

# BIOLOGY (BIO)

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## BIO 101 General Biology I (0-4 credits)

This is the first half of a one-year course designed to give the science major an understanding of general biological principles. Topics include: cell structure and function, mitosis, meiosis, molecular processes in cells (enzyme functions, photosynthesis, cellular respiration, DNA structure protein synthesis) and basic concepts of development, and genetics. Restriction/Requirement: Only open to Biology, Behavioral Neuroscience, Chemistry, Forensic Science, Biochemistry, Computer Science, Information Technology, Psychology, and Health Sciences majors. All other majors/programs require permission from Department Chair.

**Course Rotation:** Fall and Summer.

**Prerequisites:** MAT 103 or Math Placement Exam score of 30 or higher. MAT 103 can be taken concurrently with BIO 101.

## BIO 102 General Biology II (0-4 credits)

This continuation of BIO 101 surveys the five kingdoms, highlighting major phyla of biota. Mechanisms for maintaining individual and species homeostasis in plants and animals, including physiological, behavioral, and reproductive strategies will be examined. Students will also be introduced to basic concepts of evolutionary biology, ecology, and population biology. (3 lecture hours, 3 laboratory hours per week. Foundation Course).

**Course Rotation:** Spring.

**Prerequisites:** BIO 101 with minimum grade of C-.

## BIO 115 Human Sexuality (3 credits)

This course provides a balance of biological and behavioral aspects of human sexuality using a multidisciplinary approach. Anatomical and physiological correlates, STDs and the human immune system, and pregnancy/conception/developmental issues will be highlighted. Fulfills 3 credits toward Women's and Gender Studies Minor. Not open to Biology, Behavioral, Neuroscience, Chemistry, Forensic Science, or Biochemistry Majors. Not open to students who have completed BIO 101 and BIO 102.

**Course Rotation:** PLV: Fall and Spring.

**Prerequisites:** This course does not have a prerequisite.

## BIO 123 Biology and Contemporary Society (0-4 credits)

This course emphasizes the interdependence of biological systems to each other and to the environment in general. Discussions include topics such as evolution, plant and animal classification and structure, and concepts of bioethics. Students will be expected to discuss specific issues that impact biological systems, including humans. Restrictions/Requirements: Not open to Biology, Behavioral Neuroscience, Chemistry, Forensic Science, or Biochemistry majors. Not open to students who have completed BIO101 and BIO102. 2 lecture hours and 2 laboratory hours per week.

**Course Rotation:** NY and PLV: Fall, Spring, and Summer.

**Prerequisites:** This course does not have a prerequisite.

## BIO 124 Introduction to Neuroscience (0-3 credits)

This course is designed for Undeclared and Non-Science Majors interested in exploring Biology and Neuroscience through lecture and lab activities centered on the nervous system. The course is designed to fulfill the prerequisites for Neurobiology (BIO 325) - a required course in the Neuroscience Minor sequence. This course also fulfills the Science lab core requirement. 2 Lecture hours and 2 Laboratory hours per week. Restrictions/Requirements: Not open to Biology, Behavioral Neuroscience, Chemistry, Forensic Science, or Biochemistry majors. Not open to students who have completed BIO101 and BIO102.

**Course Rotation:** NY; Fall and Spring

**Prerequisites:** This course does not have a prerequisite.

## BIO 125 Biological Aspects of Nutrition (3 credits)

A study of the role nutrition plays in biological systems, microorganisms, plants, and animals. The structure and function of related organs and cellular organelles will be emphasized as well as the relationship between nutrient utilization and the physiological activities of the entire organism. Restrictions/Requirements: Not open to Biology, Behavioral Neuroscience, Chemistry, Forensic Science, or Biochemistry majors. Not open to students who have completed BIO101 and BIO102.

**Course Rotation:** Fall, Spring and Summer.

**Prerequisites:** This course does not have a prerequisite.

**BIO 127 Microbes in our lives-Friend or Foe? (3 credits)**

This survey course introduces topical aspects of microbiology and examines the ubiquitous microbial world and its challenging impact on human life throughout history. The principles of microbial diversity, disease and prevention, antibiotic resistance, vaccination, biological warfare and global public health issues are explored. Current issues where microbes play a central role provide this basis for discussion. Not open to Biology, Behavioral Neuroscience, Chemistry, Forensic Science, or Biochemistry majors. Not open to students who have completed BIO101 and BIO102.

**Course Rotation:** PLV, Spring

**Prerequisites:** This course does not have a prerequisite.

**BIO 152 Anatomy and Physiology I (0-4 credits)**

3 lecture hours and 3 laboratory hours per week. This is the first half of a two-semester course in structure and function of the human body. Emphasis is given to the cell as the basic structural and functional unit of the body and the organization of cells into tissues and organ systems. Organ systems include the skeletal, muscular, nervous, digestive, respiratory, blood vascular, lymphatic, urogenital, and endocrine. Only open to Nursing Students. 3 lecture hours and 3 laboratory hours per week.

**Course Rotation:** Fall, Spring, and Summer.

**Prerequisites:** CHE 113 with minimum grade of C. CHE 113 can be taken concurrently with BIO 152.

**BIO 153 Anatomy and Physiology II (0-4 credits)**

This is the second half of a two-semester course in the structure and function of the human body. Organ systems include digestive, respiratory, blood, vascular, lymphatic, urogenital, endocrine, and reproductive. Only open to Nursing Students. 3 lecture hours and 3 laboratory hours per week.

**Course Rotation:** Fall, Spring, Summer

**Prerequisites:** BIO 152 with minimum grade of C.

**BIO 170 Spaceship Earth: Issues of Sustainability (3 credits)**

This course examines the environmental issues shaping national and international agendas. The study of environmental problems will analyze issues of sustainability by examining the interdependence of biological, sociological, cultural, economic, and political aspects of conservation biology. Students evaluate environmental problems and use collaborative learning to explore creative solutions.

**Course Rotation:** PLV: TBA.

**Prerequisites:** This course does not have a prerequisite.

**BIO 195 Prescription for Addiction (3 credits)**

This course is designed to offer insight into the anatomical, biochemical and pathological changes that occur when psychoactive drugs are introduced into the human body via various methods of delivery. Discussions will focus on the stimulants, including cocaine and amphetamines; depressants, including opioids, sedatives and alcohol and those that can act as stimulants or depressants, including LSD, marijuana and the designer drugs. Attention will be directed to the Egyptian, Indian, Chinese, Greek, South American and other ancient cultures who utilized these mind-altering substances for spiritual, medicinal and religious purposes toward the goal of being one with nature and sustaining a relationship to absorb the ancient knowledge of their culture. Students will gain knowledge of the prescription drug epidemic, the effects of over-the-counter medications and the lethal consequences of drug interactions. Not open to science majors; fulfills AOK 3 and AOK 5.

**Course Rotation:** PLV: Spring

**Prerequisites:** This course does not have a prerequisite.

**BIO 199L Topics in Biology: Toxicology - The Science of Poisons (3 credits)**

This course presents an overview of the study of how chemicals affect the human body. It reviews the history of the field from ancient times when poisons were used to change the leadership of empires, to modern times when they have been used in clandestine operations. Some basic concepts related to poisons are studied, such as the premise that the "dose makes the poison" and that all chemicals are toxic depending upon the extent of exposure. Students are introduced to major classes of toxic materials. Other topics include poisons in natural food and in the natural world, how chemical exposure is regulated by governmental laws, and indoor chemicals that can affect health.

**Prerequisites:** This course does not have a prerequisite.

**BIO 205 Concepts of Environmental Science (3 credits)**

The course will expose the students to the major environmental problems that face humanity and the biosphere today along with strategies proposed for their solution. We will also discuss relevant physical, meteorological, geological and biological process to enhance student understanding of ecological principles and critically important environmental issues. Specific topics include ecosystems, human population, soil and food supply, water and air pollution, energy supply, conservation, climate change, and achieving a sustainable society. Assignments will involve the use of computers to access important information on the Internet and analyze it critically as well as environmental issues in your community. Students will have an opportunity to enhance their ability to communicate in short writing assignments and presentations.

**Course Rotation:** PLV: Spring

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 210 Ecology (0-4 credits)**

An introduction to the study of the distribution and abundance of organisms in the natural world. Fundamental ecological concepts at the level of individuals, populations, communities, ecosystems, and the global environment will be discussed. Interactions among organisms will be examined. Application of ecological concepts to current environmental and conservation related issues will be presented. Laboratory periods will be devoted to field work. 3 lecture hours and 3 laboratory hours per week.

**Course Rotation:** Fall

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 212 Human Disease and Disorders (4 credits)**

This course is designed to provide a basic understanding of the pathophysiologic mechanisms underlying and the clinical manifestations of major human diseases and disorders. It provides a linkage between sciences and the clinical presentation of disease states.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 215 Urban Ecology (3 credits)**

This course explores environmental issues that specifically relate to the urban scene. The focus is on understanding basic ecological dynamics of urban and suburban areas. Topics discussed include urban flora and fauna, climate, and pollutant effects on quality of life. Specific environmental-related urban public health problems are evaluated. A combination of lecture, demonstration and field trips are used to facilitate understanding of basic concepts.

**Course Rotation:** NYC: Fall.

**Prerequisites:** (BIO 101 and BIO 102 with minimum grades of C-) or ENV 221 with minimum grade of C-.

**BIO 218 Genetically Modified Organisms (3 credits)**

Genetically Modified Organisms (GMO) have been a source of debate especially over the last decade as more and more of the world's cropland is planted with genetically modified plants. Explore GMOs from food plants to animal "pharming" where this same DNA technology is applied to animals such that they produce large amounts of human proteins, vaccines, and other substances for medical use. We will investigate various literatures for the social, economic, political, and environmental impact issues surrounding this technology. Restrictions/Requirements: student must be a Biology or Chemistry or Environmental Studies major with approval.

**Course Rotation:** Online: Fall.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 221 Botany (0-4 credits)**

A discussion of the interrelationships, evolutionary development, and taxonomy of representative plants from the major divisions of the plant kingdom. Emphasis is on morphology as it relates to function, economic importance and classification. 3 lecture hours and 3 laboratory hours per week.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 222 Plants and People (3 credits)**

The goal of Plants in People will enable you to understand, appreciate and interpret the inextricable link between humans and plants. This is a relationship that has an old, evolutionary basis that began from the time humans first walked on the earth. Humans have an innate connection to plants. We shape their world and they have shaped ours. By delving into this connection, we will see how humans have coopted plants for our own good, and how they have coopted humans for their own good. We will span the early origins of humans where plants have directed the evolution of a morphology and physiology and how humans have taken plants to build their civilization of dominance over the world: how we dress, where we live, what we eat, how we smell and many other components of human existence are strongly attributable to our relationship to plants. We will consider how our relationships with plants have permeate every part of human culture including our language, music and media. And we will see how use and abuse of plants has led to human diseases, such as addiction, ecological destruction and famine. We will also consider how plants underly human sensation and our expression of aesthetics. Finally, we will talk about the future of human use and misuse of plants, particularly in agriculture ranging from organic farming to biotechnology. This course will change how you view plants from their evolutionary importance, their dynamic qualities (time lapse) and their significance in your life. Note, the syllabus may change depending on need and your interests.

**Course Rotation:** NYC: Summer 2

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 231 Genetics (0-4 credits)**

This course is designed to provide the student with a working knowledge of classical genetics and an understanding of the current concept of the gene. Human genetics, gene action, and population genetics are also considered. 3 Lecture hours and 3 Laboratory hours.

**Course Rotation:** Fall.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 232 Developmental Biology (0-4 credits)**

An analysis of morphogenetic processes with emphasis on the structural and biochemical aspects of vertebrate embryogenesis.

**Course Rotation:** Fall PLV alternate years.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 233 Fundamentals of Histology and Histopathology (0-4 credits)**

A study of the cellular structure of vertebrate tissues, with emphasis on the relationship between structure and function and changes related to various disease states. Laboratory exercises acquaint the student with both classical staining methods and modern immunohistochemical techniques.

**Course Rotation:** Fall PLV.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 236 Comparative Vertebrate Anatomy (0-4 credits)**

An introduction to the diversity of vertebrate forms. Structural and physiological adaptations will be related to evolutionary history. Laboratories mainly devoted to dissection of animals representative of major classes of vertebrates. 3 Lecture hours and 3 Laboratory hours.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 237 Biological Oceanography and Marine Biology (3 credits)**

This course is an intensive overview of oceanography from the biological perspective emphasizing the interaction between the biotic and abiotic components of the marine environment. Specific topics include marine species of plants and animals, marine microbiology, food webs, energy flow and marine habitats.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 243 General Endocrinology (4 credits)**

A study of endocrine hormones, including both classical hormones and recently discovered hormones and growth factors. The origin of these regulatory substances and their regulation of processes such as growth, regeneration, reproduction, blood chemistry, and metabolic rate will be discussed at the whole organism, cellular, and molecular levels. Open only to CHP students.

**Prerequisites:** BIO 102 or BIO 153 with minimum grades of C-.

**BIO 251 Principles of Human Anatomy (0-4 credits)**

3 lecture hours, 3 laboratory hours per week. This course provides a systemic approach to the study of the human body. Discussion of anatomical terminology, cellular processes and tissue classification is followed by study of the gross and microscopic anatomy of each of the organ systems. Laboratory exercises will reinforce lecture concepts through the use of anatomical and skeletal models, histological slides and cat dissection. 3 lecture hours, 3 laboratory hours per week.

**Course Rotation:** Fall

**Prerequisites:** (BIO 101 and BIO 102 with minimum grades of C-) and [(CHE 102 with minimum grade of D) or (CHE 111 and CHE 112 with minimum grades of D)].

**BIO 254 Basic Microbiology (0-4 credits)**

Basic course in microbiology dealing with causative agents of human diseases. Other topics include chemotherapy, host-parasite relationships, and the basis of the immune process. Laboratory includes culturing, primary identification, antibiotic, and biochemical tests. This course is intended for Nursing majors, and not open to Biology majors. 3 lecture hours, 3 laboratory hours per week.

**Course Rotation:** Spring

**Prerequisites:** BIO 153 with minimum grade of C.

**BIO 264 Microbiology (0-4 credits)**

An introduction to the study of microorganisms. Topics include microbial genetics, chemotherapy, and host-parasite relationships. Laboratory techniques include isolation and culturing, antibiotic and biochemical tests, as well as microbiological assays. 3 lecture hours, 3 laboratory hours per week.

**Course Rotation:** Spring and Summer.

**Prerequisites:** (BIO 101 and BIO 102 with minimum grades of C-) or [(BIO 153 with minimum grade of C) and (CHE 101 or CHE 102 or CHE 113 with minimum grades of C)].

**BIO 292 Biology Laboratory Research Training (0 credits)**

As may be agreed upon by the student and the faculty supervisor, students may be trained in such things as the development and implementation of a hypothesis; the creation of experimental design; the performance of experiments; the role of primary scientific literature; the critical analysis of scientific data; and the reporting of scientific data. The specific experiences of a student will vary depending upon the student's interests and the faculty supervisor's research expertise. Requirements/Restrictions: Permission of the chairperson of Biology department required. Open to all Biology, Chemistry, Physical Sciences, pre-OT, pre-PT, pre-Optometry, pre-Podiatry, and Forensic Science majors only.

**Course Rotation:** NYC & PLV: Fall, Spring, & Summer.

**Prerequisites:** This course does not have a prerequisite.

**BIO 296C The Neurobiology of Alzheimer's Disease (3 credits)**

Memories are, arguably, our most prized possessions. They are an integral part of our identities and influence our choices and decisions. The unraveling of memories that occurs in Alzheimer's makes this neurodegenerative disease so particularly devastating for the patient and for their friends and family. More than five million Americans are currently diagnosed with Alzheimer's disease, with an expectation that this number will continue to rise in the upcoming decades. While there is no current cure, our understanding of the disease and its underlying mechanisms has greatly expanded in recent years. This course will explore the clinical manifestation of Alzheimer's disease, its progression, risk factors, neural circuits involved, molecular pathways involved, the current status of drug discovery, and the disease's greater impact on society. In the process, we will also discuss the larger questions of what is known about where memories and attention are stored in the brain. Students will volunteer for 20 hours over the course of the semester at the local Alzheimer's Association chapter of Hudson valley to meet and achieve their civic engagement. This course is a Biology elective course and is designed to fulfill the writing enhanced and civic engagement requirements (formerly AOK1).

**Course Rotation:** PLV: Fall

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 296D Topic: Medicinal Botany: Plants that Heal (0-3 credits)**

Medicinal botany explores the use of various plants in treating human afflictions and disease throughout history. We will look at some of the ways different cultures co-opt plants for traditional healing and evaluate their efficacy based on scientific literature and assays. The course will teach you how to recognize major medicinal plants in the field, prepare herbal medicines, conduct assays to assess their phytochemical properties, as well as perform plant DNA barcoding to verify the botanical identity of herbs sold in New York City. Poisonous plants, hallucinogenic plants and remedial plants for various ailments will be discussed. We will visit the Brooklyn Botanic Garden and hear a guest lecture from an herbalist.

**Course Rotation:** NYC: Fall, Odd Years

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C.

**BIO 297J Topics: Habitats of the Hudson Valley: Identification and Assessment (3 credits)**

This intensive field course will focus on the techniques and tools environmental scientists use to study current issues in conservation. Students will assess the local environment by collecting, analyzing, and interpreting data from local field sites. Classes will consist of short lectures, field activities, and group discussions. Students will learn to identify local ecological communities including indicator plant and animal species as well as threats to these groups. Participants should feel comfortable spending long periods outdoors in a variety of weather conditions as well as hiking through uneven terrain.

**Course Rotation:** PLV; Fall

**Prerequisites:** This course does not have a prerequisite.

**BIO 301 Tropical Ecosystem Assessment (0-4 credits)**

This is a research-based lecture and computer lab course in which students will learn about the relationships between the biotic diversity of soil microbes in the tropics and the carbon and nitrogen cycle components. the roles they play in the ecosystems within intact and managed tropical lowland forests in Costa Rica, and how these ecosystems are impacted by land management and a changing climate. Through lectures and various readings, students will learn basic information about Microbial Ecology, Nutrient Cycles, and Tropical Ecosystems, and how they connect. Students will develop research questions and conduct research projects to address these questions using existing data sets on the DNA-based diversity of the soil microbes and associated carbon and nitrogen data that have been collected from different habitats in Costa Rica. In the computer lab, students will organize the bioinformatics and nutrient data, and use univariate statistical software (SPSS) to analyze the carbon and nitrogen data, and use multivariate statistical software (Primer and its add-on PERMANOVA) to conduct analyses of the data. and write a research paper on their project. Grades will be based on participation in the classroom, successful analysis and interpretation of their data as shown by a detailed outline for their paper-including critical findings and interpretations .and a final paper and presentation.

**Course Rotation:** NYC: Fall, odd years

**Prerequisites:** BIO 101 and BIO 102 and CHE 111 and CHE 112 with minimum grades of C-.

**BIO 305 Evolutionary Biology (3 credits)**

This course will provide a comprehensive introduction to the current field of evolutionary biology, including the theoretical background as well as an introduction to current research in experimental evolution. By the end of this course you should be able to see how evolution provides a framework for the broader field of biology, and have a basic understanding of the major topics in evolutionary biology: the theory of evolution by natural selection, the history of evolutionary thought, population genetics, sexual and kin selection, evolutionary trees/phylogenies, how new species form, and human evolution. Lectures will cover a variety of topics within the field of evolutionary biology. We will examine the theoretical basis of these various topics in detail and break that theoretical basis down into its underlying components. We will also examine how evolutionary theory can be applied to real-world examples, particularly in issues relevant to medicine, agriculture, conservation, and sociology.

**Course Rotation:** NYC: Fall, even years. PLV: Fall, odd years.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 306 Advanced Microbiology (3 credits)**

A survey of the topic of microbial pathogenesis. Concepts examined include mechanisms of microbial invasion, disease mechanisms, host response to infection, virulence, drug resistance, and immunity. Viral as well as bacterial pathogens are discussed.

**Course Rotation:** Winter.

**Prerequisites:** BIO 264 with minimum grade of C-. BIO 264 with minimum grade of C-.

**BIO 307 Microbial Ecology (4 credits)**

This course is a study of microorganisms in the environment. It will focus on the physiology and metabolism, ecology, and functional diversity of some of the more common microorganisms. Students will be introduced to the domains of Archaea, Bacteria, Eukarya, and viruses, compare and contrast their morphological and physiological characteristics, and their role in ecology, along with the biogeochemical cycles.

**Course Rotation:** NYC: Fall, even years.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 308 Reproductive Biology (3 credits)**

This lecture will introduce students to the biological aspects of a wide variety of issues related to reproduction and reproductive health and medicine. Students will be asked to analyze related literature, to develop hypotheses, and analyze data related to reproduction.

**Course Rotation:** NYC: Spring, Odd Years

**BIO 321 Developmental Biology (3 credits)**

The goal of this course is to introduce students to the broad field of developmental biology. A particular emphasis is the intimate connection between developmental biology and evolution, which will be a theme throughout the course. Additional emphasis is on the connection between mechanisms of normal development and disease etiology. The course will cover general principles of development and current important issues. Relevant ethical issues will be discussed. Both invertebrate and vertebrate model systems will be covered, including *Drosophila*, *C. elegans*, chick, frog, zebrafish, mice and human. Another emphasis of the course is to teach you how to experimentally approaching the topic of development. We will therefore emphasize how to formulate and test hypotheses. Students will become familiar with cutting edge molecular, genetic and imaging techniques that are applicable to analysis of many aspects of development.

**Course Rotation:** PLV; Fall.

**Prerequisites:** BIO 101 and BIO 102 and BIO 231 with minimum grade of C- and either (BIO 225 or BIO 335 with minimum grade of C-).

**BIO 322 Animal Behavior (0-4 credits)**

An introduction to the mechanisms and adaptive significance of animal behavior. Fundamental principles derived from evolution, ecology, neurobiology, and development will be examined. Activities such as navigation and orientation, migration, feeding, echolocation, communication, predator-prey interactions, mating systems and parental care will be discussed using examples throughout the animal kingdom.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C.

**BIO 325 Neurobiology (3 credits)**

A comprehensive study of how the nervous system functions. The course will first provide as in depth foundation on the function of neurons including the cell biology of neurons, nerve cell communication and the action potential, synapse structure and function, nerve cell specializations including axons and dendrites, how small circuits of neurons are formed and how they function. Having established this basic understanding of nervous system function we will then study a selection of other topics in detail, focusing on how our knowledge is being built through experimental neuroscience.

These topics will include synaptic plasticity, learning and memory, the function of larger scale neuronal systems (in particular, the visual system), and the molecular mechanisms of neurodegenerative diseases such as Alzheimer's and Parkinson's.

**Course Rotation:** NY: Fall, PLV: Spring.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-, or BIO 124 with minimum grade of B.

**BIO 327 Cellular Biochemistry (4 credits)**

This course expands the basic knowledge base obtained in BIO 335. Topics include protein structure and function, enzyme kinetics, signal transduction, metabolism and gene expression. The concepts discussed will be applied to pathological situations using medical case studies and the scientific literature related to relevant disease states so as to obtain an understanding of the contribution of biochemical processes to both health and disease. 4 Lecture hours.

**Course Rotation:** Fall.

**Prerequisites:** BIO 101, BIO 102, BIO 231, BIO 335 with minimum grades of C-, and CHE 111, CHE 112, CHE 224 with minimum grades of D.

**BIO 328 Advanced Biochemistry (3 credits)**

**Course Rotation:** TBA.

**Prerequisites:** BIO 101, BIO 102, BIO 327, BIO 231, BIO 335 with minimum grades of C-, and CHE 111, CHE 112, CHE 223, and CHE 224 with minimum grades of D.

**BIO 334 General Physiology (0-4 credits)**

An examination of the fundamental phenomena underlying the function and regulation of organ systems in animals, such as contraction, excitation, conduction, secretion, and membrane function. Laboratory exercises illustrate these processes. 3 Lecture hours and 3 Laboratory hours.

**Course Rotation:** Spring

**Prerequisites:** BIO 101, BIO 102, and (BIO 236 or BIO 251) with minimum grades of C-.

**BIO 335 Molecular and Cellular Biology (0-4 credits)**

This course provides an in-depth investigation of molecular mechanisms within the cell, including transcription, translation, energy conversion, cell signaling, molecular transport, cytoskeletal and extracellular structure, cell division, and cancer development. Laboratory exercises will involve techniques widely used in cell and molecular biology. 3 Lecture hours and 3 Laboratory hours. Additional flexible hours required on the NYC campus.

**Course Rotation:** Spring.

**Prerequisites:** BIO 101 and BIO 102 and BIO 231 with minimum grade of C-.

**BIO 335A Molecular and Cellular Biology (1 credits)**

This practicum will provide students with additional time in the inquiry-based BIO 335 laboratory to design and implement their own experiments.

**Prerequisites:** This course does not have a prerequisite.

**BIO 336 Genomics (0-4 credits)**

This course will explore contemporary and emerging topics in genome research. Emphasis will be on how new technologies are revolutionizing the way we think about genetics. Topics will include genomic organization, next-generation sequencing technology, bioinformatics for sequence data, comparative genomics and genome-wide association studies, whole-genome transcriptional analysis and new advances in epigenetic research. Credit Badge: Data Science.

**Course Rotation:** Fall, Spring, and Summer

**Prerequisites:** BIO 101, BIO 102, BIO 231, BIO 335 with minimum grades of C-.

**BIO 343 General Endocrinology (3 credits)**

A study of endocrine hormones, including both classical hormones and recently discovered hormones and growth factors. The origin of these regulatory substances and their regulation of processes such as growth, regeneration, reproduction, blood chemistry, and metabolic rate will be discussed at the whole organism, cellular, and molecular levels.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 345 Introduction to Toxicology (3 credits)**

An introduction to the study of the injurious effects of substances on living organisms. Consideration is given to mechanisms of entry to the body, the biochemistry of toxic substances within the body, including acute and chronic effects and long-term mutagenic and carcinogenic effects. The hazards and methods of handling toxic substances, and treatment for their effects are also considered.

**Course Rotation:** NYC: Spring, odd years; Summer.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-, and CHE 223 with minimum grade of D.

**BIO 346 Introduction to Basic Pharmacology (3 credits)**

An introduction to the basic principles of pharmacology. This course provides a basic foundation in pharmacology as it relates to both health and illness. Mechanisms of drug-receptor chemical interaction and dose-response curves are examined.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 347 Pharmacology I (3 credits)**

In this two-semester course, the student will be introduced to the basic principles of pharmacology. Concepts covered include mechanism of action, absorption, distribution, metabolism, excretion, drug interactions, and problems with special populations, dosage, and toxicology. The first semester will emphasize basic concepts; the second semester will examine applications in the treatment of specific diseases.

**Course Rotation:** NYC: Fall.

**Prerequisites:** BIO 101 and BIO 102 with minimum grade of C-.

**BIO 348 Pharmacology II (Clinical) (3 credits)**

A continuation of BIO 347 that stressed the application of pharmacological agents in the treatment of specific diseases.

**Course Rotation:** NYC: Spring.

**Prerequisites:** BIO 101, BIO 102, and BIO 347 with minimum grades of C-.

**BIO 357 Parasitology (3 credits)**

An examination of the biology of important protozoan and helminth parasites of vertebrates. Emphasis is placed on morphological, biochemical, and physiological aspects of parasitism. Mechanisms of action are clinically active antiparasitic agents are discussed.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-, and CHE 111, CHE 112, CHE 223, CHE 224 with minimum grades of D.

**BIO 358 Introduction to Virology (3 credits)**

This course will present the basic cell and molecular biology of DNA and RNA viruses focusing specifically on mammalian viruses. Topics covered include: structure, classification, life cycle, and pathogenesis of viruses. The role of the host cell response and immune system as well as treatment options including anti-viral medication and vaccines will also be introduced. Emerging virus, virus evolution, and virus escape mechanism will also be discussed.

**Prerequisites:** BIO 101, BIO 102, BIO 231, BIO 335 with minimum grades of C-.

**BIO 359 Immunology (0-4 credits)**

A study of the immune response, both humoral and cell mediated, including antigen-antibody structure and reactions, immunoglobulins and host-parasite interactions. Laboratory techniques will include current methods of immunology.

**Course Rotation:** Spring.

**Prerequisites:** BIO 101, BIO 102, BIO 231, CHE 111, CHE 112, and (BIO 325 or BIO 335) with minimum grades of C-.

**BIO 372 Introduction to Molecular Biotechnology (0-4 credits)**

This course provides a background in the basic theory and methods underlying molecular biotechnology. Students will also become familiar with biotechnological enterprises, the modern molecular technologies used in these enterprises and their role in research and development. Discussions and laboratories will focus on theory and examples of actual practice using both virtual and real laboratory exercises. Restrictions/Requirements: 2 lecture hours, 4 laboratory hours per week.

**Course Rotation:** TBA.

**Prerequisites:** BIO 101, BIO 102, BIO 231, BIO 335 with minimum grades of C-. BIO 335 can be taken concurrently.

**BIO 375 Advanced Cell Biology (3 credits)**

An in-depth investigation of advanced cellular and molecular biology concepts, including receptor ligand interactions, cell division, senescence, apoptosis, angiogenesis, metastatic and signal transduction. Current biomedical literature will be used in class discussions.

**Course Rotation:** Spring.

**Prerequisites:** BIO 101, BIO 102, BIO 231, BIO 335 with minimum grades of C-.

**BIO 395 Independent Study in Biology (1-4 credits)**

Students may select a topic for guided research that is not included in the regular course offerings. The student meets regularly with the faculty member to review progress. A paper must be submitted. Restrictions/Requirements: Junior standing and permission of Department Chair. 8-10 hours of independent research per week and 1 conference hour.

**Course Rotation:** Fall, Spring, Summer

**Prerequisites:** This course does not have a prerequisite.

**BIO 398A Topics: Vertebrate Paleontology (0-4 credits)**

This course focuses on understanding the evolution, biogeography, systematics, form, and function in fossil vertebrate groups.

**Course Rotation:** NYC: Fall, Odd Years

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.



**BIO 399 Topics in Biology (3-4 credits)**

This course provides an in-depth discussion of specific areas that are not part of the regular course offerings of the Department. It may be taken more than once for credit. Specific topics vary each semester. Recent offerings are as follows: Vertebrate Nervous System; Bioinformatics; Advanced Immunology; Ecotourism and Sustainable Development; Wildlife Ecology, Urban Green Roof; Genetically Modified Organisms. Course rotation: Specific topics are generally offered in Fall and Spring. Restrictions/Requirements: 3 lecture hours per week.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 399C Topic: Cancer Cell Biology (3-4 credits)**

**Course Rotation:** TBA.

**Prerequisites:** BIO 101, BIO 102, BIO 231, and BIO 335 with minimum grades of C-.

**BIO 399D Topics in Biology: Ecosystems (3-4 credits)**

**Course Rotation:** TBA.

**Prerequisites:** BIO 101, BIO 102, and BIO 210 with minimum grades of C-.

**BIO 399E Topic: The Vertebrate Nervous System (3-4 credits)**

**Course Rotation:** TBA.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 399F Topics in Biology: Bioinformatics (3 credits)**

**Course Rotation:** TBA. Credit Badge: Data Science.

**Prerequisites:** BIO 101, BIO 102, BIO 231, and BIO 335 with minimum grades of C-.

**BIO 399G Topics in Biology: Marine Pollution (3 credits)**

**Course Rotation:** TBA.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 399J Topics in Biology: Wildlife Ecology and Conservation (3-4 credits)**

This course provides a review of the ecology of mammals. Topics will include ecosystems and natural communities, food and cover, predators and predation, competitors and competition, wildlife diseases, animal behavior, urban wildlife, exotic wildlife, nongame and endangered wildlife, economics of wildlife, conserving wildlife, hunting and trapping, wildlife as a public trust and other important topics that evolve. The course will review both theoretical and methodological approaches associated with obtaining data from animals.

**Course Rotation:** TBA.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 399K Topics in Biology: Ecotourism and Sustainability in Tuscany (3 credits)**

This course provides an opportunity to have an interdisciplinary experience in the study of ecotourism, sustainability and business/hospitality issues in Italy. Students will visit various venues that demonstrate sustainable business and environmental practices. Students will also participate in a community green mapping project in the Mugello Territories in Tuscany. Restrictions/Requirements: permission of department chairperson required.

**Course Rotation:** TBA.

**Prerequisites:** (BIO 101 and BIO 102) or (ENV 221 and ENV 222) with minimum grades of C-.

**BIO 399L Topics in Biology: The Urban Green Roof (3 credits)**

This field type course will provide students with experience in developing plans and plantings for the urban green roof to be built on the Pace NYC campus. Students will learn the history of urban green roofs and the environmental advantages. Restrictions/Requirements: Permission of Department Chairperson required.

**Prerequisites:** (BIO 101 and BIO 102) or (ENV 221 and ENV 222) with minimum grades of C-.

**BIO 399M Topic in Biology: Biological and Chemical Warfare (3 credits)**

An overview of chemical and biological weaponry from a historical and modern perspective. Restrictions/Requirements: permission of Department Chair.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 399N Topic: Advanced Immunology (3 credits)**

This course provides an in-depth discussion of various topics in modern immunology.

**Prerequisites:** BIO 101, BIO 102, BIO 231, BIO 359, and (BIO 325 or BIO 335) with minimum grades of C-.

**BIO 399Q Special Topics in Biology: Mammalogy-Adaptation, Diversity and Ecology of Mammals (3 credits)**

This course will cover the major aspects of mammalian biology emphasizing evolution, structure, function, behavior, ecology and biogeography.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 399R Topic: Field Course in Biological Oceanography and Marine Mammals (3 credits)**

This is a field study course that will be held at the Woods Hole Oceanographic Institute in Woods Hole, MA. The discussions will include aspects of marine mammal ecology and ecosystem productivity. The human influence on marine mammal species will also be addressed. Restrictions/Requirements: permission of department chairperson.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 399S Topics in Biology: Urban Field Ecology (3 credits)**

This course studies the flora of the metropolitan habitat. Discussions will include desirable and undesirable species. Course involves lectures, field trips and student projects growing plants in an urban horticultural setting using various growth media and under various conditions.

**Prerequisites:** (BIO 101 and BIO 102) or (ENV 221 and ENV 222) with minimum grades of C-.

**BIO 399T Topics in Biology: Research Methods For Ecological Field Studies (3 credits)**

This course will review the ways in which biological data are collected, analyzed, and reported, so that informed decisions about ecosystem management and conservation can be made. The course will have both classroom and field components and will explore the many techniques employed by biologists to study important phenomena in ecology, such as territory and home range estimates, habitat evaluation, food habits, population viability analysis, population dynamics, GIS mapping, and genetic analyses. We will review both theoretical and methodological controversies associated with obtaining data from organisms.

**Prerequisites:** BIO 101 and BIO 102 and BIO 210 with minimum grades of C-.

**BIO 399Y Topic: Marine Biology (3 credits)**

This course presents basic concepts of marine biology and discusses the effects of human activity on animals and plants.

**Prerequisites:** BIO 101 and BIO 102 with minimum grades of C-.

**BIO 480 Research in Biology (3 credits)**

Under faculty supervision students conduct research and submit a report at the close of the semester. A maximum of 2 semesters for credit may be elected. Contact department for more information concerning requirements. Students must contact the Department Chairperson prior to registration for this course. Restrictions/Requirements: Junior and senior standing and permission of Department Chairperson. 8-10 hours of independent research per week and 1 conference hour.

**Course Rotation:** Fall, Spring, Summer

**Prerequisites:** This course does not have a prerequisite.

**BIO 481 Research in Biology II (3 credits)**

This course involves laboratory based research under the direction of a faculty member and will involve 60-75 hours of research during the semester. The topic of research depends upon the faculty member. Students must contact the Department Chairperson prior to registration for this course.

Restrictions/Requirements: permission of Instructor and Chair. 8-10 hours or independent research each week.

**Course Rotation:** Fall, Spring, Summer.

**Prerequisites:** BIO 480 with minimum grade of C-.

**BIO 490 Introduction to Research in the Biological Sciences (0-3 credits)**

An introduction to the basic research and data analysis techniques used in the modern biological sciences. Discussion topics include hypothesis generation, methods of data presentation and utilization of proper statistical techniques based upon experimental design. Students will make presentations for group discussion on current advances and research in biology. Restrictions/Requirements: Biology majors: C- or better in BIO 335.

Behavioral Neuroscience majors: C- or better in BNS 410.

**Course Rotation:** Fall, Spring.

**Prerequisites:** Biology Majors: BIO 101, BIO 102, BIO 231, and BIO 335 with minimum grades of C-. Behavioral Neuroscience Majors: BIO 101, BIO 102, BIO 231, and BNS 410 with minimum grades of C-.

**BIO 491 Internship in Biology (3 credits)**

A direct experience in the working environment designed to enhance and extend the knowledge gained in the classroom. The student reports to a regular assignment and receives guidance and direction from professionals. The student will work on projects requiring reports and will meet regularly with a department advisor who will provide overall supervision. Contact the department for more information concerning requirements. Restrictions/Requirements: Acceptance in a position, junior standing, and permission of Department Chair.

**Course Rotation:** Fall, Spring, Summer.

**Prerequisites:** This course does not have a prerequisite.

**BIO 492 Internship in Biology II (3 credits)**

A continuation of BIO 491. Restrictions/Requirements: Completion of junior year. Permission of the department chairperson and acceptance in a position.

**Course Rotation:** TBA.

**Prerequisites:** BIO 491 with minimum grade of C-.

**BIO 493 Major Field Test in Biology (0 credits)**

This 0 credit, P/F course involves the administration and reporting of performance on the biology and behavioral neuroscience major comprehensive exam, the Educational Testing Service's Major Field Test (MFT) in Biology. The examination assesses students' basic knowledge base as well as the ability to integrate and synthesize information in biology and related sciences. It will provide excellent experience for taking professional or graduate school entrance examinations, such as the GRE biology subject tests, MCAT or DAT. Awarding of the BS degree in Biology or Behavioral Neuroscience or a BA degree in Biology requires passing this exam. Students are advised to enroll in this course after they complete the Biology or Behavioral Neuroscience major core curricula. Restrictions/Requirements: Senior standing.

**Course Rotation:** NYC & PLV: Fall & Spring

**Prerequisites:** This course does not have a prerequisite.