

MATH 4397: Mathematical Biology

Lectures: MW 4 – 5:30 in PGH 350

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Prerequisites:

Two semesters of calculus, differential equations and linear algebra.

Text:

Ellner and Guckenheimer: *Dynamical Models in Biology* (Princeton University Press)
Britton: *Essential Mathematical Biology* (Springer)

Topics Covered:

Mathematical modeling is of increasing importance in the biological and medical sciences. This course focuses on various models of biological processes using ordinary differential equations and probabilistic techniques. We will look at models in molecular and cell biology, physiology, neuroscience, ecology and epidemiology. Topics covered include the Hodgkin-Huxley model of electrical activity, Michaelis-Menton theory, continuous and discrete population interactions, biological oscillators, aspects of network theory, and the dynamics of infectious diseases.

Computers:

There will be several computational challenges that will require the use of Matlab. I will give assignments from Cleve Moler's book, which can be found here:

<http://www.mathworks.com/moler/chapters.html>

You will need to learn the basics of Matlab on your own. Here are a couple of tutorials to get you started

<http://www.math.ufl.edu/help/matlab-tutorial/>

<http://www.math.utah.edu/lab/ms/matlab/matlab.html>

The first assignments will also involve some basic Matlab programing. These should take a relatively short time to go over.

How to get in touch with me:

The best way to get in touch with me is by e-mail. Use it if you have a question that can be answered quickly, or need to set up an appointment.

Homework:

There will be 4 homework assignments during the semester. You are free to work together on the homework sets, however the work you turn in must be your own. In other words you are encouraged to work together on solving the problems, but not to copy the solutions from other students. To insure that this is the case, *write up the solutions on your own*, and not in a group. **I will hold you to this standard, and if will investigate any cases of plagiarism.**

The homeworks will be worth 20% of your grade.

Project:

There will be a research project for the course. You will be able to choose your own topic (as long as it is within the scope of the course). There will also be a set of potential projects that will be available from the instructors.

The topic will be decided in consultation with the instructor. You will also prepare a short oral presentation on the paper to the class. Papers will be submitted both electronically (in .doc, .rtf or .pdf format) and as a hard copy. Presentations will be submitted in .ppt, .key or .pdf format. Submitted papers and presentations become the property of the class and may be given to future classes as examples (with your identifying information removed).

Separate guidelines for the assignments will be provided.

Attendance:

Attendance is strongly encouraged.

Reading Assignments:

Reading assignments from the textbooks will be indicated in the course schedule. You will be expected to read the assigned chapters carefully, ahead of time and to participate in the discussions in class.

Grades:

Grades will be assigned on the following basis:

- 5% class participation
- 35% project
- 30% homework
- 30% final exam

Please see the schedule for the dates of the exams.

Academic Honesty:

Dishonesty includes cheating on your homework, falsifying data, and misrepresenting the work of others as your own (plagiarism). I will take all instances of academic dishonesty very seriously. I urge you to read the sections of the student handbook discussing academic dishonesty and the disciplinary actions it entails.