

Math 227A, Mathematics and Computational Biology

Fall 2016 Syllabus

Course Code:	45060	Instructor:	Germán A. Enciso
Room:	RH 340P	Email:	enciso@uci.edu
Day and Time:	MWF 11am-11:50am	Office Hours:	MW12pm-12:50pm, RH 440E
Class Website:	https://eee.uci.edu/16f/45060	TA:	n/a

Texts:

- 1) *Nonlinear Dynamics and Chaos*, Steven Strogatz, Perseus, 1994.
- 2) *Mathematics useful in the biological sciences*, ordinary differential equations, Fred Y.M. Wan, lecture notes written for this course.

Premise of the Course: This course should not be confused with a course on models in mathematical biology. Rather, it is intended as an introduction to the main mathematical concepts that lie behind many of these models. The goal is to develop an appreciation for dynamical systems, and to learn what analytical tools are available to study them.

We will use as texts the book by Strogatz and the lecture notes of prof. Wan, covering basic behavior of dynamical systems in 1D and multiple dimensions. In the second part of the course we will cover boundary value problems. As time allows, we can also talk about related subjects such as hysteresis, relaxation oscillations, the mathematics of chemical reaction networks, or calculus of variations. We won't have time to treat at length the most famous mathematical biology models but I will try to describe them (or at least simplified versions) as a motivation before they are treated in more detail in future courses.

Homework Assignments: In mathematics graduate programs, the first year is usually considered a challenging period where students catch up on skills and work long hours on homework problems each week. This course will be taught in that spirit, and there is a weekly homework assignment due on Friday at the beginning of the lecture. The HW due each week corresponds to the sections that were covered in class during the three lectures (MWF) of the previous week. No late or missed homeworks will be accepted, however the lowest HW grade for each student will be dropped. It is possible that only a subset of the HW problems will be graded (but you won't know which ones!). You are welcome to work together in groups for the HW, for instance if you come from a biology background and work together with a more computational student. However, each student should write up and submit their own answers.

Tentative Topics and Reading Material

0	23-Sep	Analytical 1D Methods	Wan, Sections 1.1-1.5
1	9/26-9/30	Geometrical 1D Methods	Strogatz 2.0-2.6, 3.0-3.4,3.7
2	10/03-10/07	Linear Systems	Strogatz 5.0-5.2, 6.0-6.3 Wan 4.4 (Jordan)
3	10/10-10/14	Nonlinear Systems	Strogatz 6.0-6.4, 6.8
4	10/17-10/21	n-D Bifurcations, degree theory	
5	10/24,10/26	Monotone Systems, Review	
	28-Oct	Midterm Exam	
6	10/31-11/04	Boundary Value Problems	Wan, Chapter 6
7	11/07,11/09	Green's Function	Wan, Chapter 6
	11-Nov	Veterans Day	
8	11/14,11/16	Geometric Singular Perturbation	
9	11/18-11/23	Chemical Reactions, Deficiency	
	25-Nov	Thanksgiving	
10	11/28,11/30		
	2-Dec	Review	
	9-Dec	Final Exam, 8am-10am	

Grading Policy: This is the breakdown of the grades for this quarter:

Final Exam	35%
Midterm	25%
Homework	30% (lowest grade dropped)
Class participation:	10%

Midterm and Final Exam: You may **not** use any calculators, cell phones, iphones, etc. or any notes for exams that take place in the classroom.

Academic Integrity: Students are responsible for informing themselves of UCI's policies regarding academic dishonesty. Students found in violation of the code are subject to penalties ranging from loss of credit for work involved to a grade of F in the course, and possible risk of suspension or probation. The academic dishonesty policy will be enforced in all areas of the course, including homework, quizzes, and exams. For more information about the academic dishonesty policy and procedures, including information about your rights and responsibilities as a student, see <http://www.editor.uci.edu/catalogue/appx/appx.2.htm> .