BIOM 300 "Modeling Techniques in Biology" - Fall 2008

Instructor:
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Teaching Assistant:
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Meeting time & place:
Lectures: Tues 8.30-9.20am; Wed 10.30-11.20am; Fri 9.30-10.20am.
JEFF 225
Lab: Mon 10:30-11:30 (other hours TBA) in JEFF 220. The first labs will commence during the week beginning Sept 15th.

Course webpage: http://www.mast.queensu.ca/~ahurford/BIOM300.html
A copy of this syllabus, along with assignments any other important information can be found on the course website.

Textbook: Otto, S. P & T. Day. 2007. *A biologist's guide to mathematical modeling in ecology and evolution*. Princeton University Press. USA.
Textbook webpage: http://www.zoology.ubc.ca/biomath/

Course requirements and grading:
- 8 assignments worth a total of 25%
- 1 cumulative assignment worth a total of 5%
- 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**
Sept. 9	Chapter 2 – How to construct a model		
Sept. 10	Chapter 2 – How to construct a model		
Sept. 12	Primer 1/Chapter 2 – How to construct a model		
Sept. 16	Chapter 2 – How to construct a model		L1 - Intro
Sept. 17	Chapter 3 – Classic models in E&E		
Sept. 19	Chapter 3 – Classic models in E&E	A1	
Sept. 23	Chapter 3 – Classic models in E&E		L2 - Functions
Sept. 24	Chapter 3 – Classic models in E&E		
Sept. 26	Chapter 4 – Numerical and graphical techniques	A2	
Sept. 30	Chapter 4 – Numerical and graphical techniques		L3 - Simulations
Oct. 1	Chapter 5 – Finding equilibria/stability		
Oct. 3	Chapter 5 – Finding equilibria/stability	A3	
Oct. 7	Chapter 5 – Finding equilibria/stability		L5 – Local stability
Oct. 8	Chapter 5 – Finding equilibria/stability		
Oct. 10	Chapter 6 – General solutions/transformations	A4	
Oct. 14	Chapter 7 – Analyzing linear models		Thanksgiving
Oct. 15	Midterm on Chapter 1-6.		
Oct. 17	Primer 1 – Linear algebra (optional).		
Oct. 21	Chapter 7 – Analyzing linear multiple-variables		L7b – Matrices/MVLS
Oct. 22	Chapter 7 – Analyzing linear multiple-variables		
Oct. 24	Chapter 7 – Analyzing linear multiple-variables	A5	
Oct. 28	Chapter 7 – Analyzing linear multiple-variables		L8 – Linear MVM
Oct. 29	Chapter 8 – Nonlinear multiple-variable models		
Oct. 31	Chapter 8 – Nonlinear multiple-variable models	A6	
Nov. 4	Chapter 8 – Nonlinear multiple-variable models		L9alt – Solving DEs
Nov. 5	Chapter 8 – Nonlinear multiple-variable models		
Nov. 7	Chapter 9 – General solutions multiple-variables	A7	
Nov. 11	Chapter 9 – General solutions multiple-variables		L10 – Lotka-Volterra
Nov. 12	Chapter 9 – General solutions multiple-variables		
Nov. 14	Supplementary material – Parameterization	A8/CA out	
Nov. 18	Supplementary material – Parameterization		LA1 – Parameterization
Nov. 19	Supplementary material – Model Validation/selection		
Nov. 21	Chapter 10 – Class structured models		
Nov. 26	Chapter 10 – Class structured models		LA2 – Validation
Nov. 27	Supplementary material – R_0		
Nov. 28	Chapter 1 – Modeling objectives	CA in	