

ECOL 419/519 Introduction to Modeling in Biology

Fall 2023

Instructors:

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Course modality and meeting times

This class is scheduled to be taught in person. The class will take place MWF 11-11:50 am in BioSciences East 225.

If you are in isolation or quarantine but well enough to join the class, we will try to accommodate you by zooming in; but you will need to notify us before each class to get a Zoom link. Experience and discussions with students have shown that the class is most effective in person; the class is not a hybrid modality class. We ask that you do not use the Zoom option for other reasons.

Course description

'Modeling' plays a critical role in biology and the scientific process generally. This course will explore what that role is, focusing on questions in ecology and evolutionary biology. We will introduce different modeling approaches in terms of techniques used, but also in terms of the type of insights that they produce. No advanced mathematical or computer skills are required (during the class, if you feel you struggle with mathematical content, please alert the instructors: we will provide help).

ECOL419: Expected learning outcomes for undergraduates

The main goal of this class is to familiarize students with what constitutes 'evidence' in science, and in particular what contribution modeling and theory papers make to science and understanding the world. Students will become able to extract, from scientific papers, information on what the paper contributed to science, and how this was achieved using mathematical or computational models or techniques. Students will gain confidence in reading and extracting such information even when papers are challenging to read or contain unfamiliar mathematical techniques, or when papers are not explicitly or clearly stating it.

ECOL519: Expected learning outcomes for graduate students

The primary goal of this class is to enable students to read theory papers (or papers containing some modeling) effectively and critically, including when the paper is challenging and includes unfamiliar mathematical techniques. Reading a paper effectively includes, in particular, understanding what the paper contributed to science, and whether this was convincingly achieved. Students will also learn basics of writing scripts and programming through in-class and homework exercises. This will allow hands-on experience in what modeling can be used for and what is involved. We also aim for students to gain enough familiarity with scripts and programming languages to make further learning progress on their own.

Workload for the course

There are no midterm exams. The main workload, other than during class periods, will stem from the required readings – students will realize that to adequately read a scientific paper containing theory/modeling, quite a few hours may be needed. There will also be some homework exercises, largely consisting of programming short scripts in *Mathematica*. See below for detailed grading information. All required readings will be made available on D2L. There will be a take-home exam at the end of the semester, in which you will read an assigned theory paper and analyze it using the tools learned throughout the semester.

Homework exercises

We will have some homework exercises which will help you get comfortable with *Mathematica* and practical issues in implementing models. You will submit your *Mathematica* notebook files to a folder on D2L.

Software and equipment requirements

You will need access to Mathematica to complete the homework. For most people, this means buying a student license for Mathematica online from <https://www.wolfram.com/mathematica/pricing/students/>. A permanent installation on your local computer is ~\$171 for students, however you can also rent for ~\$54/semester or \$86/year, or ~\$9/month for a cloud-based version (check the website for current pricing and conditions). If you aren't sure whether this class is right for you, then you can begin with a 15 day free trial version, but you will still need longer-term access to complete the class.

In case of quarantine or isolation, you will need to be prepared to participate by zoom, for which you will also need a laptop or web-enabled device with webcam and microphone, and access to reliable internet signal. Please email us as soon as you know that you will not be attending class in person.

For this class, use of a laptop to complete exercises during class is highly recommended.

If any of these technological requirements present obstacles to you, please do contact the instructors; we may be able to find alternative solutions for a small number of students.

Quizzes

We will have a series of 'mini-quizzes' in class, usually consisting of only one or a few questions about the required reading or lecture material.

Grading

Final grade will be determined from the homework exercises (30%), quizzes in class (40%), and the take-home exam (30%). A: 90-100%; B: 80-89%; C: 70-79%; D: 60-69%; E (fail): 0-59 %

Undergraduate vs. Graduate student requirements

Undergraduate and graduate students will both be completing the same homeworks and other assignments. However, undergraduate students will be able to drop either one of the homework grades or one of the quiz grades from their overall grade calculation (i.e. their worst homework/quiz grade will not be counted towards the final grade).

Readings & Course website

You will be able to obtain readings, homework assignments, and lecture notes via the current class schedule at the course website on D2L.

General issues

Professional Communication

If you send any emails to the instructor, make sure to mention the name of the class (ECOL519) in the subject line. Also, start your email by addressing the recipient, and end it with a greeting; always end the email with your full name. Re-read your email to check for spelling and grammar errors. Not adhering to these rules will mean that the addressee will get the impression that you are unused to professional communication, and this will probably result in them focusing on your communication style instead of your actual message; this is very detrimental in emails to future employers or mentors, so you should start practicing good habits now. Never assume an email will be answered in less than 3 days.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and

not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

While in-class use of a laptop to complete exercises is highly recommended, we expect the laptop to be used almost exclusively for the current class-relevant task. No electronic communication devices should be used during the class session.

Academic advising:

If you have questions about your academic progress this semester, please reach out to your academic advisor (<https://advising.arizona.edu/advisors/major>). Contact the Advising Resource Center (<https://advising.arizona.edu/>) for all general advising questions and referral assistance. Call 520-626-8667 or email to advising@arizona.edu.

Life challenges:

If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The [Dean of Students Office](#) can be reached at (520) 621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges:

If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520) 621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Note that all College of Science graduate students can visit CAPS for free (the fee will be covered by the College).

Statement on compliance with COVID-19 mitigation guidelines:

The health and wellbeing of everyone in this class is the highest priority. Accordingly, we are all required to follow the university guidelines on COVID-19 mitigation. Please visit www.covid19.arizona.edu for the latest guidance.

Classroom attendance

- If you feel sick, or may have been in contact with someone who is infectious, stay home. This applies to all communicable diseases. We are happy to accommodate your participation via Zoom in this case.
- Notify your instructors if you will be missing a course meeting or an assignment deadline, **in advance** of that course meeting or deadline. However, if you realize you are showing illness symptoms or have been exposed only just before class, emailing/messaging us only then is fine.
- If you are isolating at home but not too sick to follow the class, we will strive to having you participate via Zoom. Please note that if most of the students are in the classroom, as an online participant you will inevitably not get the full benefit of group interactions and learning.
- Non-attendance for any reason does not guarantee an automatic extension of due date or rescheduling of examinations/assessments.
 - Please communicate and coordinate any request directly with your instructor.
- If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Accessibility and Accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu>) to establish reasonable accommodations.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. Students are also encouraged to give concrete tips for solving programming or scripting problems. The use of the internet or published works to help you solve problems in the assignments is also encouraged. Otherwise, graded work/exercises must be the product of independent effort. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog.

See <http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://www.library.arizona.edu/help/tutorials/plagiarism/index.html>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See

<http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>.

Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>.

Confidentiality of Student Records

<http://www.registrar.arizona.edu/ferpa/default.htm>

Subject to change

Please note that the information contained in the course syllabus, other than the grade and absence policies, may be subject to change with advance notice, as deemed appropriate by the instructor. This is particularly true of the details in the course schedule. The most up-to-date version of the class schedule (including assignment due dates) can always be found on D2L.