

BIOLOGY (BIO)

BIO 100 PRINCIPLES OF BIOLOGY

3, 3/0; NS23

Non-majors only. The unifying principles of modern biology with special emphasis on cell biology, metabolism, and genetics. Offered every semester.

BIO 101 HUMAN BIOLOGY

3, 3/0; NS23

Non-majors only. Biological principles of the human condition with particular emphasis on physiology of normal body function with regard to nutrition, disease, psychoactive agents, reproduction and contraception, and aging. Contemporary health-related issues. Offered every semester.

BIO 104 ENVIRONMENTAL BIOLOGY

3, 3/0; NS23

Non-majors only. Biological aspects of global environmental problems. Principles of ecology. Offered every semester.

BIO 111 FOUNDATIONS OF BIOLOGY

3, 3/0

A molecular and cellular approach to understanding human biology. Emphasis on biomolecules, cell structure and function, cell division, genetics, gene expression, and biotechnology as they pertain to understanding human biology and human health. Offered every semester.

BIO 189 TOPIC COURSE

1, 0/3

Current topics in Biology. Offered occasionally.

BIO 211 INTRODUCTION TO CELL BIOLOGY AND GENETICS

4, 3/3

Prerequisite: BIO 111 with a grade of C or better or CHE 112. The chemicals of life and their hierarchical organization in cells. Cell organelles. Metabolism and energy transformations. Cell division, gene expression, Mendelian and population genetics. Biotechnology in human health, nutrition and society. Offered every semester.

BIO 213 INTRODUCTION TO ECOLOGY, EVOLUTION, AND BEHAVIOR

4, 3/3

Prerequisite: BIO 111, C or better. Population, community and ecosystem ecology; human impact on the environment. The Darwinian revolution, evolution of populations and the formation of new species. Principles of animal behavior. Offered every semester.

BIO 295 RESEARCH EXPERIENCE IN BIOLOGY

1-3, 0/0

Prerequisite: Instructor Permission. Scholarship or creative work conducted under the supervision of a faculty member. Offered occasionally.

BIO 300 BIOSTATISTICS

4, 3/3

Prerequisites: Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213; Upper-division status. Statistical inference as a guide to decision making during biological investigations. Elements of experimental design. Exploratory data analysis. Tabular, graphical, and written interpretation of results. Application of inferential techniques including confidence intervals, t-tests, analysis of variance, chi-square analysis of contingency tables, and linear regression and correlation. Offered spring only.

BIO 301 CELL PHYSIOLOGY

4, 3/3

Prerequisites: BIO 111 (with a grade of C or better), BIO 211, BIO 213, CHE 111/113 and CHE 112/114. Basic concepts in cell physiology with an emphasis on transport across cell membranes, cell communication, and excitability of nerve and muscle cells. Labs introduce students to a variety of techniques employed to study cell physiology including biochemistry, cellular electrophysiology, and fluorescence microscopy. Offered alternate years.

BIO 303 GENETICS

4, 3/3

Prerequisites: BIO 111 (with a grade of C or better), BIO 211, BIO 213, CHE 111/113 and CHE 112/114. Principles of Mendelian, molecular and population genetics. Classic and molecular experimental methods for studying of gene structure, transmission, expression. Offered every fall semester.

BIO 305 MOLECULAR BIOLOGY

4, 3/1

Prerequisites: BIO 111 (grade of C or better), BIO 211, BIO 213, CHE 111/113, CHE112/114 and CHE 201. An in-depth study of the structure and function of eukaryotic genes at the molecular level. Topics include the cellular machinery of gene expression, processes that regulate gene expression, the structure and evolution of the genome, and genes that regulate development. Offered occasionally.

BIO 308 SURVEY OF HUMAN ANATOMY AND PHYSIOLOGY

3, 3/0

Prerequisites: BIO 100 or BIO 101 or BIO 111. Physiology and pertinent anatomy of the major organ systems of the human body including consideration of clinical health and disease. Does not serve as a prerequisite for most postgraduate medical or health programs. Offered each fall semester.

BIO 309 LABORATORY SURVEY OF HUMAN ANATOMY AND PHYSIOLOGY

1, 0/3

Prerequisites: BIO 100 or BIO 101 or BIO 111. Human anatomy and functions of the major anatomical systems using the techniques of rigorous animal dissection (e.g., cats and sheep organs) and physiological experiments. Not applicable as a biology elective for students pursuing a B.A. in biology. Does not serve as a prerequisite for most postgraduate medical or health programs. Offered occasionally.

BIO 311 HUMAN ANATOMY AND PHYSIOLOGY I

4, 3/3

Prerequisites: BIO 100 or BIO 101 or BIO 111 with a grade of C or higher. Advanced study of human anatomy and physiology. Topics include basic biochemistry, function of cells, tissues, integument, skeletal system and joints, muscular system, and nervous system. Offered fall semester.

BIO 312 HUMAN ANATOMY AND PHYSIOLOGY II

4, 3/3

Prerequisite: BIO 311. A continuation of BIO 311. Advanced study of the endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems. Offered spring semester only.

BIO 314 ADVANCED CELL BIOLOGY

4, 3/3

Prerequisites: BIO 111 (grade of C or better), BIO 211, BIO 213, CHE 111/113, CHE 112/114 and CHE 201. Current models of eukaryotic cell structure and function. Topics include: membrane transport, electrical properties of membranes, protein targeting, membrane trafficking, cytoskeleton, cell signaling, control of the cell cycle and cancer. Offered every spring semester.

BIO 315 ECOLOGY

4, 3/3; IN23, RE23

Prerequisites: Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213. Ecosystems, biotic communities, interspecific and intraspecific relationships, biogeochemical cycles, energy flow, population ecology, introduction to analysis of community composition, effects of humanity in modifying natural environments. Several half-day or all-day field trips may be required. Offered fall only.

BIO 316 GENERAL MICROBIOLOGY

4, 3/3

Prerequisites: BIO 211, BIO 213 and CHE 111/113. Microorganisms and techniques of observing their morphology, growth characteristics, and distribution. Microbial molecular biology and genetics. Relevance of microorganisms to everyday human activities. Offered every spring.

BIO 321 COMPARATIVE VERTEBRATE ANATOMY

4, 3/3

Prerequisites: Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213. Function, evolution, and development of the diversity of vertebrate structure. Rigorous dissections of representative vertebrate morphologies (e.g., preserved sharks, amphibians, cats, etc.). Offered occasionally.

BIO 322 GENES AND SOCIETY

3, 3/0

Prerequisites: BIO 100 or BIO 101 or BIO 111. The influence of genes on the human conditions, including diseases, behavior and evolution, and the emerging technologies to alter human genes. Offered occasionally.

BIO 324 BIOLOGY OF HUMAN REPRODUCTION

3, 3/0

Prerequisites: BIO 100 and upper-division status. Non-majors only. Anatomy and physiology of the human reproductive system, development of the human embryo, and the processes of birth and lactation. Offered occasionally.

BIO 325 ICHTHYOLOGY

4, 3/3

Prerequisites: Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213. Study of the biology of fishes: structure and function (anatomy and physiology), systematics, evolution, diversity, zoogeography, and ecology. Offered alternate years.

BIO 333 BIOLOGICAL FORM, FUNCTION AND DIVERSITY

4, 3/3

Prerequisites: Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213. The origin and history of life on Earth and its diversification with an emphasis on Eukarya. Survey of the morphology, physiology, development, reproduction, and life cycles of protists, plants, fungi, and animals. Offered every fall semester.

BIO 350 GENES IN POPULATIONS

4, 3/3

Prerequisites: BIO 111 (with a grade of C or better), BIO 211, BIO 213 and CHE 111/113; Upper-division status. Processes that cause populations to change over time; mutation, natural selection, genetic drift, and gene flow. Application of population genetic principles to problems in conservation biology and forensic genetic analysis. Offered occasionally.

BIO 355 SURVEY OF MICROBIOLOGY

3, 3/0

Prerequisites: BIO 100 or BIO 101 or BIO 111. Non-majors only. Morphology and physiology of microorganisms. General application to infectious disease, food science, and human microbiome. Importance of human gut microbiome and factors regulating diversity of human-associated microbes. Offered every fall.

BIO 361 BIOLOGY SEMINAR

1, 0/0

Participation in weekly seminars on topics ranging from ecology and evolution to biomedical sciences and cell biology.

BIO 362 BIOLOGY SEMINAR

1, 0/0

Participation in weekly seminars on topics ranging from ecology and evolution to biomedical sciences and cell biology.

BIO 375 GLOBAL CHANGE ECOLOGY

3, 3/0

Prerequisites: BIO 211 or BIO 213. Introduction to the concepts and applications of global change ecology, including species invasion, habitat fragmentation and climate change. Ecological and sustainable applications in academic, government and private settings toward evaluating and addressing the impacts of global change. A basic understanding of biology and ecology is helpful but not necessary. Offered occasionally.

BIO 389 TOPIC COURSE

1-6, 1/0

Current advanced topics in Biology. Offered occasionally.

BIO 402 COMPARATIVE ANIMAL PHYSIOLOGY

4, 3/3

Prerequisites: BIO 111 (with a grade of C or better), BIO 211, BIO 213 and BIO 333. Study of hormonal control, neural processing, sensory mechanisms, circulation, gas exchange, digestion, muscles, energetics, and thermoregulation using vertebrate and invertebrate examples. Offered occasionally.

BIO 405 EVOLUTION

3, 3/0

Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213; Upper-division status. The pattern of evolution including fossil, biogeographic, and genomic evidence. Phylogenies; processes contributing to changing allele frequencies in populations through time including selection, drift, mutation, migration, and nonrandom mating; models of speciation. Mendelian framework for quantitative genetics. Sexual selection, inclusive fitness, altruism and the evolution of eusociality. Mass extinction and recent discoveries related to human origins. Offered at least once a year.

BIO 408 PLANT PHYSIOLOGY

4, 3/3

Prerequisites: Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213. Plant physiological processes including photosynthesis, respiration, transpiration, translocation, photomorphogenesis and tropisms; plant water potential, effects of hormones, soil nutrients, environmental stress; plant anatomy in relation to physiological function; use of instrumentation to measure physiological performance. Offered alternate years.

BIO 412 DEVELOPMENTAL BIOLOGY

4, 3/3

Prerequisites: BIO 305 or BIO 314 or BIO 333. Principles and processes of animal development with emphasis on molecular, cellular, and physical mechanisms. Topics include cell fate specification, axis formation, fertilization, cleavage, gastrulation, organogenesis, and regeneration. Comparative aspects of development across different phyla of the animal kingdom. Offered alternate years.

BIO 414 MAMMALOLOGY

4, 3/1

Prerequisites: Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213. Introduction to the study of mammals: including classification, distribution, ecology, and behavior as they relate to life histories of mammals; identification of mammals in the field and laboratory; and field methods of mammalian studies. Offered occasionally.

BIO 418 LIMNOLOGY

4, 3/3

Prerequisites: BIO 111 (with a grade of C or better), BIO 211, BIO 213 and CHE 111/113; Upper-division status. Physical, chemical, and biological factors that influence freshwater life and the ecological interactions in freshwater communities. Lectures, demonstrations, and field trips. Offered alternate years.

BIO 421 INVERTEBRATE STRUCTURE AND FUNCTION

3, 2/2

Prerequisites: BIO 111 (with a grade of C or better), BIO 211, BIO 213 and BIO 333. Functional approach to the morphology, physiology, adaptation, ecology, reproduction, and evolution of invertebrates. Offered occasionally.

BIO 428 VERTEBRATE STRUCTURE AND FUNCTION

4, 3/3

Prerequisites: BIO 212 and BIO 213. Comparative study of vertebrates with emphasis on their anatomy, adaptations, ecology, and phylogenetic relationships. Offered occasionally.

BIO 429 FISHERIES BIOLOGY

4, 3/3

Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213; Upper-division status. Ecology and management of fish populations. Sampling techniques and fisheries-management techniques (including stocking, hatcheries, and aquaculture programs). Feeding, behavior, and life history of fishes. Offered occasionally.

BIO 430 STREAM ECOLOGY

4, 3/3

Prerequisites: BIO 111 (with a grade of C or better), BIO 211, BIO 213 and BIO 333; Upper-division status. Biological, chemical, geomorphic, and hydrologic features affecting the ecology of flowing water systems. Emphasis on freshwater invertebrate life histories, adaptations, and community structure in shallow streams. Offered alternate years.

BIO 431 AQUATIC ENTOMOLOGY

4, 3/1

Prerequisites: BIO 212 and BIO 213. Survey of the classification, taxonomy, and identification of aquatic insects. Emphasis on aquatic insects of northeastern North America, their life histories, adaptations, and community structure in streams and wetlands. Offered occasionally.

BIO 433 ORNITHOLOGY

4, 3/3

Prerequisites: Prerequisites: BIO 111 (with a grade of C or Better), BIO 211 and BIO 213. Introduction to the study of birds including a survey of the diversity of avian behaviors, life history strategies, mating systems, ecology, and physiological-morphological specializations of flight. Offered occasionally.

BIO 434 EXPERIMENTAL BEHAVIORAL ECOLOGY

4, 3/3

Prerequisites: Biology, Chemistry, & Forensic Chemistry Majors Only. BIO211 & BIO213. Exploration of fundamental concepts in the evolution of behavior. Topics include communication, parental care, sexual selection, foraging theory, and kin selection. Development, phylogenetics, and genetics of behavior will be discussed. Offered occasionally.

BIO 435 CANCER BIOLOGY

4, 3/3

Prerequisites: BIO 211, BIO 213, CHE 112/114. Exploration of the fundamental concepts and mechanisms in cancer biology. Topics include the nature of cancer, tumor viruses, oncogenes, growth factors, signal transduction, tumor suppressor genes, cell cycle control, apoptosis, multistep tumorigenesis, and genomic integrity. This course will also cover the basic principles of cancer prevention, diagnosis, and treatment. Offered occasionally.

BIO 440 APPLICATIONS IN BIOTECHNOLOGY

3, 3/0; IN23, RE23

Prerequisites: BIO 111 (with a grade of C or better), BIO 211, BIO 213, CHE 111/113 and CHE 112/114. Case-study exploration of molecular, cellular and immunological techniques used to address industrial, agricultural, environmental and human health issues. Emphasis on underlying biological principles, the biotechnology employed and evidence of effectiveness. Safety, policy issues, bioethical considerations and public perception will be discussed. Offered every fall semester.

BIO 441 BIOINFORMATICS

4, 3/3

Prerequisites: BIO 211, BIO 213, CHE 112/114. Introduction to bioinformatics concepts and techniques. Bioinformatic applications in academic, biotechnological, clinical and pharmaceutical settings for analyzing individual DNA and protein sequences. Hands-on in-class bioinformatics exercises and activities in a form of bioinformatic laboratory. No formal computer programming training or high-level mathematical skills required. Offered occasionally.

BIO 450 RECOMBINANT DNA TECHNOLOGY

4, 2/6

Prerequisites: BIO 303 OR BIO 314. An extensive hands-on experience using the techniques of biotechnology. Techniques involving the construction of recombinant DNA molecules and their analysis will be emphasized. Offered alternate years.

BIO 488 BIOLOGY INTERNSHIP

1-15, 0/0

Prerequisites: Minimum cumulative and biology GPA of 2.5; BIO 111, BIO 211, BIO 213, BIO 333; faculty adviser and department chair permission. An opportunity to apply learned principles and methodologies in a workplace setting. Offered every semester.

BIO 495 SPECIAL PROJECT

1-3, 0/0

Prerequisites: Faculty adviser and department chair permission. Offered every semester.

BIO 498 HONORS RESEARCH

1,3, 0/0

Prerequisites: BIO 111, BIO 211, BIO 213, BIO 333; completion of 70 or more credit hours; minimum GPA of 3.4 in biology major and minimum cumulative GPA of 3.0. Independent investigation of an original scientific problem, completed over two semesters with transition to the second semester dependent upon satisfactory completion of research proposal during the first semester. Submission of a final written report of investigation and an oral presentation of work at a scientific meeting. Offered every semester.

BIO 499 INDEPENDENT STUDY

3-12, 0/0

Prerequisites: Faculty adviser and department chair permission. Offered every semester.