direction of a staff member. A research paper at a level significantly beyond a term paper is required; it must also be presented orally at an appropriate off-campus science meeting.

Requirements:

Written approval of the department chairperson is required.

Candidates for Independent Research must have a minimum GPA of 3.00 and be of upper class standing.

BIO-397. PROFESSIONAL PREPARATION TECHNIQUES

Credits: 2

Professional Preparation Techniques introduces Biology majors to Biology as a profession. Students learn how to read, write, and analyze research papers and how to make oral presentations and posters using electronic and paper-based supplements. Career development issues, including effective presentation of credentials, are also addressed. Offered every fall and every spring semester.

Pre-Requisites

Junior-level standing, or permission of the instructor.

BIO-398. TOPICS

Credits: 1-3

A study of topics of special interest not extensively treated in regularly offered courses.

[Click here for course fee.](#)

Pre-Requisites

Will vary according to the specific topics course.

BIO-399. COOPERATIVE EDUCATION

Credits: 1-6

Professional cooperative education placement in a private or public organization related to the student's academic objectives and career goals. In addition to their work experience, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student's discipline. See the Cooperative Education section of this bulletin for placement procedures. **Requirements:** Sophomore standing, 2.0 minimum cumulative GPA, consent of the academic advisor, and approval of placement by the department chairperson.