

# Math 5110/6830: Mathematical Biology

## Fall Semester 2006

**Lectures:** Tuesday-Thursday 12:25 pm-1:45 pm, LCB 225  
**Instructor:** Alla Borisyuk  
**Office Hour:** (tentative) Monday 1:00 pm - 2:00 pm in LCB 303  
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**Office Hours:** TBA

**Text:** the class notes are supposed to be self-sufficient, however, most of it will be a combination of material from the following books:

- L. Edelstein-Keshet *Mathematical Models in Biology*  
<http://ec-securehost.com/SIAM/CL46.html>
- G. de Vries, T. Hillen, M. Lewis, J. Muller, and B. Schoenfisch  
*A Course in Mathematical Biology: Quantitative Modelling with Mathematical and Computational Methods*  
<http://www.ec-securehost.com/SIAM/MM12.html>

These books will be on reserve in the math center. I may add other references as needed.

**The Course.** Math 5110 is designed to introduce the mathematically apt to some of the basic models and methods of mathematical biology. No previous knowledge of biology is necessary, but strong calculus is a must, some knowledge of ODEs is desirable.

The first semester covers models of population dynamics, reaction kinetics, diseases, and cells that can be written as ordinary differential equations, and discrete-time dynamical systems. Class notes are intended to be self-contained for these topics.

**Homework.** Written homework will be handed out at almost every lecture (and posted on the web page) and due the following Tuesday. Part of class each Tuesday will be used to work out any homework problems that caused widespread confusion. Homework will be worth 25% of your grade. Feel free to consult other students, but only after thinking hard about the problems yourself.

**Computing:** The students will be expected to work with Matlab for some of the assignments. You will have access to the math departments' computer system, including all software. There will be some Matlab training provided.

**Tentative test dates.** There will be two midterms, on October 3 and November 21, each worth 25% of your grade, and a comprehensive final worth 25% of your grade.

### Tentative course outline

Week of	Topic	Similar chapters
August 24	Introduction to mathematical biology	
August 29	Linear discrete-time models	EK ch1
Sept 5	Non-linear scalar discrete-time models	EK 2.1-2.6; dV 2.2
Sept 12	Systems of non-linear discrete time eqns	EK 2.7-3.5; dV 2.3
Sept 19	Applications of difference equations	
Sept 26	Review	
Oct 3	Midterm 1	
Oct 10	Examples of continuous models	EK ch4; dV 3.1-3.3
Oct 17	Geometric approach to model analysis	EK ch5; dV 3.4
Oct 24	Bifurcations	dV 3.7
Oct 31	Excitable systems	EK ch8
Nov 7	Cellular/Molecular events	EK ch7
Nov 14	Review	
Nov 21	Midterm 2	
Nov 28	Supplementary material/Projects/	
Dec 5	Final Preparation	

**ADA statement.** The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.