

Course Syllabus

[Jump to Today](#)

 [Edit](#)

Introduction to Ecological Modeling: Concepts, Methods and Applications

M/W/F 10:30 – 11:20

Lab W 12:30 – 2:20

Professor: Tim Essington

TA: Maia Kapur

Office Hours, Thursday, 2- 4pm, rm 318B

Wednesdays immediately after lab until 3:30pm.

Thursdays, 1 - 2pm FISH 336c.

Learning Goals

By the end of this course you will be able to

- Identify different types of models
- Develop and apply ecological models to answer ecological questions
- Critically evaluate models
- Fit models to data using likelihood and bayesian methods
- Develop skills needed to implement models in spreadsheets and in R

About the Course

This is a course about modeling (the process), not models (the product). As a consequence, you will be learning by doing in this course through in-class exercise and three projects. In-class exercises will familiarize you with the process of model evaluation, while the assignments are designed to expose you to the entire model-building process. To be prepared for this course, you should have prior coursework in calculus, statistics and ecology.

Contacting Instructors

There are two ways to send questions or comments:

If you have a question about any course content, use the Discussion Board link on the canvas site.

If you have a personal question that is not appropriate for sharing with the class, send a private message to us via canvas

In both cases, please only send queries that can be answered by a short message. Questions that require more in-depth responses should be made in person during office hours (see above). The discussion board and private messages will be checked daily, M – F. Generally, expect a response within 24 hours after it is checked.

Coursepack

The coursepack is your textbook for this course. The material there was derived and compiled from previous course offerings, but edited and synthesized to enhance student learning.

The best way to learn is to review each week's material prior to lectures and come prepared with questions. You are required to review this material in advance of lecture. There are brief quizzes along the way that are intended to ensure that you are paying attention to the material, and not just racing through it. You won't have access to the homework assignments until you have viewed all of the on-line material for that week.

Lectures

Monday and Wednesday lecture sessions are intended to give the necessary background material to conduct the weekly exercises. You'll learn the major concepts, the people who developed this field, and specific applications of varying modeling applications.

Each lecture will begin by gathering questions from students (using in-class and discussion board requests). Topics that related to those questions will be emphasized in the lecture. If there are no questions, the standard, pre-prepared lecture will be given. This means that you have the opportunity to tailor your lecture to the topics and concepts that you find most challenging.

Lecture preparation grading. Each student is required to either post online or ask in class at least one substantive question regarding the reading assignment for each lecture. What is a substantive question? One, it should be specific. Something like "can you go over derivatives?" is too broad. "Can you explain how derivatives are used to model state variables?" is specific. Two, it should pertain to something that is clearly central to the course material. That might be asking for clarification, asking about extensions or applications, or asking about how topics from different weeks relate to each other.

Weekly exercises and Lab session

Weekly exercises are where the magic happens. It is your chance to dig into these models and develop your skills, through practice, of interpreting and developing models. Weekly homework is due on the FRIDAY of each week, which means you should aim to get a large portion of the exercises done in the lab session. If you are in the B section, please give yourself plenty of time to work on these and seek us out for help in office hours. You will need access to a computer with Microsoft Excel or R installed to complete the exercises.

Skills Session

Friday mornings will focus on developing particular skills through hands-on tutorials. We'll meet in the

computer room(s) for sessions that involve student-activities.

Projects

You might notice that there is no exam for this course. That is intentional - it is hard to see how we could evaluate student learning with a sit-down exam. Instead, there are series of projects, each of which is intended to act as a take-home exam. Projects are due at the beginning of lecture on the due date. These assignments are different from the weekly exercises in that they are intended to test your mastery of the material. We will still give plenty of help to students as needed.

Grading

Your final grade will be based on your weekly homework and class assignments

Weekly Homework & Discussion points: 50%; Projects 50%

The following lists the minimum scores needed to achieve each grade tier. This will be curved as needed.

Total

%	Grade
----------	--------------

95%	4
-----	---

90%	3.5
-----	-----

85%	3
-----	---

80%	2.5
-----	-----

75%	2
-----	---

70%	1.5
-----	-----

65%	1
-----	---

62%	0.7
-----	-----

Late assignments are subject to a 10% / day penalty. Assignments submitted later than 3 days from the due date will not receive credit. **Holidays and weekend days are NOT excluded from the late penalty assignment.**

Spreadsheets vs. R

Spreadsheets are an extremely useful tool for developing many models. Some students may prefer to use R for weekly exercises and class assignments. We will provide R programs to accompany each spreadsheet in

weekly exercises and will provide support to students that choose to use R for assignments.

Course Schedule

	Date	Notes	Topics	Lab	Skills
M	1/07				
W	1/09		Why do we Model? What is a Model? Process of Model Building	Model Development	Mastering Microsoft Excel**
F	1/11				
M	1/14				
W	1/16		Population Models	Population Models	
F	1/18				Programming in VB and R**
M	1/21	<i>Martin Luther King Jr. Day</i>			
W	1/23		Myths and Misconceptions about Sensitivity modeling and decision making; Sensitivity Analysis		Implementing Monte Carlo Routines**
F	1/25				
M	1/28				
W	1/30		Multi-species models*	Competition and predation	
F	2/01				Simulating Differential Equations
M	2/04		Stochastic population		

W	2/06	Project 1 due	models*	Population Viability Analysis	
F	2/08				Putting the "fun" in "function"***
M	2/11				
W	2/13		Ecosystem models and Probability	Compartment Models	
F	2/15				Simulation Modeling in R**
M	2/18	Presidents Day		Probability	
W	2/20		Probability and Likelihood	Probability vs. Likelihood	
F	2/22				Drop in Project 2 help**
M	2/25				
W	2/27		Parameter Estimation	Likelihood	
F	3/01	Project 2 Due			Numerical Optimization Methods
M	3/04				
W	3/06		Parameter Estimation 101; Bayesian Parameter Estimation	Parameter Estimation	
F	3/08				Bayesian Integration

Methods

M	3/11		
W	3/13	More Bayesian Applications	More Bayes Theorem
F	3/15		Drop in help on Project 3**
W	3/18	Project 3 due	

**** Denotes skills sessions that meet in Rm 136**

Academic Conduct Statement:

Plagiarism, cheating, and other misconduct are serious violations of the student conduct code. We expect that you will know and follow the UW's policies on cheating and plagiarism. Any suspected cases of academic misconduct will be handled according to UW regulations. More information, including definitions and examples, can be found in the Faculty Resource for Grading and the Student Conduct Code (WAC 478-120).

Course Summary:

Date	Details	
Fri Jan 11, 2019	 Weekly Lab 1 (https://canvas.uw.edu/courses/1256098/assignments/4481845)	due by 10pm
Fri Jan 18, 2019	 Weekly Lab 2 (https://canvas.uw.edu/courses/1256098/assignments/4481847)	due by 10pm
Fri Jan 25, 2019	 Weekly Lab 3 (https://canvas.uw.edu/courses/1256098/assignments/4481848)	due by 10pm
Fri Feb 1, 2019	 Weekly Lab 4 (https://canvas.uw.edu/courses/1256098/assignments/4481849)	due by 10pm
Wed Feb 6, 2019	 Project 1 (https://canvas.uw.edu/courses/1256098/assignments/4481842)	due by 10am

Date	Details	
Fri Feb 8, 2019	 Weekly Lab 5 (https://canvas.uw.edu/courses/1256098/assignments/4481850)	due by 10pm
Fri Feb 15, 2019	 NEW Weekly Lab 6 (https://canvas.uw.edu/courses/1256098/assignments/4481852)	due by 10pm
	 Old Weekly Lab 6 Dropped for this year (https://canvas.uw.edu/courses/1256098/assignments/4481851)	due by 10pm
Fri Feb 22, 2019	 NEW Weekly Lab 7 (https://canvas.uw.edu/courses/1256098/assignments/4481853)	due by 10pm
Fri Mar 1, 2019	 Project 2 (https://canvas.uw.edu/courses/1256098/assignments/4481843)	due by 10am
	 Weekly Lab 8 (mini) (https://canvas.uw.edu/courses/1256098/assignments/4661357)	due by 10pm
Fri Mar 8, 2019	 Weekly Lab 9 (https://canvas.uw.edu/courses/1256098/assignments/4481854)	due by 10pm
Fri Mar 15, 2019	 Weekly Lab 10 (https://canvas.uw.edu/courses/1256098/assignments/4481846)	due by 10pm
Wed Mar 20, 2019	 Project 3 (https://canvas.uw.edu/courses/1256098/assignments/4481844)	due by 10:30am
	 Bayes Theorem Quiz (https://canvas.uw.edu/courses/1256098/assignments/4481834)	
	 Estimating parameters using likelihood (https://canvas.uw.edu/courses/1256098/assignments/4481827)	
	 Isocline Quiz (https://canvas.uw.edu/courses/1256098/assignments/4481832)	
	 Made up quiz (https://canvas.uw.edu/courses/1256098/assignments/4481828)	
	 Maximum Likelihood Quiz (https://canvas.uw.edu/courses/1256098/assignments/4481841)	
	 Model Selection Quiz (https://canvas.uw.edu/courses/1256098/assignments/4481833)	
	 Stability Quiz (https://canvas.uw.edu/courses/1256098/assignments/4481840)	
	 Stage Structured Quiz (https://canvas.uw.edu/courses/1256098/assignments/4481839)	

Date	Details
	 Stochasticity Intro Quiz (https://canvas.uw.edu/courses/1256098/assignments/4481836)
	 Week 1 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4537403)
	 Week 10 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4571352)
	 Week 2 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4537405)
	 Week 3 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4571313)
	 Week 4 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4571334)
	 Week 5 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4571337)
	 Week 6 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4571348)
	 Week 7 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4571349)
	 Week 8 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4571350)
	 Week 9 Discussion (https://canvas.uw.edu/courses/1256098/assignments/4571351)

