ChemBio Courses of Interest

Below is a list of courses being offered this year that many of our students have taken in the past.

Online Course Catalog courses.my.harvard.edu
Nano and Quarter Courses https://nanosandothercourses.hms.harvard.edu

Fall Semester

BCMP 200. Molecular Biology

Class Number: 13275
Joseph John Loparo (Medical School), Frank Slack (Medical School), Lee Stirling Churchman (Medical School), Alan Brown (Medical School), and Karen Adelman (Medical School)
Half course (fall term). M., W., F., 10:45-12:15.
Principles of Molecular Biology is a course organized around the Central Dogma of Biology with presentations covering fundamental aspects of DNA and RNA structure, their function and their interactions with proteins. The course opens with a discussion of the physical and chemical properties that drive the interactions of proteins with nucleic acids. This is used as a basis for understanding the material presented in the subsequent five modules, which cover DNA replication, DNA repair, gene regulation, transcription and translation. Throughout this course an emphasis will be placed on how the structure of small molecular machines (proteins) define their function in the processes and pathways that are introduced.
Note: Offered jointly with the Medical School as BP 723.0.
Prerequisite: Intended primarily for graduate students familiar with basic molecular biology or with strong biology/chemistry background.

HBTM 235. Principles of Human Disease: Physiology and Pathology

Class Number: 11901

Enrollment: Course enrollment is open to graduate students from any program as well as undergraduates.).
Constance L. Cepko (Medical School), and members of the Department
Half course (fall term). M., W., F., 9-10:30.
This course covers the normal physiology and pathophysiology of selected organs, through lectures, readings, tutorials based on clinical cases, and patient presentations. Human biology is emphasized, with some examples also drawn from model organisms. Recent therapeutic approaches, including RNAi, gene therapy, and genome editing will be covered.
Prerequisite: Knowledge of introductory biochemistry, molecular biology, and cell biology required (MCB52 and MCB54 or equivalent and one year of organic chemistry for undergraduates).

Chemical Biology 300hf. Introduction to Chemical Biology Research
Class Number: 13433
Enrollment: This course is limited to first year students in the Chemical Biology Program.
Suzanne Walker (Medical School)and members of the Committee
Half course (throughout the year). W., 4:30–5:30.
Lectures introduce the research areas of current program faculty in Chemical Biology.

Chemistry 101 Chemical Biology Towards Precision Medicine - Fall Requirement
Class Number: 16383
Stuart L. Schreiber
Half course (fall term). Tu., Th., 10:30–11:45.
Chemical Biology Towards Precision Medicine teaches students principles of modern organic synthesis, chemical biology and human biology relevant to the discovery of safe and effective small-molecule therapeutics in the future. The course will explore patient-based 'experiments of nature' that illuminate disease, including cancer, diabetes, infectious disease and psychiatric disease, among others. Students will then use their knowledge of chemistry and chemical biology to propose research yielding novel small molecules that affect biological systems by mechanisms suggested by the experiments of nature. Chem 101 aims to prepare students for the next decade where academic research tests hypotheses emerging from human biology in humans using novel small-molecule probes.
Prerequisite: Chemistry 17/27, Chemistry 20/30, or the equivalent.

Chemistry 163. Frontiers in Biophysics **-Not offered this year**
Class Number: 15447
Adam Cohen
Half course (fall term). T., Th, 9–10:315.
This interdisciplinary course will explore the physical interactions that underpin life: the interactions of molecules, macromolecular structures, and cells in warm, wet, squishy environments. Topics will include Brownian motion, diffusion in a potential field, continuum mechanics of polymers, rods, and membranes, low Reynolds number flow, interfacial forces, electrostatics in solution. The course will also cover recently developed biophysical tools, including laser tweezers, superresolution microscopies, and optogenetics. Numerical simulations in Matlab will be used extensively

Note: Primarily for advanced undergraduate students and graduate students with either biological or physical backgrounds.
Prerequisite: Chemistry 160, Chemistry 161, or permission of the instructor.

Chemistry 170. Chemical Biology NOT OFFERED THIS FALL
Class Number: 16643
David Liu, Christina Woo
Half course (fall term). Tu., Th., 2:30–4:00.
Applying chemical approaches to problems in biology. Topics include: protein engineering and directed evolution; RNA catalysis and gene regulation; chemical genetics, genomics, and proteomics; drug action and resistance; rational and combinatorial approaches to drug discovery; metabolic engineering.

Genetics 201. Principles of Genetics
Class Number: 10705
Fred Winston (Medical School), Thomas G. Bernhardt (Medical School), Maxwell G. Heiman (Medical School), Mitzi I. Kuroda (Medical School), and Steven A. McCarroll (Medical School)
Half course (fall term). M., W., F., 9-10:30.
An in-depth survey of genetics, beginning with basic principles and extending to modern approaches and special topics. We will draw on examples from various systems, including yeast, *Drosophila, C. elegans*, mouse, human and bacteria.
Note: Intended for first-year graduate students. Offered jointly with the Medical School as GN 701.0.

MCB 169. Molecular and Cellular Immunology
Class Number: 10679
Shiv S. Pillai (Medical School)
Half course (fall term). Tu., Th., 10:30-11:45
The immune system is frontier at which molecular biology, cell biology, and genetics intersect with the pathogenesis of disease. The course examines in depth the cellular and molecular mechanisms involved in the development and function of the immune system and also analyzes the immunological basis of human disease including AIDS and other infectious diseases, autoimmune disorders, allergic disorders, primary immunodeficiency syndromes, transplantation, and cancer.
Prerequisite: Life and Physical Sciences A or Life Sciences 1a or equivalent. Genetics and cell biology strongly recommended.

MCB 176. Biochemistry of Membranes
Class Number: 14292
Guido Guidotti
Half course (fall term). M., W., 3–5:45; .
A course on the properties of biological membranes, essential elements for cell individuality, communication between cells, and energy transduction. Topics include:

membrane structure; membrane protein synthesis, insertion in the bilayer and targeting; transporters, pumps and channels; electron transport, H+ gradients and ATP synthesis; membrane receptors, G proteins and signal transduction; membrane fusion.
Prerequisite: MCB 52 and MCB 54 are recommended but not required.

Intoduction to Computer Science and Programming in Python
MIT Class number 6.0001 & 6.0002
John Guttag(MIT) TBD
Introduction to computer science and programming for students with little or no programming experience. Students develop skills to program and use computational techniques to solve problems. Topics include the notion of computation, Python, simple algorithms and data structures, testing and debugging, and algorithmic complexity.
Note: 6.0001 and 6.0002 are half semester courses. Students must take both.

January Term

***Chemical Biology 2200. Introduction to Chemical Biology** **REQUIRED**
Catalog Number: 13977
Intended for first-year graduate students in the Chemical Biology Program; permission of the instructor required for all others.
Stephen Haggarty (Medical School) and Ralph Mazitschek
Half course (spring term). M., through F., 8am - 5pm (two weeks in mid January).
This course will provide a survey of major topics, technologies, and themes in Chemical Biology, with hands-on exposure to a variety of experimental approaches.
Note: Intended for first-year graduate students in the Chemical Biology Program; permission of the instructor required for all others.

PyMol Nanocourse
Rachelle Gaudet and Tom Torello
March 18-19, 2014 10:00am – 12:00pm and 2:00pm – 4:00pm
PyMOL is one of the most popular software programs to display and explore high---resolution structures of macromolecules. It is readily used to create publication---quality figures, and movies and animations of structural information. In two days, you will learn the basics of PyMOL and be able to display, explore and present three---dimensional structures of macromolecules. With this basic training, you will be able to generate high--quality images and simple movies, and have the resources to learn more on your own to generate more complex displays.
NOTE: SPACE IS LIMITED TO 45

Spring Semester

Chemistry 171. Biological Synthesis -
Class Number: 18475
Emily Patricia Balskus
Half course (fall term). M., W., 10:30–11:45.
This course will examine synthesis from a biological perspective, focusing on how organisms construct and manipulate metabolites, as well as how biological catalysts and systems can be used for small molecule production. Topics to be covered include mechanistic enzymology, biosynthetic pathways and logic, biocatalysis, protein engineering, and synthetic biology.

Applied Mathematics 111. Introduction to Scientific Computing
Class Number: 16358
Cengiz Pehlevan
Half course (spring term). M & W, 3–4:15.
Many complex physical problems defy simple analytical solutions or even accurate analytical approximations. Scientific computing can address certain of these problems successfully, providing unique insight. This course introduces some of the widely used techniques in scientific computing through examples chosen from physics, chemistry, and biology. The purpose of the course is to introduce methods that are useful in applications and research and to give the students hands-on experience with these methods.
Prerequisite: Applied Mathematics 21a and 21b, or Mathematics 21a and 21b, or permission of instructor.

BCMP250
Biophysical and Biochemical Mechanisms of Protein Function
Class Number: 13440
Andrew Kruse, Steve Blacklow, Eric Fischer, Philip Cole
Half course(spring term). Tues & Thurs 10:30 – 12:00
Biophysical and Biochemical Mechanisms of Protein Function focuses on the molecular mechanisms that underlie essential biochemical processes such as signal transduction. Major topics include biochemical thermodynamics and conformational equilibria, protein structure and folding, receptor pharmacology, allostery, and enzymatic mechanisms of signaling. The course includes both content lectures and research frontiers seminars focused on current research in biochemistry with an emphasis on signal transduction in therapeutically relevant pathways.

BCMP 234. Cellular Metabolism and Human Disease
Class Number: 11232
Thomas Michel (Medical School),
Half course (spring term). M., W., F., 9-10:30.

Cellular and organismal metabolism, with focus on interrelationships between key metabolic pathways and human disease states. Genetic and acquired metabolic diseases and functional consequences. Interactive lectures and critical reading conferences are integrated with clinical encounters.
Prerequisite: Knowledge of introductory biochemistry, genetics, and cell biology required (MCB 52 and 54 or equivalent); one year of organic chemistry.

Cell Biology 201. Principles of Cell Biology
Class Number: 11894
Danesh Moazed (Medical School)
Half course (spring term). M., W. F., 10:30-12,
CB201 is a graduate level course intended to teach critical concepts in cell biology, and expose students to current and quantitative approaches in cell biology research. Topics include the molecular basis of cellular dynamics, subcellular compartmentalization, protein trafficking, chromosome biology and epigenetics, regulated ubiquitin-proteasome pathways, cell cycle regulation, cytoskeleton and motor dynamics, signal transduction, cell-cell interactions, and programmed cell death.
Note: Methodological focus on current approaches in cell biology including quantitative tools. Emphasis on experimental design. Offered jointly with the Medical School as CB 713.0.
Prerequisite: Basic knowledge in biochemistry, genetics and cell biology.

BCMP 236. Modern Drug discovery: from principles to patients (Required)
Class Number: 10565
Tim Mitchison and members of the Department Half course (spring term). Tu., Th., 3:30-5.

This course will familiarize students with central concepts in drug action and therapeutics: specifically we will cover concepts surrounding Pharmacokinetics (PK) and the intersection of PK and medicinal chemistry in both lectures and cases based discussions. These concepts are central to modern drug development and evaluation. In the course we will cover drug-target interactions, Pharmacokinetics and Pharmacodynamics. This course will have a focus on modern approaches to therapeutic development for small molecules, protein based therapeutics, nucleic acid based drugs and antibacterial compounds as well new frontiers in therapeutic discovery.

Microbiology 201. Molecular Biology of the Bacterial Cell
Class Number: 11433
David Z. Rudner (Medical School), Thomas G. Bernhardt (Medical School), Simon L. Dove (Medical School),
Half course (spring term). Tu., Th., 10–12.
This course is devoted to bacterial structure, physiology, genetics, and regulatory

mechanisms. The class consists of lectures and group discussions emphasizing methods, results, and interpretations of classic and contemporary literature.

BioStats 282. Introduction to Computational Biology and Bioinformatics
Class Number: 11590
Xiaole Shirley Liu (Public Health)
Half course (spring term). Tu., Th., 12:00–1:15.
Basic biological problems, genomics technology platforms, algorithms and data analysis approaches in computational biology. There will be three major components of the course: microarray and RNA-seq analysis, transcription and epigenetic gene regulation, cancer genomics.

This course is targeted at both biostatistics and biological science graduate students with some statistics and computer programming background who have an interest in exploring genomic data analysis and algorithm development as a potential future direction.

Prerequisite: Biostatistics degree program or Computational Biology and Quantitative Genetics degree program

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