Undergraduate Courses

5 Neuroanatomy. (Cross-listed as Occupational Therapy 103.) See Occupational Therapy for course description.
Whitney, Pessina

6 Big Bang to Humankind. (Cross-listed as Chemistry 0006 & Astronomy 0006). Course will explore the origins of the Universe, the formation of Earth and its structure, the chemistry of life, the development of complex organisms, and the development of modern humans. Students will learn the evidence for the various ideas presented, the scientific method used by scientists, and how the community of scientists evaluates the evidence. This course does not fulfill pre-medical requirements for a lab-based chemistry course. Open to all students, freshman through seniors. Spring.
Campbell.

10 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. Spring.
Ellmore

14 Organisms and Population. Forms a logical sequel to Biology 13. Selected topics in animal and plant physiology, development, genetics, and population biology, with emphasis on evolutionary mechanisms. Three lectures and one laboratory each week. Prerequisite: Biology 13 recommended. Spring.
Warchola, Svoboda, Grossi

41 General Genetics. Basic concepts of classical and molecular genetics, including Mendelian genetics, genetic mapping, recombination, the genetic code, gene transcription and translation, regulation in prokaryotes and eukaryotes, genetic engineering, and human chromosomal abnormalities. Prerequisite: Biology 13 or equivalent. Fall/Summer.
K. Mirkin

44 Primate Social Behavior. (Cross-listed as Anthropology 0044): Introduction to social lives of primates. Uses experimental and observational studies to teach students how to understand and engage with scientific literature and method. Covers ecological, physiological, and developmental bases of primate social behavior, with attention to evolution of social interactions among individuals of different age, sex, relatedness, and status. Topics include competition and cooperation, dominance and territoriality, sex and mating, parenting, cognition and conservation. Includes a weekly lab where students will learn primatological methods. (Group C) No pre-requisites. Spring.
Machanda
46 Cell Biology. Basic concepts of cellular organization, function, regulation. Emphasis on molecular/biochemical approach to fundamentals of bioenergetics; plasma membrane functions such as transport, secretion, and signal transduction; organelle function and biogenesis; cell growth and division. Prerequisite: Biology 13 or equivalent. (Group A.) Spring.
Koegel

50 Experiments in Molecular Biology. Similar to Biology 49, but investigating a series of laboratory problems using modern techniques of biotechnology. Gene cloning, recombinant protein expression, protein biochemistry, and immunochemistry are emphasized for teaching state-of-the-art laboratory skills and for reinforcing basic concepts of modern molecular biology. One laboratory session per week plus one discussion period. Prerequisites: sophomore standing and Biology 13 or equivalent. Open only to majors in biology, biochemistry, or biotechnology. Spring.
Fuhrman and members of the department

52 Experiments in Cell Biology. The field of Cell Biology focuses on examining cells and the behaviors they perform. This course will introduce students to the investigation of several laboratory problems using standard techniques of cell biology examining diverse organisms, ranging from single cells to intact animals. One laboratory session per week plus one discussion period. Requires completion of BIO 0013 or equivalent. Spring.
McLaughlin, Fuchs, Levin

62 Molecular Biotechnology. (Cross-listed as BME 62 and CHBE 62.) Overview of key aspects of molecular biology and engineering aspects of biotechnology. Lecture topics include molecular biology, recombinant DNA techniques, immunology, cell biology, protein purification, fermentation, cell culture, combinatorial methods, and bioinformatics. (Group A.) (May be taken at the 100-level with consent; see below.) Recommendations: CHEM 1, BIO 13, or permission of instructor.
Kaplan, Lennon

94 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.
Prerequisites: Permission of research mentor and subsequently course coordinator. Pass-fail grading.
Koegel

Undergraduate and Graduate Courses

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.) Spring.
McVey
106 Microbiology. A survey to provide a general understanding of bacteria and viruses. Bacterial structure, growth, ecology, pathogenic mechanisms, and viral life cycles. The laboratory will familiarize students with microbiological methods and various groups of microorganisms. Three lectures, one laboratory per week. Prerequisites: Requires completion of Bio 013, Bio 014, and Bio 041 or graduate student. Spring. Wolfe

116 General Physiology II. Elements of homeostasis and of endocrine, nervous, and digestive systems are discussed at various levels, from the molecular to the organ system. Material will include lessons from and comparisons across vertebrates and invertebrates. Prerequisites: Bio 13 and 14, or equivalent. Kao

118 Plant Physiology. Interaction of living plant components performing biological functions including water transport, mineral uptake, movements, and signalling between plant parts in response to environmental cues. Prerequisites: Biology 13 and 14, or equivalent. Introductory chemistry recommended. (Group B.) Spring 2016 and alternate years. Ellmore

119 Biophysics. (Cross-listed as PHY 25) Presentation at an introductory level of selected topics in physics relevant to modern medicine and biology. Development of topics to the point of application to biomedical problems. Topics drawn from acoustics, physics of fluids, diffusion, laser physics, and other subjects varying from year to year. Prerequisites: PHY 1, 2, or 11, 12 or permission of instructor. Corequisite: MATH 42 (formerly MATH 13). Spring. Cebe

130 Animal Behavior. An examination of ethological theory: the development of behavior, orientation, migration, communication, and social behavior. Particular emphasis will be placed on the functioning of animal societies. Prerequisites: Biology 13 and 14, or equivalent. (Group C.) Spring. Starks

131 Principles of Medical Imaging. (Cross-listed as Electrical Engineering 131). This interdisciplinary course presents the principles of medical imaging techniques such as diagnostic ultrasound, radiography, X-ray, computed tomography (CT), and magnetic resonance imaging (MRI). For each imaging modality, topics include the physical principles, key aspects of instrumentation design, mathematical methods, and the anatomical/physiological information content of the images. Representative medical images will be discussed and interpreted. This course cannot be taken for basic science requirement for engineering students. Prerequisites: Mathematics 11, Physics 2 or 12, or consent. Fantini

133 Ecological Statistics and Data w/Lab. Probability and likelihood, fitting simple models to data, and using models to make predictions. Examples come from problems in ecology, with emphasis on monitoring plant and animal populations and forecasting how these populations will respond to changing environments. Includes an introduction to Bayesian statistics, building mixed and compounded probability distributions, and use of the open-source statistics program, R. Open to students at any level who are interested in using models to interpret biological or environmental data. Students should have an interest in ecology. Calculus recommended, strong working knowledge of high school algebra required. (Group C or Group Q) Spring. Crone

143 Evolutionary Biology w/Lab. Theory and evidence on mechanisms of evolutionary change in natural populations. Population genetics, speciation, biogeography, biochemical coevolution, life history strategies, sexual selection, and genetics of endangered species. Labs address questions in ecology and evolutionary
biology through the application of bioinformatic analytical tools on genomic data sources (gene expression, protein, DNA). Prerequisites: Bio 13 and 14, or equivalent. 1.5 credits (Group A, Group C or Group Q) Spring.  

*Dopman*

**152 Biochemistry and Cellular Metabolism.** An in-depth examination of the structure and function of biomolecules: chemical and physical properties of proteins, carbohydrates, and lipids; enzyme kinetics and mechanisms; metabolism of carbohydrates, lipids, and amino acids and the metabolic relationships of organ systems. Prerequisites: Biology 13 and Chemistry 51 or 50. (Group A.) Spring.  

*Fuchs*

**164 Marine Biology.** An intermediate-level introduction to the biology of marine organisms. Following a detailed survey of major marine animal and plant groups, the course will consider food web dynamics; physiological and ecological adaptations to key marine habitats, including the deep sea, coral reefs, estuaries, and the intertidal zone; and the impact of global warming, ocean acidification, and overfishing on marine communities and fisheries. Prerequisites: Biology 13 and 14, or equivalent. (Group C.) Spring.  

*Pechenik*


*Scheck*

**172 Biochemistry II.** (Cross-listed as Chem 172) Continuation of Chem 171. Prerequisites: Bio 171. Fall.  

*Turner*

**178 Seminar in Immunology.** Advanced topics in immunology. Readings and discussion of the current literature emphasized. Topics include antigen presentation. T-cell activation, cytokine release and effects, self-and non-self recognition, and immunopathology of HIV. Prerequisite: Biology 104 and consent. (Group A) Spring 2015 and alternate years.  

*Bernheim*

**180 Seminar in Conservation Biology - Climate Change and Extinction Risk.** Climate change is a current and looming threat to species worldwide. In this seminar we will focus on the potential consequences of climate change to species extinction risk, and possible ways to reduce the risk. Seminar format with student-lead presentations; discussions of chapters from a recent book on climate change and extinction risk, as well as primary scientific literature. Prerequisite: Upper level Group C course in Biology. (Group C) Spring 2018 and alternate years.  

*Reed*

**186 Seminar in Field Endocrinology.** Advanced seminar explores the mechanistic role of endocrine systems in coordinating how animals survive, breed, and adapt to the ever-changing natural environment. Emphasis on wild animals in natural conditions with focus on student-led discussions of primary scientific literature surrounding a core text. Prerequisite: Bio 110 and Junior Standing or consent. (Group B) Spring.  

*Romero*

**188 Seminar in Molecular Biology and Genetics.** Current topics in molecular biology, genetics and genomics, studied through readings from the original literature. Focus will be on studies recognized by the Nobel Prize Committee as pivotal to modern molecular biology and genetics. These studies and current research directions that follow from them will be covered using a combination of lectures, class discussion,
and presentations. Selected topics of current interest to be covered include genome structure and polymorphisms as related to human disease, RNA functioning in the regulation of gene expression, and cell cycle regulation and cancer. (Group A) Prerequisites: Biology 41 and junior standing or permission of instructor.
Freudenreich, Mirkin

194 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 Susan Koegel

196-01 Selected topics: Biology of Fishes. Please reach out to Jan Pechenik for more details on this course

196-03 Selected Topics Please reach out to Philip Starks for more details on this course

196-08 Selected Topics: Research in Developmental Plasticity Please reach out to Michael Levin for more details on this course

196-20 Selected Topics: Mod, Simulat & Opt Bio Systems Please reach out to Joel Grodstein for more details on this course

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 average of at least 3.30. Prerequisites: Biology 193 or equivalent, and prior consent of the course coordinator.
Kelly Mc Laughlin

Additional Graduate Courses

Graduate courses include all 100 level courses and above.
The following courses are primarily for graduate students; undergraduate registration requires the consent of the instructor.

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. It is 0 credits.
Various

244 Graduate Seminar in Evolutionary Ecology. An examination of current topics in evolutionary ecology, including plant-herbivore coevolution, sexual selection, phenotypic plasticity, life-history strategies, and conservation biology. Reading and discussion of primary literature will include focus on experimental methodologies and statistical methods. Prerequisites: Biology 71 or 143, or equivalent, and consent. (Group C.)
Lewis

246 Topics in Physiology of Animal Behavior An examination at the graduate level of current topics in physiology related to animal behavior. Topics may include biomechanics, neurophysiology, endocrinology
and cognition. Students will read and present papers from the current literature. Discussions will focus on key papers in the field, critical evaluation of data or published interpretations and an understanding of experimental techniques used to answer central questions. Prerequisite recommendations: One course from Bio 110, 116, 134 or equivalent, and graduate standing or permission of the instructor.

254 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. 1 graded credit. Prerequisite: consent.

256 Masters Thesis Research (1st Year). This course provides credit for first year graduate student MS thesis research. The content includes learning experimental design, research presentations, and reading papers in the field of the chosen ThMS research. Chose section -01 and the faculty mentor you are working with.

258 Graduate Research and Experimental Design (2nd Year). 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.

262 Science Communication. This course is designed to help graduate students learn how to communicate better about science to the public, to their fellow scientists, to advocacy groups, and to funding agencies. Scientists are increasingly called upon to explain and advocate science to diverse groups. This course will provide training in writing, speaking, and graphical presentation skills in a variety of formats. Students will also learn how to effectively edit and critique their work and others’. We will focus on writing and communicating in a popular style so that students can develop their abilities to present information clearly and logically; such skills will translate naturally into writing for scientific journals, for grants, and for presentations at conferences. Tytell

291 Graduate Seminar in Molecular and Developmental Biology A & B Presentation of individual reports on basic topics to a seminar group for discussion and criticism. Credit as arranged.

294 Special Topics. Guided individual study of an approved topic. Credit as arranged.

296 Master’s Thesis. Guided research on a topic that has been approved as a suitable subject for a master's thesis. Credit as arranged.

298 PhD Dissertation Guided research on a topic suitable for a doctoral dissertation. Credit as arranged.
401PT Master's Continuation, Part-time.

402FT Master's Continuation, Full-time.

405 Graduate Teaching Assistant

406 Graduate Research Assistant

501PT Doctoral Continuation, Part-time.

502FT Doctoral Continuation, Full-time.