BIOLOGY (BIOL)

BIOL 114 — Biological Principles Course count: 1
These courses introduce non-science majors to principles and modes of inquiry underlying the study of living things. Each course examines a subset of subject matter, which may range from biological molecules and cells to the structure and function of organisms to interactions of organisms with their environments. All courses in this series share the common goal of providing a rigorous introduction both to the methods of scientific inquiry and to the content of the discipline. Recently taught subjects include evolution, microbiology, cancer, environmental biology, the molecular biology of the HIV pandemic, toxicants and radiation, biology of the brain, biology of aging, human anatomy and physiology, the unseen world, oceans and people, Mesozoic life and conservation biology.

GPA units: 1
Common Area: Natural Science
Typically Offered: Fall, Spring

BIOL 161 — Introduction to Cell & Molecular Biology Course count: 1
Fundamental principles of biology studied at the molecular and cellular levels of organization. Intended for all potential biology majors and pre-health students regardless of major. Includes laboratory.

GPA units: 1.25
Common Area: Natural Science
Typically Offered: Fall, Spring

BIOL 162 — Introduction to Mechanisms of Multicellular Life Course count: 1
Fundamental principles of mechanistic biology at the organ and system levels. Emphasis on vertebrates with some material on higher plants. Intended for all potential biology majors and pre-health students regardless of major. Includes laboratory.

GPA units: 1.25
Common Area: Natural Science
Typically Offered: Fall, Spring

BIOL 163 — Introduction to Biol Diversity and Ecology Course count: 1
An introduction to evolution, ecology and the diversity of life: plants, animals, fungi, protists and prokaryotes. Intended for all biology and environmental studies majors.

GPA units: 1.25
Common Area: Natural Science
Typically Offered: Fall, Spring

BIOL 199-S01 — Change Through Time: Evolutionary Thinking Across Disciplines Course count: 1
This course will cover the theory and practice of systematics and its connections to other disciplines with a focus on data analysis and the importance of (bio)informatics to solve complex problems. Because the relevance of evolutionary history to understanding many biological patterns (e.g., ecology, biogeography, and epidemiology), developing a clear understanding of how to infer, read, and interpret evolutionary trees is of paramount importance for biologists. In addition, seemingly disparate fields of study in the humanities can use the same methodologies to infer genealogies and descent with modification to answer a wide array of questions about language and culture relationships, diversity, and change through time.

GPA units: 1
Common Area: Natural Science

BIOL 201 — Microbiology of a Hurricane Course count: 1
This course will introduce students to scientific thinking and give a brief introduction to the biology of bacteria, viruses and fungi. Emphasis will then shift to examining the role of microbes within hurricanes and environments affected by hurricanes through review of scientific literature. Topics will include, outbreaks of infectious diseases, spread of antibiotic resistance, bioremediation of contaminated sites and bioenergy.

GPA units: 1
Common Area: Natural Science

BIOL 210 — Microbiology for Allied Health Course count: 1
A comprehensive introduction to microbiology. This course provides an overview of microorganisms, including their structure and function, growth, ecology, genetics, taxonomy, and evolution. Emphasis is placed on prokaryotes and viruses of medical significance. The laboratory emphasizes pure culture methods, diagnostic microbiology, and physiology. Includes laboratory.

Prerequisite: BIOL 161 and CHEM 181 and permission of the Health Professions Advisors.
GPA units: 1.25
Typically Offered: Annually

BIOL 211 — Anatomy & Physiology I Course count: 1
This course studies the functional systems of the human body. It focuses heavily on their integrative nature and maintenance of homeostasis. Topics covered include cell and tissue structure, the nervous, skeletomuscular, endocrine systems. Permission for enrollment is controlled by the Health Professions Advisor. This course is reserved for students planning to attend physician's assistant, nursing, physical therapy or other allied health programs after graduation. It may not be used as credit toward the biology major.

Prerequisite: BIOL 161 or BIOL 162 and permission of the Health Professions Advisors.
GPA units: 1.25
Common Area: Natural Science
Typically Offered: Annually

BIOL 212 — Anatomy and Physiology 2 Course count: 1
This course is a continuation of Anatomy and Physiology 1. It may not be used as credit towards the biology major.

Prerequisite: BIOL 211 and permission of the Health Professions Advisors.
GPA units: 1.25
Typically Offered: Annually

BIOL 213 — Comparative Vertebrate Anatomy Course count: 1
The structure, function, development and evolution of the skeletal, muscular, nervous, respiratory, circulatory, digestive and urogenital systems of the chordates, with special emphasis on vertebrates. Includes laboratory. Organismal biology.

Prerequisite: BIOL 162
GPA units: 1.25
Typically Offered: Annually

BIOL 214 — Biomechanics Course count: 1
What happens when the world of organisms bumps up against a non-biological reality? How do organisms overcome the limitations of physics, and adapt to new challenges? In this course we will explore how the form and function of organisms reflect the physical constraints and limitations they must contend with and overcome in their everyday life, with a focus on hands-on experimental investigation. We will use basic principles from physics and engineering to understand the relationship between form and function in organisms. Emphasis will be on structural mechanics, but we will also touch briefly on some simple fluid mechanics. Class will include a final research project.

Prerequisite: Biol 162 or permission of the instructor.
GPA units: 1
Typically Offered: Alternate Years, Fall

BIOL 220 — Entomology Course count: 1
An introduction to insects covering diversity, morphology, physiology, ecology and behavior, as well as considerations of the economic and medical importance of insects. Includes laboratory. Organismal biology.

Prerequisite: BIOL 161 and BIOL 162 and BIOL 163
GPA units: 1.25
Typically Offered: Alternate Years

BIOL 223 — Microbiology Course count: 1
A comprehensive introduction to microbiology. This course provides an overview of microorganisms, including their structure and function, growth, ecology, genetics, taxonomy, and evolution. Emphasis is placed on prokaryotes and viruses. The laboratory emphasizes enrichment and pure culture methods, diagnostic microbiology, and physiology. Includes laboratory. Biological Diversity.

Prerequisite: BIOL 161; Prerequisite or Corequisite CHEM 222
GPA units: 1.25
Typically Offered: Annually

BIOL 230 — Developmental Biology Course count: 1
This course provides a comparative exploration of development from fertilization to adulthood using both organismal and molecular/cellular approaches. We will discuss and compare basic aspects of patterning and morphogenesis using the major model systems of nematodes, fruit flies, frogs, chicks and mice. Throughout the course, we will also examine how developmental processes affect aging, cancer, and regeneration/repair after disease. This course includes a laboratory component, during which we will explore developmental processes using nematodes, fruit flies, chicks and flat worms. Organismal biology.

Prerequisite: BIOL 161 and BIOL 162. Students who have taken BIOL 232 may not enroll in BIOL 230.
GPA units: 1.25
Typically Offered: Annually

BIOL 232 — Developmental Biology Lecture Course count: 1
This course provides a comparative exploration of development from fertilization to adulthood using both organismal and molecular/cellular approaches. We will discuss and compare basic aspects of patterning and morphogenesis using the major model systems of nematodes, fruit flies, frogs, chicks and mice. Throughout the course, we will also examine how developmental processes affect aging, cancer, and regeneration/repair after disease. Organismal biology.

Prerequisite: BIOL 161 and BIOL 162. Students who have taken BIOL 230 may not enroll in BIOL 232.
GPA units: 1
Typically Offered: Annually

BIOL 233 — Freshwater Ecology Course count: 1
An extensive exploration into the hydrology, chemistry, and ecology of freshwater ecosystems. Covering stream ecology and limnology from natural pristine settings to urban environments, we aim to understand the basic functioning as well as the impact of current threats on freshwater systems. Ecological and evolutionary biology.

Prerequisite: BIOL 163
GPA units: 1
Typically Offered: Annually

BIOL 234 — Freshwater Ecology Lab Course count: 0
Field-based study of New England's diverse freshwater habitats, encompassing lakes, streams, reservoirs, rivers, and wetlands. Laboratory work will focus on characterizing the chemistry and biology of these ecosystems. Students will undertake an independent lab project, collecting and analyzing data to produce a comprehensive lab report. Field activities may occur in strenuous conditions at various off-campus locations.

Corequisite: BIOL 233.
GPA units: 0.5
Typically Offered: Annually

BIOL 235 — Marine Biology Course count: 1
This course presents a survey of the organisms that live in the sea and their adaptations to the marine environment. The course covers the major divisions of marine life and their diversity of form, as well as common ecological patterns, physiological processes and evolutionary strategies. The function and role of coastal, open-ocean, and deep sea ecosystems are also considered, as is the relevance of marine biology to current scientific, social, health, and economic affairs. Includes laboratory. Ecological and evolutionary biology.

Prerequisite: BIOL 163
GPA units: 1.25
Common Area: Natural Science
Typically Offered: Annually

BIOL 237 — Plant Ecology Course count: 1
The study of the distribution and abundance of plants and their interactions with the abiotic environment and other organisms. In this course, we will investigate these interactions over a range of scales, from the physiological to the community, landscape, and global. Further, we will examine how plant ecological principles apply to the fields of agriculture, conservation biology, and environmental science. Classes will be a mix of lecture on general principles plus discussion of primary literature and writings by scientists historically underrepresented in the field of ecology. Laboratory exercises will introduce students to standard lab, field, and data analysis techniques used by plant ecologists, as well as provide an opportunity to learn about the natural history of various Massachusetts ecosystems. Students will conduct an independent research project. Ecological and evolutionary biology.

Prerequisite: BIOL 163
GPA units: 1.25
Common Area: Natural Science
Typically Offered: Spring

BIOL 241 — Virology Course count: 1
This course is a general introduction to virology. Its primary focus is on human viruses that contribute to disease. We will explore different strategies viruses have adopted to replicate in the host cell, the battles viruses wage to outmaneuver the host immune system and the disease states that result from a viral infection. Molecular and cellular biology.

Prerequisite: BIOL 161
GPA units: 1
Typically Offered: Annually

BIOL 242 — Virology Lab Course count: 0
This laboratory sequence focuses on exploring the molecular techniques employed to investigate questions in the field of virology. Students will have an opportunity to use the classical plaque assay, produce and isolate virions and examine the interplay between cellular restriction factors and viral proteins.We will also discuss the primary literature as it relates to the projects and explore how the work fits into the broader context of the field. There will also be opportunities for student to actively engage in determining the direction of the work. This laboratory is taken as a fifth course; while figured into the GPA, it does not count as one of the 32 courses required for graduation.

Prerequisite: BIOL 161
GPA units: 0.5

BIOL 261 — Genetics Course count: 1
An introduction to genetics that explores the molecular and cellular basis of heredity and physical traits. Topics include the central dogma, cell division, Mendelian inheritance, genetic analysis, chromosome structure and replication, gene expression, molecular biology techniques, genetic linkage, disease gene identification, and population genetics. Genomic approaches are interwoven throughout. The accompanying lab emphasizes model organism and human genetics and involves both genetic screens and molecular techniques. Molecular and cellular biology.

Prerequisite: BIOL 161 and BIOL 162 or BIOL 161 and permission of the instructor. Students who have taken BIOL 262 may not enroll in BIOL 261.
GPA units: 1.25
Typically Offered: Annually

BIOL 262 — Genetic Analysis Course count: 1
The mechanisms of heredity and genetic analysis. Topics include Mendelian inheritance, chromosome structure and function, genetic mapping, molecular genetics, mutation, genetic regulation, and population genetics. This course is a nonlaboratory equivalent of Biology 261. Molecular and cellular biology.

Prerequisite: BIOL 161 and BIOL 162 or BIOL 161 and permission of the instructor. Students who have taken BIOL 261 may not enroll in BIOL 262.
GPA units: 1
Typically Offered: Alternate Years

BIOL 266 — Cell Biology Course count: 1
The course explores the structure and function of eukaryotic cells and considers how cellular structure allows for biological activity. A range of topics will be discussed including membrane structure and function, homeostasis and metabolism, intracellular compartments and protein trafficking, signal transduction, the cytoskeleton, and the cell cycle. The cell biology of human disease will be considered throughout the course. The laboratory (Biology 268) is optional but recommended. Molecular and cellular biology.

Prerequisite: BIOL 161 and CHEM 181.
GPA units: 1
Typically Offered: Annually

BIOL 268 — Cell Biology Lab Course count: 0
This laboratory accompanies Biology 266. Students will learn the tools for solving problems in cell and molecular biology, as well as the appropriate approaches, controls, and analysis for experiments. The lab uses three model systems (the yeast S. cerevisiae, nematode C. elegans, and mammalian cell culture) to introduce students to a range of techniques including microscopy and staining, gel electrophoresis, genome databases and in silico analysis. Students will also design and carry out independent experiments. This laboratory is taken as a fifth course; while figured into the GPA, it does not count as one of the 32 courses required for graduation.

Prerequisite or Corequisite: BIOL 266 or by permission.
GPA units: 0.5
Typically Offered: Annually

BIOL 269 — Neurobiology Lecture Course count: 1
A study of the nervous system at multiple levels, from molecular to the systems level. Major topics include: structure of the nervous system and neurons, generation of electric signals, function of synapses, structure and function of sensory and motor circuits, and a discussion of higher order processing. Molecular and Cellular biology.

Prerequisite: BIOL 161. Students who have taken BIOL 267 may not enroll in BIOL 269.
GPA units: 1
Typically Offered: Alternate Years

BIOL 270 — Neurobiology Lab Course count: 0
This is an optional laboratory course that accompanies Biology 269. By performing experiments and reading related primary literature, students will be introduced to a wide range of experimental techniques used in neurobiology, including immunohistochemistry, electrophysiology, optogenetics and animal behavior. The course focuses on experimental design, data collection, analysis, interpretation and presentation. This laboratory is taken as a fifth course; while figured into the GPA, it does not count as one of the 32 courses required for graduation.

Prerequisite: BIOL 120 or BIOL 131
GPA units: 0.5
Typically Offered: Annually

BIOL 275 — Biological Statistics Course count: 1
An introduction to the handling, analysis, and interpretation of biological data. Topics include descriptive statistics, probability distributions, goodness of fit tests, hypothesis testing, analysis of variance, regression, and correlation.

Prerequisite: BIOL 161 or BIOL 162 or BIOL 163. Students who have taken ECON 249, MATH 220, PSYC 200 or SOCL 226 may not enroll in the class.
GPA units: 1
Typically Offered: Fall, Spring

BIOL 280 — Ecology Course count: 1
A comprehensive introduction to the study of relationships between organisms and their environments, including individual organisms, populations, communities, and ecosystems, alongside the natural history of New England. Through exploration of classic and contemporary ecological literature, we delve into the evolution of the field and current ideas. This course emphasizes ecological and evolutionary biology.

Prerequisite: BIOL 163.
GPA units: 1
Typically Offered: Annually

BIOL 281 — Conservation Biology Course count: 1
A study of the effects of human activity on biological diversity at the population and system levels. Topics include the underlying philosophical approaches to conservation, techniques for measuring biological diversity, for assessing and predicting changes, the principles of management and restoration and the use of mathematical models in management. Classes will be a mix of lecture on general principles plus student-led discussion of case studies and of the recent conservation literature. Ecological and evolutionary biology.

Prerequisite: BIOL 163.
GPA units: 1
Typically Offered: Alternate Years

BIOL 282 — Ecology Lab Course count: 0
This lab introduces techniques for field and laboratory settings, exploring basic and advanced methods to understand ecological patterns and processes across all levels. Activities will cover terrestrial and aquatic ecosystems, as well as computational methods for analyzing ecological data. Students will conduct an independent lab project, culminating in a comprehensive lab presentation. Fieldwork may involve strenuous conditions and visits to off-campus locations.

Corequisite: BIOL 280.
GPA units: 0.5
Typically Offered: Annually

BIOL 283 — Evolution Course count: 1
An inquiry-based approach to the study of evolutionary processes, including those that are adaptive and neutral with respect to natural selection. Evolution will be examined at a variety of scales, from molecular to ecological, and from changes in populations over a few generations to patterns over millennia. Most attention will be devoted to empirical work that addresses conceptual issues in evolutionary biology, including natural selection and fitness, speciation, population genetics, phylogenetics, and molecular evolution. Ecological and evolutionary biology.

Prerequisite: BIOL 161, BIOL 162, and BIOL 163. BIOL 261 or BIOL 262 is recommended.
GPA units: 1
Typically Offered: Annually

BIOL 285 — Invertebrate Biology Course count: 1
Invertebrate Biology presents a survey of the diversity in animal body designs. The course emphasizes the form, function, behavior, ecology, and evolutionary relationships of major invertebrate taxa. The course will also cover historical and modern interactions between invertebrates and humans, e.g. as food, parasites, model systems for biological and medical research, as well as being general sources of fascination.

Prerequisite: BIOL 163.
GPA units: 1.25
Typically Offered: Alternate Years

BIOL 287 — Ethology & Behavioral Ecology Course count: 1
A comparative look at animal behavior and the evolutionary forces that shape it. Topics include the history and approaches to studying animal behavior, behavioral genetics and heritability, development of behavior, communication, foraging, competition and cooperation, mating and parenting systems, and social behavior. The importance of good experimental design and the proper role of modeling in behavioral studies are emphasized. Field projects are included. Ecological and evolutionary biology.

Prerequisite: BIOL 163 or permission of instructor.
GPA units: 1
Typically Offered: Alternate Years

BIOL 299-99 — Biology of Urban Ecosystems Course count: 1
As humans living in a time of rapid urbanization, where the vast majority of human population expansion is predicted to occur within cities, it is important to assess and understand the interface of human expansion and transforming natural landscapes. The Urban Ecology course will explore the interactions of the human species with our increasingly urbanized landscapes. Through a series of lectures, discussions, and independent projects, students in this course will examine the ecology within and around cities. In particular, this course will focus on the role of humans and human societies with nature in urbanized environments, the impact of urbanized spaces on organisms and their interactions, and the importance of urban planning for the health of humans and nature alike.

Prerequisite: BIOL 163.
GPA units: 1
Common Area: Natural Science

BIOL 299-S02 — Diversity of the Immune System Course count: 1
This primary-literature based course will allow students to explore the powerful mechanisms used by organisms to defend themselves from devastating foreign invasion. (We may even extend beyond the realm of the living organism and examine the defense of viruses against invaders!) Specifically, students will examine the different immune strategies that are utilized. They will characterize common strategies adopted by distinct organisms and also identify unique strategies that have evolved in particular organisms. We will place an emphasis on looking at model organisms (e.g. Escherichia coli, Drosophila melanogaster, Caenorhabditis elegans, mice) and humans.

Prerequisite: BIOL 161
GPA units: 1

BIOL 301 — Biochemistry 1 Course count: 1
A detailed study of the chemistry of biological molecules. Topics include the structural chemistry of the major classes of biological compounds, enzyme catalysis, bioenergetics, metabolic regulation, glycolysis, gluconeogenesis, beta-oxidation of fatty acids, tricarboxylic acid cycle, electron transport chain and oxidative phosphorylation. Molecular and cellular biology. Equivalent to CHEM 301.

Prerequisite: CHEM 222
GPA units: 1
Typically Offered: Annually

BIOL 302 — Biochemistry 2 Course count: 1
A continuation of Biology 301. Topics include the chemistry, enzymology and regulation of lipid, protein and carbohydrate metabolism, photosynthesis, DNA replication, transcription, and translation. Molecular and cellular biology.

Prerequisite: BIOL 301 or CHEM 301
GPA units: 1
Typically Offered: Annually

BIOL 303 — Biochemistry 1 Lab Course count: 0
This optional laboratory course accompanies Biology 301 and introduces students to experimental methods used for the purification and characterization of biological molecules through a multi-week, full-semester procedure. While conducting the steps of this overall procedure, students gain experience with a wide range of biochemistry lab techniques including column chromatography, gel electrophoresis, Western blotting, and enzyme activity assays. This laboratory is taken as a fifth course; while figured into the GPA, it does not count as one of the 32 courses required for graduation. .

Prerequisite or Corequisite: BIOL 301 or CHEM 301
GPA units: 0.5
Typically Offered: Annually

BIOL 304 — Biochemistry 2 Lab Course count: 0
This optional laboratory course accompanies Biology 302 and introduces students to the principles and methods of molecular biology as they relate to the modern practice of laboratory biochemistry. Through a multi-week, full- semester procedure, students are exposed to a wide-range of techniques including genomic DNA isolation, PCR, plasmid DNA construction, sequence analysis and recombinant protein expression. This laboratory is taken as a fifth course; while figured into the GPA, it does not count as one of the 32 courses required for graduation.

Prerequisite or Corequisite: BIOL 302
GPA units: 0.5
Typically Offered: Annually

BIOL 310 — Molecular Biology of Cancer Course count: 1
Explores the cellular and molecular mechanisms through which normal cells transform into cancer cells. Topics include gene regulation, signal transduction, mutation and DNA repair, chromosome instability, cell division and death, metastasis, angiogenesis, cancer immunology, and the development of targeted cancer therapies. The multi-faceted nature of cancer provides a framework to integrate multiple areas of biology. Emphasizes presentation, discussion, and analysis of data from current research papers, allowing students to gain skills in critically evaluating and communicating scientific data. Molecular and cellular biology.

Prerequisite: BIOL 161 and BIOL 230 or BIOL 232 or BIOL 241 or BIOL 261 or BIOL 262 or BIOL 266 or BIOL 267 or BIOL 269 or BIOL 361 or permission of instructor.
GPA units: 1
Common Area: Natural Science
Typically Offered: Every Third Year

BIOL 331 — Ecosystem Ecology Course count: 1
The course covers the history of ecosystem ecology, biogeochemical cycles and budgets, ecosystem energetics and trophic structure, and the response of ecosystems to disturbance and human-accelerated environmental change. The latter part of the course emphasizes discussion of recent primary literature that contributes to the conceptual framework underlying the management and conservation of diverse ecosystems. Ecological and evolutionary biology.

Prerequisite: BIOL 163
GPA units: 1
Typically Offered: Alternate Years

BIOL 332 — The Diverse Biology of Stem Cells Course count: 1
Stem cells are the building blocks of our bodies. They can build embryos, renew damaged tissues, and regenerate lost body parts. But stem cells can also become dysregulated to form tumors and in some organisms, they lose function with age. In this course, we will develop a rich understanding of the evolution and biology of diverse stem cell populations examined across many different species of animals and plants. Each example we study will add context to our knowledge of how stem cells work. Not only is this critical for biologists interested in stem cells across the phylogenetic tree, but also for health care professionals interested in using stem cells more effectively in human disease therapies. Creating this broad knowledge base will require us to weave together important themes from evolutionary biology, developmental biology, genomics, genetics, molecular biology, and human health to provide a clear comprehensive toolkit that will guide us through this inquiry-based approach to stem cell biology.

Prerequisite: One 200 level Biology course.
GPA units: 1
Common Area: Natural Science
Typically Offered: Alternate Years, Fall

BIOL 362 — Topics in Genomics Course count: 1
This seminar begins with an introduction to methods commonly used for genome sequencing and annotation. It then proceeds to consider selected topics in depth by using current primary literature. Examples of these topics include: the genomics of health and disease, the genomics of gene expression, genome evolution, and genomic conflict. Students also gain experience with various forms of scientific communication, including oral presentations, research proposal preparation, and peer review. Molecular and cellular biology.

Prerequisite: Biol 261 or Biol 262
GPA units: 1
Typically Offered: Alternate Years

BIOL 369 — Experimental Approaches in Neurobiology Course count: 1
In this seminar, primary literature will be used to learn how researchers study the impacts of genetic and environmental factors on neural activity, circuits and behavior. We will look at a range of traditional and non-traditional model organisms, including invertebrates and mammals. We will discuss ways in which these studies inform our understanding of how these animals function, as well as insights we can relate to human neural processes. Organismal biology.

Prerequisite: BIOL 269 or NEUR 210 or PSYC 221 or BIOL 161 and NEUR 220 or instructor permission.
GPA units: 1
Common Area: Natural Science
Typically Offered: Every Third Year

BIOL 383 — Applied Evolution Course count: 1
This seminar will explore in depth some examples of socially relevant evolutionary biology. Through text and primary literature readings we will examine how a strong understanding of evolutionary biology impacts medicine, human health and disease, conservation of biodiversity, agriculture, and biotechnology. Students will be able to describe and explain basic evolutionary principles and apply those principles to problems in our society. Students will interpret real-world data and results, construct experiments to test evolutionary hypotheses, and evaluate primary literature. Ecological and evolutionary biology.

Prerequisite: BIOL 261 or BIOL 262 or BIOL 283
GPA units: 1
Typically Offered: Alternate Years

BIOL 390 — Physiology Course count: 1
The functioning of cells, organs, and organisms with emphasis on mammals. Major themes are homeostasis, control mechanisms, and system integration. Topics include: excitable and contractile cell physiology, energy metabolism and temperature regulation, respiration and circulation, digestion, water balance, and coordination and control of these systems by neuroendocrine mechanisms. Includes laboratory. Organismal biology.

Prerequisite: BIOL 162. PHYS115 suggested.
GPA units: 1.25
Typically Offered: Annually

BIOL 391 — Physiology Lecture Course count: 1
The functioning of cells, organs, and organisms with emphasis on mammals. Major themes are homeostasis, control mechanisms, and system integration. Topics include: excitable and contractile cell physiology, energy metabolism and temperature regulation, respiration and circulation, digestion, water balance, and coordination and control of these systems by neuroendocrine mechanisms. Organismal biology.

Prerequisite: BIOL 162. PHYS115 suggested.
GPA units: 1
Typically Offered: Alternate Years

BIOL 392 — Molecular Immunology Course count: 1
The course emphasizes the molecular aspects of the human immune system. It spans the incredible breadth of the immune defenses ranging from the power of innate immunity, to the sophistication of the development and function of adaptive immunity. Integrative topics such as autoimmunity, immunodeficiency and transplantation are also covered. Molecular and cellular biology.

Prerequisite: BIOL 223 or BIOL 230 or BIOL 241 or BIOL 261 or BIOL 262 or BIOL 266 or BIOL 267 or BIOL 269 or permission of the Instructor.
GPA units: 1
Typically Offered: Alternate Years

BIOL 393 — Molecular Immunology Lab Course count: 0
This laboratory sequence focuses on exploring the molecular techniques employed to investigate an immunological question. The semester-long project is designed as two mini projects that explores a well characterized antiviral human protein. Students construct expression plasmids, ectopically express proteins in both bacteria and tissue culture cells and perform functional assays. We will also discuss the primary literature as it relates to the project and explore how the work fits into the broader context of the field. These projects are built as discovery projects where students may actively participate in the direction of the work. This laboratory is taken as a fifth course; while figured into the GPA, it does not count as one of the 32 courses required for graduation.

Prerequisite: BIOL 241 or BIOL 261 or BIOL 262 or BIOL 266 or Corequisite BIOL 392.
GPA units: 0.5
Typically Offered: Alternate Years

BIOL 399-F02 — Cell Biology of Disease Course count: 1
How do the basic functions of cells translate to human health? And how do changes in cell biology lead to human disease? In this course, we will explore the cellular, molecular, and genetic underpinnings of a human disease in order to understand the function of key cell biological pathways. The course will take a data-driven approach, and students will analyze the primary literature to build our understanding of how cells function--and what happens when function is disrupted. Students will take an active role in discerning which topics to study during the semester in order to best understand the disease and potential interventions and treatments. Students will also serve as discussion leaders, write about cell biology for different audiences, and propose potential experiments to advance the field. This course can serve as a pre- or co-requisite for BIOL 268: Cell Biology laboratory.

Prerequisite: BIOL 266 or one of the following: BIOL 223, 230, 232, 241, 261, 262, 267 or 269 or permission of the instructor.
GPA units: 1

BIOL 399-S01 — Topics in Genomics Lab Course count: 0
This project-based laboratory course will introduce students to concepts in genomics and bioinformatics through hands-on explorations of large data sets, commonly used bioinformatic algorithms, and genome browsers. Students will conduct original research as part of a nation-wide project on genome evolution, explore genomics primary literature, and interact with genomics researchers. This lab is designed to complement topics from the concurrently offered BIOL 362 seminar, but can also be taken as a standalone lab.

Prerequisite: BIOL 261 or 262 or instructor permission
GPA units: 0.5

BIOL 399-S02 — Genome Evolution Course count: 1
This course will compare the content and functions of genomes across organisms and examine the evolutionary processes that affect genomes. Topics may include chromosome structure, new gene evolution, repetitive DNA, genomic conflict, and how evolutionary pressures of the past shape present-day traits. The course will be run as a lecture-lab hybrid. In the lecture portion, students will engage with primary literature and methods of scientific communication. The lab portion will focus on methods for detecting genomic features in related species and incorporate an original research project that may lead to publication.

At least one of the following Biology courses, or instructor permission. Courses include: BIOL 230, 232, 241, 261, 262, 266, 269, 283, 299-S02 (Diversity of the Immune System), 301, 302, 383, 392.
GPA units: 1

BIOL 401 — Undergraduate Research Course count: 1
Individual experimental investigation and associated study of the scientific literature under the direct supervision of a member of the faculty. The number of positions is limited; students contemplating research should make inquiries early in the year preceding the term in which research is to be initiated.

GPA units: 1.25
Typically Offered: Fall, Spring

BIOL 405 — Directed Readings Course count: 1
An in-depth literature study of a topic of interest to the student under the tutorial supervision of a member of the faculty.

GPA units: 1
Typically Offered: Fall, Spring

BIOL 407 — Honors Research Course count: 1
Open only to students in the College Honors Program. Individual experimental investigation and associated study of the scientific literature under the direct supervision of a faculty member. Students contemplating research should make inquiries early in the year preceding the term in which research is to be initiated. One semester may be counted towards the biology major; additional semesters may be taken for college credit.

GPA units: 0
Typically Offered: Fall, Spring

BIOL 408 — Honors Research Course count: 1
Open only to students in the College Honors Program. Individual experimental investigation and associated study of the scientific literature under the direct super-vision of a faculty member. Students contemplating research should make inquiries early in the year preceding the term in which research is to be initiated. One semester may be counted towards the biology major; additional semesters may be taken for college credit.

GPA units: 2.5
Typically Offered: Fall, Spring