

**Math 5110/6830: Mathematical Biology**  
**Fall Semester 2009**

**Lectures:** TH 12:25 pm-1:45 pm, LCB 225

**Instructor:** Alla Borisjuk

**Office Hours:** (tentative) Tuesday 9:30-10:30 am in LCB 303

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**Office Hours:** Monday 4 to 5 in LCB 115

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

- (EK) L. Edelstein-Keshet *Mathematical Models in Biology*.

<http://ec-securehost.com/SIAM/CL46.html>

- (dV) G. de Vries, T. Hillen, M. Lewis, J. Muller, and B. Schoenfish . *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 at the beginning of the class. 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 8 and November 19, each worth 25% of your grade, and a comprehensive final worth 25% of your grade.

**Extra-credit and 6830 requirements:** Occasionally extra-credit homework problems will be given. These are required for students registered for 6830, and optional for all others. The students who do well on these problems will be allowed to do a fun class project, instead of a final, in the last week or so of class.

### Tentative course outline

Dates	Topic	Chapters (as an idea only; actual material covered will differ; come to class!)
August 25 August 27	Introduction to mathematical biology Intro to Matlab (LCB 115)	
September 1,3	Linear discrete-time equations	EK: ch 1
September 8,10	Non-linear scalar discrete-time equations	EK: 2.1-2.6; dV: 2.1,2.2
September 15,17	Systems of non-linear discrete-time equations. Applications	EK: 2.7-2.9, 3.3-3.4, dV: 2.3
September 22,24	Examples of continuous models	EK ch4; dV 3.1-3.3
Sep. 29, Oct.1	Geometric approach to model analysis	EK ch5; dV 3.4
October 6, 8	Review and <b>Midterm</b>	
October 20, 22	Bifurcations	dV 3.7
October 27, 29	Applications: Population and disease dynamics	
November 3, 5	Applications: Cellular/Molecular events	EK ch7
November 10, 12	Applications: Excitable systems	EK ch8
November 17, 19	Review and <b>Midterm</b>	
December 1,3,8,10	Supplementary material/Projects/ 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