GCB 493 Epigentics of Human Health and Disease
Epigenetic alterations encompass heritable, non-genetic changes to chromatin (the polymer of DNA plus histone proteins) that influence cellular and organismal processes. This course will examine epigenetic mechanisms in directing development from the earliest stages of growth, and in maintaining normal cellular homeostasis during life. We will also explore how diverse epigenetic processes are at the heart of numerous human disease states. We will review topics ranging from a historical perspective of the discovery of epigenetic mechanisms to the use of modern technology and drug development to target epigenetic mechanisms to increase healthy lifespan and combat human disease. The course will involve a combination of didactic lectures, primary scientific literature and research lectures, and student-led presentations.
Taught by: S Berger
Also Offered As: BIOL 493
Activity: Seminar
1 Course Unit

GCB 534 Experimental Genome Science
This course will survey methods and questions in experimental genomics, including next generation sequencing methods, genomic sequencing in humans and model organisms, functional genomics, proteomics, and applications of genomics methods. Students will be expected to review and discuss current literature and to propose new experiments based on material learned in the course.
Taught by: C Brown, J Murray
Also Offered As: PHRM 534
Prerequisites: Undergraduates and Masters students need BIOL431 or equivalent
Activity: Lecture
1 Course Unit

GCB 535 Introduction to Bioinformatics
This course provides overview of bioinformatics and computational biology as applied to biomedical research. A primary objective of the course is to enable students to integrate modern bioinformatics tools into their research activities. Course material is aimed to address biological questions using computational approaches and the analysis of data. A basic primer in programming and operating in a UNIX environment will be presented, and students will also be introduced to Python, R, and tools for reproducible research. This course emphasizes direct, hands-on experience with applications to current biological research problems. Areas include DNA sequence alignment, genetic variation and analysis, motif discovery, study design for high-throughput sequencing, RNA, and gene expression, single gene and whole-genome analysis, machine learning, and topics in systems biology. The relevant principles underlying methods used for analysis in these areas will be introduced and discussed at a level appropriate for biologists without a background in computer science. The course is not intended for computer science students who want to learn about biologically motivated algorithmic problems; BIOL 437/GCB 536 and GCB/CIS/BIOL537 are more appropriate.
Taught by: B Voight, C Greene
Course usually offered in spring term
Also Offered As: CIS 535, MTR 535, PHRM 535
Prerequisites: The course will assume a solid knowledge of modern biology. An advanced undergraduate course such as BIOL 421 or a graduate course in biology such as BIOL 526 (Experimental Principles in Cell and Molecular Biology), BIOL527 (Advanced Molecular Biology and Genetics), BIOL 528 (Advanced Molecular Genetics), BIOL 540 (Genetic Systems, or equivalent, is a prerequisite.
Activity: Lecture
1 Course Unit
Notes: All students are required to bring a laptop to the lab sessions (Fridays). TAs will provide help with the material, but students should be computer-capable with their own laptop, and should be willing/capable to download and install free software from the internet.

GCB 536 Computational Biology
An introductory computational biology course designed for computational scientists. The course will cover fundamentals of algorithms, statistics, and mathematics as applied to biological problems. In particular, emphasis will be given to biological problem modeling. Students will be expected to learn the basic algorithms underlying computational biology, basic mathematical/ statistical proofs and molecular biology. Topics to be covered are genome annotation and string algorithms, pattern search and statistical learning, molecular evolution and phylogenetics and small molecule folding.
Taught by: Kim
Course not offered every year
Also Offered As: BIOL 437
Activity: Lecture
1 Course Unit
GCB 537 Advanced Computational Biology
1. Learn important concepts/methods from statistical data analysis and machine learning as they are applied to computational biology. 2. Learn about current topics in genomics and computational biology through in depth discussion of both classic and recent papers. 3. Gain hands on experience in data analysis, coding and evaluating tools/algorithm as they apply to topics covered in class. 4. Learn to evaluate, criticize, summarize, and present research papers in genomics and computational biology.
Taught by: Y Barash, R Faryabi
Course usually offered in spring term
Also Offered As: BIOL 537
Prerequisite: GCB536 or equivalent
Activity: Seminar
1 Course Unit
Notes: This is not a bioinformatics lab. Non-GCB students need to be approved by instructors

GCB 567 Modeling Biol Systems
This course will cover topics in systems biology at the molecular/cellular scale. The emphasis will be on quantitative aspects of molecular biology, with possible subjects including probabilistic aspects of DNA replication, transcription, translation, as well as gene regulatory networks and signaling. The class will involve analyzing and simulating models of biological behavior using MATLAB.
Taught by: A Raj
Also Offered As: BE 567
Activity: Lecture
1 Course Unit

GCB 585 Wistar Inst Cancer Biol
This course is intended to provide foundational information about the molecular basis of cancer. When necessary the significance of this information for clinical aspects of cancer is also discussed. The main theme centers around cell cycle checkpoints with specific emphasis on the biochemistry and genetics of DNA damage signaling pathways, DNA damage checkpoints, mitotic checkpoints and their relevance to human cancer. The course is taught by the organizers and guest lecturers from universities and research institutions in the Northeast. Following every lecture, students present a research paper related to the topic of that lecture. The course is intended for first and second year graduate students, but all graduate students are welcome to attend.
Taught by: Skordalakes and Murphy
Also Offered As: BMB 585
Activity: Lecture
1 Course Unit

GCB 699 Lab Rotation
Activity: Laboratory
1 Course Unit