Fall 2018
Course Descriptions

Undergraduate Courses

001 Environment Preservation & Improvement *(Cross listed as ENV 0091)*
Seminar based on current readings from environmental journals that provide insight into environmental science for use by scientists, science media, business leaders, and political decision makers. Topic areas include biodiversity and wildlife, alternative energy, ocean protection, climate shift, urban ecology, sustainable agriculture, GIS and remote imagery.
Credits: 3
Ellmore

004 Gross Anatomy *(Cross listed as Occupational Therapy 102*).
A systemic approach to human anatomy, including the skeletal, muscular, respiratory, digestive, genital, urinary, and nervous systems. Detailed study of the upper and lower extremities, emphasizing normal function. Laboratory sessions weekly. **Prerequisite:** Any college biology course. Call Boston School of Occupational Therapy (617-627-5720) for information about this course.
Credits: 4
Sarikas, Whitney & Pessina

008 Microbiology of Food
Systems-based approach to how microbes play critical roles in the production, processing, and consumption of foods. Tools that microbiologists are using to study the microbiology of food systems; basic principles of microbial diversity, ecology, evolution, physiology, and genetics using a farm-to-gut approach. Equal attention to beneficial microbes as well as the historical and contemporary impacts of pathogens. Guest lectures from farmers, chefs, and local food producers and in-class demonstrations and tastings.

Credits: 3
Wolfe

009 Physiology *(Cross listed as Occupational Therapy 101)*
Normal function of the human body based on fundamental biophysical and biomechanical principles. Systems covered will include cardiovascular, respiratory, gastrointestinal, renal, neuroendocrine, muscular, and skeletal. Emphasis will be placed on how these systems contribute to neuromuscular control, muscular strength, and endurance. Call Boston School of Occupational Therapy (617-627-5720) for information about this course.
Credits: 4
Leavis

010 Plants and Humanity
Principles of botany accenting economic aspects and multicultural implications of plants, their medicinal products, crop potential, and biodiversity. Emphasis placed on global aspects of this dynamic science, with selected topics on acid rain, deforestation, biotechnology, and other applications. Also covered are medicinal, poisonous, and psychoactive species, as well as nutritional sources from seaweeds and mushrooms to mangos and durians.
Credits: 3
Ellmore

011 Kinesiology *(Cross listed as Occupational therapy 104)*
Introduction to normal human movement. The basic anatomical, physiological, and biomechanical principles that underpin normal movement and function. Includes the assessment of muscle and joint function through manual muscle testing and goniometry. Emphasis on the biomechanics of everyday activities. Call Boston School of Occupational Therapy (627-5720) for information about this course.
Credits: 3
Harney

13 Cells and Organisms with Lab
An introductory course primarily for prospective biology majors. General biological principles and widely used methods related to current advances in cell and molecular biology, genetics, immunology, plant and biomedical sciences. This course must be taken with the lab - enroll in one of the laboratories in Biology 13L A-N below. Two lectures and one laboratory each week. Four exams + final. Credit cannot be received for both BIO 13 and ES 11. **Recommendations:** Advanced high-school chemistry and biology recommended.
Credits: 5
Koegel

13L Laboratory A - P
This is the laboratory component to Bio. 13L, which meets once every week. Laboratory exercises are designed to reinforce lecture material as well as to present new topics. A good initial exposure to ways of thinking about and working with living organisms. Homework assignments will emphasize scientific writing and data presentation. **NOTE:** Turnitin.com will be used to monitor originality of assignments.

Sci-Eng Ctr Room 029A:		**Sci-Eng Ctr Room 029D:**	
Lab A	M 1:20-4:20	Lab B	M 1:20-4:20
Lab C	T 1:20-4:20	Lab D	T 1:20-4:20
Lab E	W 1:20-4:20	Lab F	W 1:20-4:20
Lab G	Th 1:20-4:20	Lab H	Th 1:20-4:20
Lab I	M 6:00-9:00	Lab J	M 6:00-9:00
Lab K	T 6:00-9:00	Lab L	T 6:00-9:00
Lab M	W 6:00-9:00	Lab N	W 6:00-9:00
Lab O	Th 6:00 – 9:00	Lab P	Th 6:00 – 9:00

49-A& B Experiments in Physiology
Experimental investigations of several problems in physiology using a wide variety of modern techniques. Classes will concentrate on several biological concepts and emphasize appropriate experimental design, data collection, data analysis and presentation. One laboratory session per week plus one discussion period. **Prerequisite:** Requires completion of BIO 0014 or equivalent.
Credits: 4
Trimmer, Kao & Tytell

51A & B Experiments in Ecology *(Cross-listed as ENV 51)*
An introduction to field research in different habitats. Emphasis on acquiring skills in taxonomic identification, sampling techniques, hypothesis testing and experimental design, data analysis and interpretation, as well as oral and written communication. Opportunity for student-designed group research projects on ecological questions. One laboratory session per week plus one discussion period. **Prerequisite:** Requires completion of BIO 0014 or equivalent.
Credits: 4
Crone, Ellmore, & Starks

54 Molecular Genetics Projects Lab
A discovery-based research experience in the field of molecular genetics, taught at the introductory level. Students will each carry out a related independent research project using modern techniques in genetics and molecular biology to discover gene function, identify proteins that play a role in maintaining genome stability, and develop testable hypotheses. Techniques used will include genetic assays, PCR, gene knockouts, and phenotype analysis. **Prerequisite: Bio 13**. Genetics prior to or concurrent with taking the course is suggested but not required. The course is appropriate for sophomores and juniors with no prior laboratory experience.
Credits: 4
Freudenreich

93 Introduction to Research
At least ten hours per week of guided laboratory research, generally including one hour of consultation or seminar with research supervisor and a paper. Details of individual project to be worked out with the supervisor. Gives students an opportunity to participate in biological research on the Tufts Medford/Somerville and Boston campuses. Does not satisfy laboratory or course requirement for the major in biology. May be counted as credit toward degree only. Students typically initiate independent research in their sophomore or junior years. Pass/fail grading. **Recommendations:** Permission of research mentor and subsequently course coordinator.
Credits: 2
Warchola

Graduate and Undergraduate Courses

103 Developmental Biology
Concepts of animal developmental biology, with emphasis on the molecular events underlying the morphological changes that occur going from egg to adult. Examples drawn from several of phyla will illustrate developmental mechanisms, patterns of gene expression and gene regulatory networks involved in gametogenesis, fertilization, cell differentiation, cell signaling, cell-cell interactions and organ formation. Topics include issues of human cloning, birth defects, stem cell research, gene therapy, assisted reproduction technologies and developmental evolution. **Prerequisite:** Biology 41 or 46 or consent. (Group A)
Credits: 3
McLaughlin

104 Immunology
Concepts of modern immunology and their importance in biology. Topics include humoral and cellular immune responses, antibody structure and biosynthesis, antigen-antibody interactions, cellular immunology, immunological tolerance, and tumor immunology. **Recommendations**: Biology 41 or equivalent.
Credits: 3
Bernheim

105 Molecular Biology
Gene structure and function in prokaryotes and eukaryotes, fundamentals of recombinant DNA technology. Mechanisms of DNA replication, recombination, transcription, and protein synthesis are emphasized. Advanced topics including gene expression during cell differentiation, retroviral infection, and regulation of cell proliferation are based on current literature. **Prerequisite:** Biology 41. (Group A.)
Credits: 3
McVey

110 Endocrinology
A comprehensive introduction to the chemical and physiological principle of hormonal integration in animals. Topics include endocrine regulation of metabolism, growth and development, reproduction, neural functions, mineral and water balance, behavior, and nutrition. **Recommendations:** BIO 13 and 14, or equivalent.
Credits: 3
Romero

115 General Physiology I.
Elements of homeostasis, circulation, respiration, and excretion are discussed at various levels, from the molecular to the organ system. **Recommendations:** BIO 13 and 14, or equivalent.
Credits: 3
Bernheim

121 Mathematical Neuroscience *(Cross-listed as Math 121)*
Mathematical and computational study of systems of differential equations modeling nerve cells (equilibria, limit cycles, bifurcations), neuronal networks (intrinsic rhythmic synchronization, entrainment by external inputs), and learning (synaptic plasticity), and of the potential function of rhythmic synchrony for signaling among neuronal networks and for plasticity. **Prerequisite:** Math 51 or instructor's consent.
Credits: 3
Börgers

132 Biostatistics
An examination of statistical methods for designing, analyzing, and interpreting biological experiments and observations. Topics include probability, parameter estimation, inference, correlation, regression, analysis of variance, and nonparametric methods. (Group Q.) **Recommended:** BIO 13 and 14, or equivalent, plus one additional biology course above BIO 14.
Credits: 3
Lewis

142 Population and Community Ecology *(Cross-listed as ENV 142)*
Introduction to population dynamics (population structure and growth), species interactions (predator-prey, competition, mutualism), and community structure (adaptations to the physical environment, patterns and processes governing the world's biomes). **Recommendations:** BIO 13 and 14 or equivalent, or permission of instructor.
Credits: 3
Warchola

144 Conservation Biology
Learning and application of principles from population ecology, population genetics, and community ecology to the conservation of species and ecosystems. Focus will be on rare and endangered species, as well as threatened ecosystems. Also includes applications from animal behavior, captive breeding, and wildlife management. (Group C) **Prerequisite:** Biology 14, or equivalent.
Credits: 3
Reed

172 Biochemistry II *(Cross-listed as CHEM 172)*
Continuation of Biology 171. One course. **Recommendations**: BIO 171.
Credits: 4
Pamuk Turner

183 Seminar in Darwinian Medicine
The mechanistic vs. evolutionary causes of diseases and modern medical practice. Focus on the evolutionary causes of disease as a means of sharpening research skills and the understanding and application of Darwinian thought. Evolutionary hypothesis creation and testing in both oral and manuscript form. (Group C.) **Recommendations:** BIO 130 or permission of instructor.
Credits: 3
Starks

193 Independent Research
At least fifteen hours per week of laboratory or field investigation, which must include independent design of experiments. Students write a summary of research accomplished and give an oral presentation to members of the department. **Recommendations**: Sophomore standing or higher, and BIO 93 or BIO 94 or equivalent, and prior permission of research mentor and course coordinator.
Credits: 3
Warchola

196-01 Teaching Biology: Pedagogy and Practice
Exploration of special topics in biology through seminars or guided individual study. **Prerequisite:** Consent.
Credits: 1
McLaughlin & McVey

196-02 Selected Topics: Plant and Animal Interactions.
Exploration of special topics in biology through seminars or guided individual study. **Prerequisite:** Consent.
Credits: 1
Crone

196-03 Selected Topics: Research in Devel. Plasticity
Exploration of special topics in biology through seminars or guided individual study. **Prerequisite:** Consent. Credits: 3
Levin

196-06 Non-majors Evolution Course
There are more than one million animal species currently on Earth, and over 300,000 plant species. Where did they all come from? The idea that all organisms have gradually changed—in many directions over long periods of time--in response to changing environmental pressures such as predation, competition for resources, and competition for mates, is at the center of most biological and environmental research. In this course we will examine the history of evolutionary thinking, explore the mechanisms through which evolution at a variety of scales is known to occur, and consider modern applications of evolutionary thinking in biomedical research. We will also discuss the geological record of past extinctions, and consider the potential of living organisms to avoid extinction and adapt to climate change, pollution, and other modern environmental changes.
Credits: 3
Dopman & Pechenik

199 Senior Honors Thesis.
Intensive laboratory or field investigation, including independent design of experiments, a written thesis, and an oral defense. Application is made during the student's sixth semester. Normally, the applicant should have received at least three grades of A toward satisfying the concentration requirements for the biology major and should have a cumulative GPA of at least 3.30.
Credits: 6
Kate Mirkin

Graduate Level Courses only

200 Lab Meeting
Lab meeting of the Professor in the selected section. This course is only for members of the lab, and should not be chosen without permission of the professor.
Credits: 0
Various

243 Topics in Molecular and Cell Biology
Topics will be drawn from several of the following areas: regulation of gene expression, chromatin structure and epigenetic regulation, mechanisms of chromosome segregation, DNA replication, recombination and repair, genome structure and genome stability, intra- and inter-cellular signaling pathways. Students will read and present papers from the current literature. Novel experimental techniques used to answer central questions will be emphasized. (Group A) **Prerequisite:** Biology 105 or equivalent OR permission of the instructor.
Credits: 3
Fuchs

253- Graduate Student Research Rotation
A research rotation is an opportunity to explore a new area of Biology, to learn new techniques, and to become acquainted with some of the research ongoing in our department as students conduct intensive laboratory or field investigation, including independent design of experiments ending with a final oral report. Students will normally present their findings the Friday before the start of spring semester. Rotation Duration: Oral reports will be given to a group consisting of other students who have just finished a rotation, the sponsoring research mentors, members' of the students' committees, graduate students, and other interested persons. **Prerequisite:** Consent
Credits: 3
Freudenreich

257 Graduate Student Research and Experimental Design
This course provides credit for second year graduate student thesis or dissertation research. The content includes learning experimental design, research presentations, and reading papers in the field of the chosen PhD or ThMS research. Chose section -01 and the faculty mentor you are working with.

260-01 Teaching Biology: Pedagogy and Practice.
This course aims to enhance the professional development of graduate students by preparing them to teach biological sciences in academic venues that range from community colleges to Research I universities. Graduate student participants will be introduced to issues related to teaching in both lab and lecture settings and will apply effective teaching techniques in their own classrooms. Program participants will learn about pedagogy, gain practical teaching experience, and receive mentoring and formal evaluation of their teaching. The course
requirements are designed to be flexible enough to be pursued alongside full-time disciplinary studies, yet ensure that participants are rigorously trained in biology-specific pedagogy. **Prerequisite**: Consent/BIO13L Teaching Assistants. **Must also register for Bio 260-02.**
Credits: 3
McLaughlin & McVey

263 Special Topics: Applied Bioinformatics and Genome Analysis
This seminar is designed to familiarize graduate students with the analysis of genomic data. Students optimize a bioinformatics pipeline in computational labs, work on problem sets, discuss primary literature, and write brief lab reports.Working with both whole genome and transcriptome sequencing data, six core topics in computational biology are emphasized: (1) high-performance computing and command-line interface (UNIX, R); (2) transcriptome assembly, (3) functional annotation, (4) gene expression, (5) variant (indel/SNP) discovery, and (6) SNP analysis. **Pre-requisites**: Graduate student status or permission of instructor. Basic knowledge of biology, plus upper level work in any of the following fields: biology, chemistry, chemical or biomedical engineering, computer science. Access to a computer and some prior background in evolution, statistics, and genetics is assumed. Experience with command-line interface is a plus.
Credits: 3
Wadsworth

291-01 Graduate Seminar
Presentation of individual reports on basic topics in molecular, cellular, and developmental biology to a seminar group for discussion and criticism.
Credits: 0
Freudenreich

293-01 Special Topics

293-02 Special Topics: Field Ornithology
Guided individual study of an approved topic. Please see departmental website for specific details.
Credits: 3
Reed

293-03 Special Topics: Protein Biochemistry
Guided individual study of an approved topic. Please see departmental website for specific details
Credits: 3
Fuchs