

L504: INTRODUCTION TO GENOME BIOLOGY FOR PHYSICAL SCIENTISTS

Instructor: Sukamol S Jakobsson

Meeting: 1:00 – 2: 15PM, Tuesday/Thursday, Myers Hall 209

Office hour: Friday 1:30-2:30 PM. Room 1013 Eigenmann

General Description

The aim of this course is to introduce the ideas of molecular biology and genetics. It is designed to meet the needs of graduate students in physical and informatics sciences who intend to pursue research in the biological area. The course will be focused mainly on the basic concepts of molecular biology, namely, what biological molecules are and how they function in an organism. It will also introduce you to the current molecular technologies being used to study these molecules, and to the research questions being asked by biologists. After taking this class, students should expect to be able to communicate with biologist collaborators, be able to read and understand biological literature, and be able to understand the research questions being asked and why they are being asked.

Prerequisites

There is no particular requirement; however, you are expected to be able to recall your high school level biology and chemistry.

Reading suggestions

- Alberts B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P. (2002) *Molecular Biology of the Cell*. (4th ed.) Garland Sciences. New York.

This is an excellent textbook, but rather expensive. However, it can be accessed for free at [NCBI](http://www.ncbi.nlm.nih.gov/pmc/books/mb12248/).

- Campbell, N.A. & Reece, J.B. (2005). *Biology* (7th ed.). San Francisco, Benjamin Cummings

This is a good general biology book. Units 1- 4 should provide a good general background for the lecture topics in this course. This book is on reserves at the LIFESCI library, and can probably be purchased used from many vendors.

You are not required to purchase these books for the class. Lecture material will be provided prior to each meeting.

Assignment and Exam

There will be two take-home assignments. Occasionally, quizzes will be given at the beginning of class. There are two exams; one midterm and one final.

Credit distribution: Midterm exam- 30%, Final exam – 30%, Quizzes (4) – 20%, Journal assignments (2) – 20%

Course outline

I. Introduction to molecular biology

An overview: How biological molecules function in organisms, and how that lead to evolution, and differentiation of organisms? What are genetic materials? How do they work? What have been studied and why?

II. Cell

Introduction to the cell: Cell structure. What are the organelles, and how do they function? How do cells obtain energy: mitochondria and chloroplasts? What are the important molecules and reactions in the cell?

III. Chromosome, DNA and RNA

We will look at structures of the chromosome, chromatin, and DNA/RNA, the chromosome theory, and cell division. What is Mendelian genetics? How do DNA replicate, repair, and recombine? How does the cell function through reading genetic codes? How are genes turned on and off in the cell?

IV. Proteins

You will be introduced to structures of proteins and their roles in protein function. You will learn how biologists determine protein structures. Important groups of proteins will also be discussed.

V. Molecular biology techniques

- What is a model organism?
- Review of current molecular techniques and how they are being used in biological studies.

VI. Topics in molecular biology

We will look at some of the biological research areas that benefit greatly from the rapid advance in genomic technology. We will also review the questions being asked by researchers, and how the latter go about in their search for the answers.