BIOL 560
Models in Ecology
Current Problems in Ecology, Section B2
Winter Semester, 2003

Time and Place:	TH, 11:00 AM, BIOL M137
Instructor:	Mark A. Lewis
Office:	B326 BIOL
email:	mlewis@math.ualberta.ca
Office Hours:	H 12:30–2:00 PM
Text:	James W. Haefner *Modeling Biological Systems*
Computer:	We will be using Excel for programming the models.

The Course. Biol 560 is a one-semester course designed to introduce ecology graduate students to the processes involved in modeling. The contents will chosen from:

1. Model formulation: modeling philosophy, modeling process, qualitative and quantitative model formulation
2. Model analysis: simulation paradigms, numerical techniques, qualitative analysis, sensitivity analysis
3. Parameter estimation
4. Model validation: confronting models with data.
5. Stochastic models
6. Optimality models: game theory, evolutionarily stable strategies, nash equilibria, dynamic programming
7. Applications: populations and individuals spatial patterns and processes

When you have completed the course you should be able to formulate and analyse quantitative (mathematical or computational) models for ecological processes, should know how to parameterize the models and how to confront them with data in a statistically meaningful way. This is a discussion-based course. However instructional lecturing is also needed so as to introduce concepts, methods and so forth. The balance between my lectures and student-led class discussion will be about 50-50.

Prerequisite. At least one 400-level ecology course. I will assume also that you have seen (and can revisit) first year calculus, and elementary statistical methods such as linear regression. If you don't have these, please see me.

Class Structure. The first twenty or so classes will be structured to have 45 minutes of lecture, 5 minutes break, followed by a 30 minute student-led class discussion. The last 5 classes will

be a 35-minute student pair project presentation, followed by a 10 minute break, followed by another 35-minute student pair project presentation.

Student-led class discussion. Each of these 30-minute discussions is to be based on a reading assigned to the class the week before. You are responsible for presenting the main ideas of the reading, and for moderating the class discussion. Each student is in charge of one discussion.

Homework. Homework problems will be suggested throughout the course (approximately one-two problems per lecture, starting in the second week of the course). You are asked to solve 10 of these problems from the first half of the course and 5 from the second half. The first set of solutions is due on **Feb 13**; the second set is due on **March 27**.

Project The class project will be based on work done by pairs of students. The goal is to apply methods and techniques learned in class to a specific research problem. A project proposal, report, and class presentation are needed. Each member of the pair needs to contribute equally to the project. This is one way to learn from each other. The project proposal is due **Feb 27**. The project report is due **April 8**.

Other discussion I have set up WebCT. You can access the course from the WebCT home page (http://www.ualberta.ca/webct/) under "Course Listing". There will be a chat room to discuss readings, assignments etc. When you post questions there, I will also participate. All students are also expected to contribute to class interactions in the student-led class discussion (above). Expect to make at least one significant contribution to each of these forums on a weekly basis.

Grading. The breakdown of the grades is as follows: leading class discussion 15%, homework 40%, project 40%, other discussion 5%. The project is broken down into proposal 5%, report 25%, and presentation 10%.

A percentage will be calculated and it will be translated into a grade according to a preassigned scale: 9: 90+, 8: 80–89, 7: 70–79, 6: 60–69, 5: 50–59 and so on.

Supplemental Texts

1. R. Hilborn and M. Mangel, *The Ecological Detective*
2. K.P. Burnham and D.R. Anderson *Model selection and multimodel inference*
3. T.M. Donovan and C.W. Welden *Spreadsheet exercises in ecology and evolution*
4. W.S.C. Gurney and R.M. Nisbet *Ecological Dynamics*
5. D. Brown and P. Rothery *Models in Biology: Mathematics, statistics and computing*