Theoretical Ecology – WILD 595

Fall Semester 2018

Instructor: Dr. Angie Luis (angela.luis@umontana.edu)

Suggested Readings

> *An Illustrated Guide to Theoretical Ecology*, Ted Case
> *A Primer of Ecology*, Nicholas Gotelli
> Additional readings will be assigned

Tentative Class meeting times:

Lecture/ Lab	MW	8:30-9:50	Clapp 452
Discussion	R	3:00-3:50	Clapp 452

Office Hours

> Mondays & Wednesdays 1-1:50 or by appointment, FOR 207A

Overview

This class is meant to provide a general toolbox of ecological modeling approaches. It will be more about how to model than about models themselves, but in illustration we will cover a variety of commonly used ecological and evolutionary models, ranging from behavior of individuals (optimality, game theory) to populations (structured and unstructured, logistic growth, matrix models) to communities (competition, predation, parasitism). The focus will be on formalizing conceptual ideas into a mathematical framework, and will not deal heavily with data. (Of course, data is important, but other courses here concentrate on data and model fitting.) This course will give you the skills to help comprehend theoretical papers and to create your own models. The course is a mix of lecture, lab (in R), case studies, and discussion. There will be a fairly high work load (hence 4 credits), with 2 lab assignments due most weeks, weekly readings, and will culminate with a project in which you will design a model for some aspect of your study system. The intention is for the project to be a chapter of your thesis/dissertation or a side-project that could be published. There is also potential for group projects. You will be able to drop 4 lab assignments.

Tentative Schedule

		Lecture/Lab	Case Study
	Week 1		
27-Aug	Monday	Organizational and Introductions	
29-Aug	Wednesday	Introduction to Ecological Modeling	
30-Aug	Thursday		Ecological Detective- Ch 2
	Week 2		
3-Sep	Monday	**NO CLASS - Labor Day**	
5-Sep	Wednesday	Simple optimality- Lack Clutch	
6-Sep	Thursday		TBD
	Week 3		
10-Sep	Monday	Optimal Foraging	
12-Sep	Wednesday	Stochastic Dynamic Programming & Optimality	
13-Sep	Thursday		Optimal prey selection
	Week 4		
17-Sep	Monday	Stochastic Dynamic Programming & Optimality	
19-Sep	Wednesday	Game Theory 1 - Hawk/Dove game	
20-Sep	Thursday		Game Theory
	Week 5		
24-Sep	Monday	Game Theory 2 - Parental Care game	
26-Sep	Wednesday	Populations- Unstructured Models	
27-Sep	Thursday		TBD
	Week 6		
1-Oct	Monday	Age Structure	
3-Oct	Wednesday	Matrix models	
4-Oct	Thursday		Matrix model
	Week 7		
8-Oct	Monday	Density Dependence, Equilibria, Stability	
10-Oct	Wednesday	Stochastic population models	
11-Oct	Thursday		Stochasticity
	Week 8		
15-Oct	Monday	Stochastic & individual-based models	
17-Oct	Wednesday	Metapopulations	
18-Oct	Thursday		Metapopulations
	Week 9		
22-Oct	Monday	Communities- competition	
24-Oct	Wednesday	Competition - R*	
25-Oct	Thursday		Competition
	Week 10		
29-Oct	Monday	Lotka-Volterra Predator-Prey	

31-Oct	Wednesday	Predator-Prey Continued	
1-Nov	Thursday		predator-prey
	Week 11		
5-Nov	Monday	Present Ideas/Model Structures for Projects	
7-Nov	Wednesday	Apparent Competition	
8-Nov	Thursday		Class Exercise
	Week 12		
12-Nov	Monday	**NO CLASS - Veterans' Day**	
14-Nov	Wednesday	Host-Microparasite	
15-Nov	Thursday		Disease
	Week 13		
19-Nov	Monday	Harvest	
21-Nov	Wednesday	**NO CLASS - Thanksgiving**	
22-Nov	Thursday	**NO CLASS - Thanksgiving**	
	Week 14		
26-Nov	Monday	Community stability	
28-Nov	Wednesday	Open	
29-Nov	Thursday		control of diversity
	Week 15		
3-Dec	Monday	Student Project Presentations	**Manuscripts DUE**
5-Dec	Wednesday	Student Project Presentations	
6-Dec	Thursday	Student Project Presentations	

GRADING: Grades will be based on lab exercises, discussion, and a project. Late assignments will be penalized 10% for each day late.

Lab exercises	60%
Discussion presentation & participation	10%
Project, Manuscript	20%
Project, Presentation	10%

DISCUSSION SECTION: There will be a discussion section that meets for 50 minutes each week. Most weeks the discussion will be on a journal article related to the topics covered that week. Each week a student will be assigned to lead the discussion with a PowerPoint presentation of the article (approximately 15-20 minutes) and discussion points to keep the discussion going. All students are required to read the journal article each week and come prepared to discuss it. Occasionally, this time may be used to discuss student projects or other topics of interest.

PROJECT: Each student will develop their own model for their system of interest. Their model can be built upon those models discussed in class or can be based on a different conceptual design (but cannot be purely statistical). The project will be presented both as a manuscript (Abstract, Introduction, Methods, Results, Discussion; suitable to submit to an ecological journal) and as a presentation (suitable to present at a conference such as the Wildlife Society or Ecological Society of America meetings). **Written manuscripts will be due Dec 3rd. PowerPoint presentation will be 15 minutes in length and occur during the last week of classes (Dec 3-6).**

PLAGARISM: Plagiarism will not be tolerated and will result in failing the course.

STUDENT CONDUCT CODE: All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code.

STUDENTS WITH DISABILITIES: The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (DSS). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with DSS, please contact DSS in Lommason 154 or 406.243.2243. I will work with you and DSS to provide an appropriate modification.

GRADING OPTION: Please note, this class is offered for traditional letter grade only, it is not offered under the credit/no credit option.