GENOMICS AND COMPUTATIONAL BIOLOGY (MD) {GCB}

SM 513. (CAMB513) Evolution in Cancer. (A) Dr. Carlo Maley and Dr. Lauren Merlo. Prerequisite(s): Permission of the Instructor.

Cancers evolve by mutation and natural selection. This is the basis for both why we get cancer and why it is so hard to cure. We will survey the cancer literature through the lens of evolutionary and ecological theory and review how that theory does and does not apply to cancer biology. This course is restricted to graduate students.

This course is a graduate seminar course with both student and faculty presentations and discussions.

531. Introduction to Genome Science. (A) W. Ewens, J. Hogenesch.

This course serves as an introduction to the main laboratory and theoretical aspects of genomics and computational biology. The main topics discussed center around the analysis of sequences (annotation, alignment, homology, gene finding, variation between sequences, SNP's) and the functional analysis of genes (expression levels, proteomics, screens for mutants), together with a discussion of gene mapping, linkage disequilibrium and integrative genomics.

L/L 535. (CIS 535) Introduction to Computational Biology. (A) S.Master S.Hannenhalli. Prerequisite(s): Introductory Biology and Introductory Programming.

The course provides a broad overview of bioinformatics and computational biology as applied to biomedical research. Course material will be geared towards answering specific biological questions ranging from detailed analysis of a single gene through whole-genome analysis, transcriptional profiling, and systems biology. The relevant principles underlying these methods will be addressed at a level appropriate for biologists without a background in computational sciences. This course should enable students to integrate modern bioinformatics tools into their research program.

Should I take the course? This course will emphasize hands-on experience with application to current biological research problems. However, it is not intended for computer science students who want to learn about biologically motivated algorithmic problems; GCB/CIS/BIO536 would be more appropriate for such individuals. The course will assume a solid knowledge of modern biology. An advanced undergraduate course such as BIO421 or a graduate course in Biology such as BIOL526 (Experimental Principles in Cell and Molecular Biology), BIOL527 (Advanced Molecular Biology and Genetics), BIOL528 (Advanced Molecular Genetics), BIOL540 (Genetic Systems), or equivalent, is a prerequisite.

536. (BIOL536, CIS 536) Computational Biology. (M)

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, basi c mathematical / statistical proofs and molecular biology. Topics to be cover ed are genome annotation and string algorithms, pattern search and statistical learning, molecular evolution and phylogenetics and small molecule folding.

SM 537. (BIOL537, CIS 635) Advanced Computational Biology. (A) S. Hannenhalli, L. Wang.

A discussion of special research topics.

SM 752. (CAMB752) Genomics. (B) Dr. Riethman.

Recent advances in molecular biology, computer science, and engineering have opened up new possibilities for studying the biology of organisms. Biologists now have access to the complete set of cellular instructions encoded in the DNA of specific organisms, including dozens of bacterial species, the yeast Saccharomyces cerevisiae, the nematode C. elegans, and the fruit fly Drosophila melanogaster.

The goals of the course are to 1) introduce the basic principles involved in mapping and sequencing genomes, 2) familiarize the students with new instrumentation, informatics tools, and laboratory automation technologies related to genomics; 3) teach the students how to access the information and biological materials that are being developed in genomics, and 4) examine how these new tools and resources are being applied to specific research problems.

999. Independent Study. (C)