

BIOD59 / EEB1420 Syllabus, Fall 2017
Models in Ecology and Conservation
Prof. Péter Molnár

Prerequisites

BIOB50

MATA29 or MATA30 or MATA31 (or equivalent). These are non-negotiable.

Course description

Modelling is a critical tool used to address urgent resource management questions in ecology, epidemiology and conservation. This practical introduction includes approaches for modelling individuals, populations, species interactions, and communities.

Applications include population viability assessments, disease eradication and climate change mitigation.

Learning goals

At the end of the course, students will have obtained a broad overview of the many situations in which models can be helpful in ecology, epidemiology, and conservation. They will have learned how to formulate ecological models, parameterize and validate them against data, and analyze them both analytically and using simulations. Students will be able to determine in which situations models can be useful and what their limitations are, and will be able to apply these skills to different biological systems / conservation management questions.

The course puts particular emphasis on sensitizing students to the philosophy and rationale behind ecological models, the links to classical hypothesis testing approaches, as well as communicating the strengths and limitations of models to both technical and non-technical audiences. These skills are critical, as most ecologists work in interdisciplinary teams and also need to communicate their results to the broader public, i.e. people that may not understand or value models.

Course information

Instructor:

Dr. Péter Molnár

Office: SW567A

Office hours: Thursdays 12-1pm, starting week 2.

If this time doesn't work for you, send me an email to schedule a meeting. I will do my best to accommodate your schedule

Email: peter.molnar@utoronto.ca (please put BIOD59/EEB1420 in the subject line)

Phone: 416-208-2247

Teaching Assistant:

Juan Sebastian Vargas Soto, juan.vargassoto@mail.utoronto.ca

Lecture times & location:

Tuesdays, 12-2pm, BV 355.

See below for tentative lecture schedule.

Tutorials:

Thursdays, 1-3pm, BV 471.

Note that this course is running as BIOD59 for undergraduate students and as EEB1420 for graduate students. Some tutorial times are only for EEB1420 students, see below for schedule and attendance

Course Website and Online Lectures: All lecture slides and tutorials will be posted on Blackboard (portal.utoronto.ca) the evening before. All lectures, but not the tutorials, will be filmed and also made available within 24 hours on the course website. Additional announcements may be made on Blackboard, as well, so please check the course website regularly.

Communication policy

Students are required to regularly and often check their UTOR email to receive announcements relating to the course. To inquire about course-related issues, students should solely use their UTOR email, as hotmail and other email providers are spam-filtered on a regular basis. **When emailing the instructor, please begin the subject line with “BIOD59: <subject>” (or “EEB1420: <subject>” for grad students) to make sure emails are not overlooked.** It is the responsibility of the student to make sure his or her email reaches the instructor.

Tentative Lecture Schedule

Date	Day	Lecture	Topic	Required Readings
Sep 5	TU	1	Introduction	
Sep 12	TU	2	How to formulate models	Otto Ch. 2
Sep 19	TU	3	Single species models: discrete time	Case, Ch. 1, 5
Sep 26	TU	4	Age- and stage-structured models; population viability analyses	Case Ch. 3
Oct 3	TU	5	Single species models: continuous time	Case, Ch. 1, 5
Oct. 9-14	Reading week			
Oct 17	TU	6	An introduction to epidemiology: interactions and disease dynamics	Keeling Ch. 2
Oct 24	TU	7	Multi-species interactions: predator-prey dynamics, competition, parasitism...	Hastings Ch. 6-9
Oct 31	TU	8	Fitting models to data	Hilborn Ch. 2, Haefner Ch.7
Nov 7	TU	9	Model discrimination & validation; modelling is an iterative process	Haefner Ch. 8
Nov 14	TU	10	Spatial models: invasive species	TBA
Nov 21	TU	11	Models and Global Change Biology	TBA
Nov 28	TU	12	Student presentations (mandatory attendance)	

Tutorial Schedule for Students enrolled in either BIOD59 or EEB1420

Date	Time	Tut.	Topic	Due dates	Attendance
Sep 7	1-3pm	1	Introduction to MATLAB		
Sep 14	1-3pm	2	Topics of Lecture 2		
Sep 21	1-2pm	3a	Topics of Lecture 3		
	2-3pm	3b	Readings: TBA		EEB1420 only
Sep 28	1-3pm	4	Topics of Lecture 4	Homework 1	
Oct 5	1-2pm	5a	Topics of Lecture 5	Homework 2	
	2-3pm	5b	Readings: TBA		EEB1420 only
Oct. 9-14	Reading week				
Oct 19	1-2pm	6a	Topics of Lecture 6	Homework 3	
	2-3pm	6b	Translating and communicating models to scientists from other fields and/or the general public		
Oct 26	1-2pm	7a	Topics of Lecture 7		
	2-3pm	7b	Readings: TBA		EEB1420 only
Nov 2	1-3pm	8	Topics of Lecture 8	Homework 4	
Nov 9	1-2pm	9a	Topics of Lecture 9		
	2-3pm	9b	Readings: TBA		EEB1420 only
Nov 16	1-3pm	10	Topics of Lecture 10	Homework 5	
Nov 23	1-2pm	11a	TBA	Research Paper & News Summary	
	2-3pm	11b	Readings: TBA		EEB1420 only
Nov 30	1-3pm	12	Student presentations (mandatory attendance)		

Attendance policy: lectures and tutorials

All lectures, but not the tutorials, will be available within 24 hours on the course website via WebOption. Attendance at lectures is not required, but strongly encouraged to allow you to participate in the many discussions that we will have. Attendance is also not mandatory at the tutorials but strongly encouraged as homework exercises will be based on work begun in the tutorials. Attendance is, however, mandatory, at five specific dates outlined in the schedule above for EEB1420 students. Absences without a valid excuse during any of these dates will lead to a zero attendance mark for that date. Attendance is also mandatory for all students at the last lecture and tutorial where students will present their research projects. Absences without a valid excuse during student presentations will result in a penalty of up to 50% of your presentation mark (assuming that other members of your group were able to give the presentation). If you miss any of these events due to illness or other causes beyond your control, submit as soon as possible, and no later than within one week of the missed date, a written request for special consideration to Jennifer Campbell (see below), explaining the reason for missing the event and attaching appropriate documentation, that is, the official University of Toronto medical certificate (<http://www.illnessverification.utoronto.ca/>).

Course readings

No single textbook covers the breadth of topics we will discuss in this class. As such, we will use a combination of chapters from different books as well as readings from the primary literature. Required book chapters are noted in the schedule above, with additional readings assigned throughout the course. Scanned copies of all required book chapters will be available for your convenience on eReserve to the degree that copyright permits, and copies of each book will also be on hold in the library. We will work with the following:

Otto S. & Day T. 2007. *A Biologist's Guide to Mathematical Modeling in Ecology and Evolution*. Princeton University Press. **Also available in bookstore; includes 'Primers' for reviewing calculus concepts**

Case T. 1999. *An Illustrated Guide to Theoretical Ecology*. Oxford University Press. **Also available in bookstore.**

Hastings A. 1997. *Population Biology: Concepts and Models*. Springer

Keeling M. J. & Rohani P. 2008. *Modeling Infectious Diseases in Humans and Animals*.

Haefner J. W. 2005. *Modeling Biological Systems: Principles and Applications*. Springer. **Available online at UofT library**

Hilborn R. & Mangel M. 1997. *The Ecological Detective: Confronting Models with Data*. Springer. **Available online at UofT library.**

Evaluation

BIOD59 – marks breakdown:

5 homework assignments, 10% each	50%
Research Paper	30%
Presentation of Research Paper	10%
Research Paper – News Summary	10%

EEB1420 – marks breakdown:

5 homework assignments, 8% each	40%
Research Paper	30%
Presentation of Research Paper	7.5%
Research Paper – News Summary	7.5%
Discussion group - Moderation	10%
Discussion group – Attendance and participation, 1% each meeting	5%

Homework assignments:

Homework assignments will be introduced during the tutorials. While all materials will be available on Blackboard, it is thus to your benefit to attend the tutorials. All homework is due at the end of the tutorials indicated in the schedule. **Penalty for late submission:** 2% per day that the assignment is received late. Weekend days count as individual days. Unless there are extenuating circumstances (e.g. medical reasons with a medical certificate), a mark of zero will be applied to all assignments submitted 5 days late or more. If you know ahead of time that you have a legitimate reason why you cannot hand in the assignment at the due date, let the course instructor know **before** the due date.

Research paper

Over the course of the semester, students will engage in a modelling project that applies the skills learned throughout the course. Students will work in groups of 2-4, which will be assigned during Week 2 of the course. At the end of course, students will present their research to the class using a powerpoint presentation, and subsequently answer questions from the audience about their project, engaging in a scientific discussion. In addition, each student will write an individual (short) *News Summary* of their paper intended for non-technical audiences. All students in the group will receive the same mark for the research paper (up to 30%). All students will also receive the same mark for the powerpoint presentation (up to 5% for BIOD59, up to 3.75% for EEB1420). Students may, however, receive different marks from their group members for their ability to answer questions and engage in subsequent discussions (up to 5% for BIOD59, up to 3.75% for EEB1420). Students will receive individual marks for their *News Summary*.

Penalties for late submission: Research paper, 2% per day that the assignment is received late. News Summary, 2% per day that the assignment is received late.

Weekend days count as individual days. Unless there are extenuating circumstances

(e.g. medical reasons with a medical certificate), a mark of zero will be applied to all assignments submitted 5 days late or more; in the case of the research paper, this applies to all students in the group. If you know ahead of time that you have a legitimate reason why you cannot hand an assignment at the due date, let the course instructor know **before** the due date. More details regarding the Research Paper will be announced in a separate document.

EEB1420 – Additional Requirement: Discussion groups

EEB1420 students are required to attend the Discussion Groups indicated in the Tutorial schedule. These discussion groups are intended to provide a deeper understanding of the topics discussed in lecture, and place them within the context of current scientific advances. Each week, groups of ~2 students will lead the discussion on 2-3 assigned readings. At the beginning of the discussion, they will provide a brief summary of the papers and provide guidance for the discussion that follows (10% of your mark). In addition, students will receive 1% for each discussion they attend.

Programming language

The course will use MATLAB in all tutorials. If students wish, they are allowed to complete the exercises and research projects in R, but should understand that programming help cannot be provided for languages other than MATLAB. All computers in the lab have MATLAB installed; if you wish to install it on your own computer, you can purchase a license for \$10 at <http://sites.utoronto.ca/ic/software/detail/matlabStudent.html>

Submission of Reports to Turnitin

Each course paper will need to be submitted on or before the due dates indicated in the schedules above to Turnitin for a review of textual similarity and detection of possible plagiarism. By submitting papers via Turnitin, students allow their paper to be included as source documents in the Turnitin.com reference database, where it will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site: <http://www.utoronto.ca/ota/turnitin/ConditionsofUse.html>. Turnitin.com is most effective when it is used by all students; however, if and when students object to its use on principle, the course will offer a reasonable offline alternative. The student will then be asked to meet with the course instructor to outline and discuss the report before its final submission to demonstrate the process of creating the report according to the academic integrity policy. **Note: Please submit only one copy of the group research project to Turnitin, as otherwise it will detect plagiarism to each other and becomes less effective comparing with other sources.**

As Turnitin is integrated in the UofT portal (blackboard), you will submit your assignment on blackboard, see <http://www.portalinfo.utoronto.ca/content/submit->

[turnitin-assignment](#) for instructions. **In addition, you are also required to submit ONE hard copy of your assignment to the instructor by the deadline.**

Academic Integrity

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's *Code of Behaviour on Academic Matters* (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

- using someone else's ideas or words in their own work without appropriate acknowledgment.
- including false, misleading or concocted citations in your work.
- obtaining unauthorized assistance on any assignment.
- providing unauthorized assistance to another student. This includes showing another student completed work.
- submitting your own work for credit in more than one course without the permission of the instructor
- falsifying or altering any documentation required by the University. This includes, but is not limited to, doctor's notes.
- using or possessing an unauthorized aid in any test or exam.

The learning environment is built on mutual trust, and we will assume that all students operate with honesty and integrity. However, in the rare cases of substantial evidence that the University of Toronto's Code of Behaviour on Academic Matters (Section B; <http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) has been compromised, I will enact the procedures outlined in the Code of Behaviour on Academic Matters. First, I will invite you to discuss the possible offence through an email invitation. If our discussion leads me to believe that you have not compromised the code, then the matter will be dropped. If either you fail to respond to two requests for this discussion or new evidence comes to light, then a formal investigation will be initiated, and a penalty according to the U of T's guidelines on sanctions may be put into place.

Medical certificates:

All medical certificates certifying reasons of absence, should be submitted to the course coordinator, Jennifer Campbell, jacampbell@utsc.utoronto.ca

AccessAbility

Everyone is a welcome member of this class, and we strive to provide an equal playing field for students with diverse learning styles and needs. In particular, if you have a disability/health consideration that may require accommodations, please contact the AccessAbility office as soon as possible. They will provide confidential services that include flexible, personalized solutions for test-taking, note-taking, and similar issues. The AccessAbility office is located in SW302 and can be reached at: (416) 287-7560 or ability@utsc.utoronto.ca.

Audio/video recordings

All lectures, but not the tutorials, will be available via WebOption on the course website for your convenience. This is intended to help you revisit lectures and tutorials on your own time, but note that for reasons of privacy as well as for protection of copyright, the further dissemination of these materials beyond the course website (such as postings on other websites), as well as any other unauthorized audio or video recordings, are strictly prohibited.