

# EEB610: Introduction to Mathematical Models

**Instructor:** Michael A. Gilchrist

**Office Hours:** 11:30- 12:30 T R and by appointment

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**Instructor:** Tom Hallam

**Office Location:** 401D Austen Peay

**Office Hours:** By appointment

**Email:** hallam@tiem.utk.edu

**Time:** T R 9:40AM - 10:55AM

**Location:** Lectures: 440 HBB, Computer Labs 424 HBB

## Course Overview

This course is an introduction to the basic mathematical models and tools used in population biology. The goal of this class is to provide empirically focused graduate students with a fundamental understanding of the different forms and behavior of the set mathematical models that are the theoretical foundations of modern ecology. Models to be covered include: exponential, logistic, and age structured models of population growth, metapopulations, inter-specific competition, and predation. The effect of discrete vs. continuous time will also be examined in a few specific cases. The tools for analyzing these models will include analytical, graphical, and numerical techniques.

### Textbooks:

Gotelli (2001) *A Primer of Ecology* 3<sup>rd</sup> Edition

Donovan & Welden (2002) *Spreadsheet Exercises in Ecology & Evolution*.

Available online at: <http://www.uvm.edu/envnr/vtcfwru/spreadsheets/>

### Website:

The course website is at [www.tiem.utk.edu/mikeg/eeb610.html](http://www.tiem.utk.edu/mikeg/eeb610.html) and will be the source for updated syllabi, readings, course schedule, and problem sets.

**Prerequisites:** Calculus (though only a vague recollection will be assumed) and some experience with Excel.

## Course Overview

This course is designed as an introduction to basic models and modeling techniques used in biology. The models will be presented from an 'ecological' perspective, but the models themselves can be applied to many other areas of biology. The course is structured as an integrated mixture of lectures and spreadsheet based computer labs and the pace will be set largely by the ability and participation of the students.

The goal of the course is to help students

Develop better quantitative intuition

Increased understanding of theory literature and ability to

- Identify model class
- Interpret model equations
- Understand key assumptions
- Evaluate model results

Incorporate theory into their research

Students are expected to actively participate in lectures by asking questions and be willing to make mistakes in lecture, lab, and homework assignments. Students will be evaluated based on class participation and completion of course assignments. Four homework assignments primarily using questions from Gotelli (2002) and Donovan & Welden (2002) will also be assigned. A final project in which students take one of the models we encounter in class or in their subdiscipline and modify it based on their research interests. Modification will be done in consultation with instructors and students write up a short paper ~ 10 pages comparing and contrasting behavior with original model.

## Course Schedule

Date	Topic	Instructor	Readings	
Aug 23	Th	Introduction & Single Population Growth: Discrete time	Gilchrist	
Aug 28	Tu	Computer Lab: Spreadsheet Intro & functions	Gilchrist	D&W: Ch. 1-2
Aug 30	Th	Single Pop. Growth: Continuous time	Gilchrist	G: preface and p. 1-14
Sept 4	Tu	Computer Lab: Single Population Growth	Gilchrist	D&W: Ch. 7
Sept 6	Th	Single Population Growth:Stochasticity & Extinction	Gilchrist	G: p. 13-23
Sept 11	Tu	Computer Lab: Demographic Stochasticity	Gilchrist	D&W: Ch. 27
Sept 13	Th		Hallam	
Sept 18	Tu		Hallam	
Sept 20	Th		Hallam	
Sept 25	Tu		Hallam	
Sept 27	Th		Hallam	
Oct 2	Tu		Hallam	
Oct 4	Th		Hallam	
Oct 9	Tu		Gilchrist	
Oct 11	Th	Fall Break		
Oct 16	Tu		Gilchrist	
Oct 18	Th		Gilchrist	
Oct 23	Tu		Gilchrist	
Oct 25	Th		Gilchrist	
Oct 30	Tu		Hallam	
Nov 1	Th		Hallam	
Nov 6	Tu		Hallam	
Nov 8	Th		Hallam	
Nov 13	Tu		Hallam	
Nov 15	Th		Gilchrist	
Nov 20	Tu		Gilchrist	
Nov 22	Th		Gilchrist	
Nov 27	Tu		Gilchrist	
Nov 29	Th	Thanksgiving Break		
Dec 4	Tu		Gilchrist	