Biology 480

Introduction to Mathematical Modeling in Biotechnology, Cell Biology, and Physiology

Spring 2011
CRN 27312 (lecture—3 credits))/CRN 27422 (lab—1 credit)
Lecture MWF 9-9:50 Science A 460/ Lab T 12-2:50 BSS 313
Instructors: Dr. Bori Mazzag and Dr. Kami Larripa
The course will also have a Graduate Assistant, Michael Stobb.
Bori's contact information: borim@humboldt.edu, BSS 338, office hours Tuesday 11-11:50, Wednesday 3-5, Friday 10-11:50.
Kami's contact information: krl23@humboldt.edu, BSS 227, office hours Monday, Wednesday, Friday 10-10:50.

Description:

The course is a mathematical and computational exploration of five diverse areas of biology: human locomotion, gene sequence analysis, signal transduction pathways involved in cancer, neurophysiology and neuroanatomy. Each biological topic will be introduced by a guest speaker whose research is relevant to the given topic. We will cover simple mathematical techniques to quantify such systems, and discuss how to describe the key components of a biological process mathematically. The course will emphasize the relevance of mathematical and computational tools to approaching biological questions and how to interpret mathematical results in the context of these problems. Key mathematical concepts of the course are: integration, phase-plane analysis and introductory notions from graph theory. The course is accompanied by a weekly 3-hour computer lab. Prerequisites of the course are Math 105 and Biology 105 or instructor's approval.

Guest Speaker Schedule

Human Locomotion: Monday, Jan. 24 9-9:50 am, Sci A 460
Neuroanatomy: Friday, Feb. 11, 9-9:50 am, Sci A 460
Neurophysiology: Wednesday, March 2, 9-9:50 am, Sci A 460
Signal Transduction: Monday, March 28, 9-9:50 am, Sci A 460 (date and time to be confirmed)
Gene Sequence Analysis: Tuesday, April 19, noon-1 pm, BSS 313

Grading

Grading will be done in the following way:

Midterm Exam (Friday before spring break, 3/11/11)—15% of course grade

We will have one written midterm exam. Problems will be similar to those done as examples in lecture or assigned in homework. More information to come, as well as guidance on what to study. Please make travel plans accordingly.

Written Homework Exercises—20% of course grade

You will have written exercises assigned throughout the course. Homework will be collected at the end of each module, and a select number of problems will be graded. Homework needs to be neat, organized, and attached if it is more than 1 page. It's okay to write math exercises by hand, but any discussion questions or other writing needs to be typed. No late work, please.

Lab Assignments—20% of course grade

Labs will introduce you to some software packages used in mathematical modeling of biological systems, such as Matlab and Graphviz. This course assumes no prior familiarity with the software or computing. You will have a weekly lab session with assignments. Lab assignments will be typically due by Friday, 5 pm. Assignments will be submitted electronically, via moodle. Lab assignments will also be posted on moodle (please note that the lab moodle site is separate from the course moodle site).

Class Participation/Preparedness/Questions for Discussion —20% of course grade

This is a specialty course in which five scientists are giving their time to present their current research. Attendance is mandatory at all guest speaker lectures, and we expect you to be engaged, thoughtful, polite and inquisitive during those talks. At the end of each module, two class sessions will be devoted to discussing the module's assigned journal article. Two students will be responsible for leading these discussions (we will rotate through students, and will make assignments during the first week or two of class). Your participation in these discussions is expected. Please come prepared and contribute. For each module, please prepare a list of questions about the journal article to guide the discussion (to be turned in and graded).

Our first guest speaker will lecture on Monday, 1/24/11. The five guest lectures are scheduled, but it is possible that they may change. If so, we will let you know as soon as possible.

Because this course is funding by a grant, we are required to do a brief online student survey at the end of each module. Participation is mandatory.

Project/Presentation—25% of course grade

The course will culminate in student projects and presentations. More information to come. The presentations will either be during the last few lectures of the course, or during our HSU scheduled final exam time (Monday May 9, 8-9:50). Please make travel arrangements accordingly. We will have a better sense of the exact timing towards the end of the semester.