Genomics
HMGP 7620 and CPBS 7792 and BMGN 7620

2 unit lecture component + optional 1 unit computer lab component

Course Directors: David Pollock, Jim Sikela, and Mark Johnston

Computational Director: Jason de Koning, **Assistant Director**: JianBin Wang

TAs: Vijetha Vemulapalli, & Alex Poole

Lecturers: David Pollock, Mark Johnston, James Sikela, David Schwartz, Richard Spritz, Tzu Phang, Mark Geraci, Katerina Kechris, Jay Hesselberth, Tamim Shaikh, Sandy Martin, Todd Castoe, Jason de Koning, Kirk Hansen, Larry Hunter, Kirk Harris, Richard Davis, Matt Taylor, Ed Janoff, and Jay Hesselberth.

Lectures Tuesdays and Thursdays, 1-2:15

RC-1 South Tower, Room 6107

Purpose

This course is designed to introduce biochemistry, genetics, and other molecular-oriented graduate students (and interested faculty and postdocs) to the field of genomics. The optional computer laboratory component is designed to provide students with the minimal skills necessary to access databases, download and manipulate large datasets, and to visualize and interpret results.

Course Description

An introduction to the theory and practice of genomics. Topics include sequencing and mapping, overview of genomes, transcriptomes, bioinformatics and statistics, population-level variation, ethics, evolutionary genomics, epigenomics, proteomics, metagenomics, and functional genomics.

Course requirements

Prerequisites: A familiarity with basic biochemistry, genetics, and molecular biology. It is assumed that students may have only rudimentary training in computation and statistics.

Readings: Mostly review papers, TBA.

Access to a computer: The computational section will take place in a room with virtual unix machines at each desk. For homework, it is preferable that students should have access to a portable computer with internet access and at least 10 GB of free hard disc space. There will be web sites to visit, data to download, machines to log into to perform remote calculations, and programs to set up locally (including perl and R). Unix-based machines (Mac or Linux) are strongly preferred.

Goals for the Course

The course will familiarize students with the tools and principles of contemporary genomics. By the end of the course, students will have a working knowledge of current

genomics technology and approaches as well as the types of databases and computational tools available. Students in the optional computer laboratory will learn how to access many of those databases, use that information to design experiments, and visualize results.

This is a team-taught course. You will get a chance to meet and interact with many instructors from the Biochemistry and Molecular Genetics, Human Genomics, Computational Bioscience, and Immunology Programs. Profs. Pollock, Johnston, and Sikela are the course directors, Drs. de Koning and Wang are the computational course directors; please raise any concerns or questions about the course with them. If you have questions about the materials presented, please start by talking with the TAs.

News

Syllabus

Lectures: Overview; Overview of Genomics and The History of Life; Genome Mapping and Sequencing; Genome Annotation and Assembly; The Human Genome; Human Genome Evolution and Structural Variation; Comparative Vertebrate Genomes; Sequence Search and Databases; Transposable Elements; Genome Architecture, Segmental Duplication, and Rearrangements; Transcriptomics; Proteomics; Transcription Factor Binding; RNA Genomics; Genome Evolution and Phylogenomics; Pharmacogenomics; Epigenomics; Metagenomics; Immunogenomics; Polymorphisms, Haplotypes, Linkage Disequilibrium, and Targetted Sequencing; Genome-Wide Association Studies; Human Genome Polymporphism and Association Studies; Epidemiology and Viral Genomics; Functional Genomics; Social Impact of Genomics.

Workshop: Unix and Perl; Database Extraction; Managing High-Throughput Data; Sequence Analysis; Transcript and Proteomics analysis; Genome Assembly and Mapping; Visualization;

Grading

Grading will be largely on the basis of problem sets and 2 tests for the seminar course, and on the basis of goal-oriented and interactive problem sets for the computational section.

Honor code

The Graduate School requires that this honor code be included in all course syllabi.

Education at the University of Colorado, Denver is conducted under the honor system. All students who have entered health professional programs should have developed the qualities of honesty and integrity, and each student should apply these principles to his or her academic and subsequent professional career. All students are also expected to have achieved a level of maturity, which is reflected by appropriate conduct at all times.