BIOMathematics 300 "Modeling Techniques in the Life Sciences" - Fall 2006

Instructor:
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Teaching Assistant:
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Meeting time & place:
Lectures: Slot 21: (M 2:30-3:30), (T 4:30-5:30), (Th 3:30-4:30)
JEFF 225

Lab: W 2:30-4:30 (other hours TBA)
Keyser computer lab on the second floor of Jeffery Hall.
First Lab is on Monday September 18.

Course Web Site: http://www.mast.queensu.ca/~tday/BIOM300/300Home.html

A copy of this syllabus, along with lecture material and any other important information can be found on the course web site. To access the site you will need the following login name and password:

Login: *lebowski*
Password: *dude*

Text: The textbook for the course is one that is about to be published by Dr. Sarah Otto (U. British Columbia) and me. Currently, you can access a copy of the text using the link on the course webpage. To do so, you will also need a login and password for the textbook website (Login: guest, Password: discover).

Course requirements and grading:

- 8 assignments worth a total of 30%
- Take home midterm worth a total of 20%
- Final Exam worth 40%
- Computer lab participation worth 10%

Brief description: The course covers mathematical techniques that are frequently used in biological modeling, particularly as it pertains to ecology and evolutionary biology. The material presented will center on how to formulate and construct sensible mathematical models for biological processes, how to obtain numerical solutions of the model, and how to use various mathematical techniques for analyzing the models in both discrete- and continuous-time. The course will introduce all techniques in the context of biological problems and examples, and will emphasize how to use mathematics to better understand biology.

The lab is centered around the software package *Mathematica* (Wolfram Research). Many of the calculations involved in analyzing the models presented in class can be done using this program, and the package also allows approximate solutions to be found numerically when exact analytical solutions are impossible. Mathematica also has extensive facilities for visualizing results using graphs.

Tentative Course Schedule:		Assgn	LAB	Lecture
Sept. 11	Chapter 1 – Introduction to mathematical biology			1
Sept. 12	Chapter 2 – How to construct a model			2
Sept. 14	Primer 1/Chapter 2 – How to construct a model			3
Sept. 18	Chapter 2 – How to construct a model		L1	4
Sept. 19	Chapter 2 – How to construct a model			5
Sept. 21	Chapter 3 – Classic models in E&E	A1 out		6
Sept. 25	Chapter 3 – Classic models in E&E		L2	7
Sept. 26	Chapter 3 – Classic models in E&E	A2 out		8
Sept. 28	**Class Canceled**			
Oct. 2	Chapter 3 – Classic models in E&E		L3	9
Oct. 3	Chapter 4 – Numerical and graphical techniques	A3 out		10
Oct. 5	Chapter 4 – Numerical and graphical techniques			11
Oct. 9	**Thanksgiving** –		L4	
Oct. 10	Chapter 5 – Finding equilibria/stability			12
Oct. 12	Chapter 5 – Finding equilibria/stability	A4 out		13
Oct. 16	Chapter 5 – Finding equilibria/stability		Tutorial	14
Oct. 17	Chapter 5 – Finding equilibria/stability			15
Oct. 19	Chapter 6 – General solutions/transformations	MT out		16
Oct. 23	Primer 2/ Chapter 7 – Analyzing linear models		L5	17
Oct. 24	Chapter 7 – Analyzing linear multiple-variables			18
Oct. 26	Chapter 7 – Analyzing linear multiple-variables	No Assign.		19
Oct. 30	Chapter 7 – Analyzing linear multiple-variables		L6	20
Oct. 31	Chapter 7 – Analyzing linear multiple-variables			21
Nov. 2	Chapter 8 – Nonlinear multiple-variable models	MT in/A5 out		22
Nov. 6	Chapter 8 – Nonlinear multiple-variable models		L7	23
Nov. 7	Chapter 8 – Nonlinear multiple-variable models			24
Nov. 9	Chapter 8 – Nonlinear multiple-variable models	A6 out		25
Nov. 13	Chapter 9 – General solutions and transformations		L8	26
Nov. 14	Chapter 9 – General solutions and transformations			27
Nov. 16	Chapter 10 – Class-structured populations	A7 out		28
Nov. 20	Chapter 10 – Class-structured populations		L9	29
Nov. 21	Chapter 10 – Class-structured populations			30
Nov. 23	Chapter 11 – Evolutionary invasion analysis	A8 out		31
Nov. 27	Chapter 11 – Evolutionary invasion analysis		Tutorial	32
Nov. 28	Chapter 11 – Evolutionary invasion analysis			33
Nov. 30	Chapter 11 – Evolutionary invasion analysis			34