

EBIO 4600 / 5600: Evolutionary Ecology

Course Information & Policies

Course Instructor

Professor: Nancy C. Emery
Email: Nancy.Emery@Colorado.edu
Office hours: *By appointment*, RAMY N235

Course Times & Locations

Lecture: Tuesday 12:30 – 1:45 PM, KTCH 1B17
Thursday 12:30 – 1:45 PM, KTCH 1B17

Lab: Thursday 2:00 – 4:45 PM, KTCH N1B17 (merged with preceding lecture period)

Course Description

Evolutionary ecology is the study of how the interactions within species, among species, and between species and the environment evolve over time. In this course, we will learn how to apply ecological, genetic, and statistical tools to address novel questions in evolutionary ecology through a series of research projects that measure natural selection, gene flow, and phenotypic plasticity in natural systems. A strong emphasis will be placed on the development of scientific skills, including how to ask a testable question, formulating hypotheses, experimental design, data analysis, and scientific communication through written and oral presentation. We will learn the nature of science while studying the science of nature!

Learning Goals

By the end of this course, you will be able to:

- 1) **Use the principles of ecology, evolution, and genetics to explain interactions within species, among species, and between species and the environment**
 - a. Use theory and empirical data to explain the distribution and abundance of organisms
 - b. Describe how phylogenetic, genetic, and ecological processes interact to generate phenotypic variation
 - c. Articulate the mechanisms by which ecological processes shape evolutionary dynamics and vice versa
- 2) **Engage in observation-discovery and hypothesis-driven studies of evolutionary ecology**
 - a. Describe the scientific process
 - b. Propose an informed hypothesis to explain observations
 - c. Design an experiment or observational study to test a specific hypothesis
 - d. Develop lab and field skills in evolutionary ecology

- e. Confidently collect and manipulate data
 - f. Confidently use R to conduct appropriate statistics
- 3) **Effectively communicate scientific content, methods and thinking**
- a. Present oral summaries of proposed research
 - b. Provide constructive feedback on the work of your peers
 - c. Clearly present research projects and results in written form that meets the standards of the scientific community
- 4) **Improve your ability to work productively and cooperatively with others towards a common goal**
- a. Complete a semester-long team-based research project that answers a well-defined experimental question.
 - b. Develop and implement a strategy for the careful management and curation of data.
 - c. Identify the strengths that you bring to collaborative teams.

Prerequisites

The following courses are prerequisites for this course:

EBIO 2040: Principles of Ecology
EBIO 3080: Evolutionary Biology

In addition, the following courses are recommended:

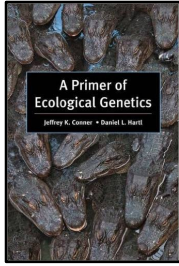
EBIO 1950: Introduction to Scientific and Academic Writing
EBIO 2070: Genetics – Molecules to Populations
An introductory statistics course

Course Structure

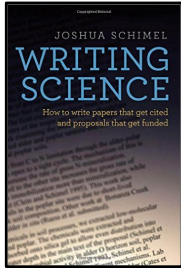
This course aims to teach you the principles of evolutionary ecology by guiding you through the process of *doing* evolutionary ecology. To accomplish this, I will use research-proven teaching techniques that emphasize student-centered active learning, and that draw upon both individual and team-based learning (TBL) approaches. You will earn points for the course by completing various challenges individually and as part of a team. My tools for teaching this course will include in-class group activities, peer instruction, hands-on exercises, homework, reading assignments and reflective responses, several writing assignments, team presentations, and a semester-long research project that the entire class will complete by working together. I enjoy experimenting with new learning activities, and value your feedback on these activities and if/why they are effective for you.

Texts

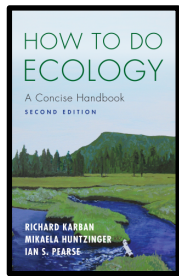
There following three textbooks are required for this course:



Title: A Primer of Ecological Genetics
Authors: Jeffrey K. Conner and Daniel L. Hartl
Publisher: Sinauer Associates, Inc.
ISBN: 978-0878932023



Title: Writing Science
Author: Joshua Schimel
Publisher: Oxford University Press
ISBN: 858-1132111113



Title: How to Do Ecology (2nd ed.)
Author: Karban, Huntzinger, & Pearse
Publisher: Princeton University Press
ISBN: 978-0-691-16176-1

Assessments

The grade structure for this course reflects the fact that *learning is a continuous process*. Therefore, you will earn points for almost everything that you do in this class, and points accrue continuously over the course of the entire semester (as opposed to through a few major assignments or exams). There will be no exams for this course - the majority of your grade will be determined by your performance on pre-class assignments, group projects and activities, peer reviews, participation, one mid-semester paper on one of the research modules, and a final paper on the class research project.

Importantly, a large proportion of your final grade will arise from points that you earn **in class** during individual and group activities. As a result, your attendance will play a major role in determining your final grade - you cannot earn points if you are not present to do the work! Please contact me (and your team, when relevant) as far in advance as possible if you anticipate any conflict with any classes or labs.

Groups and group products

Much of your work in this course will require you to effectively work with a team of your peers to complete group assignments, and the largest proportion of your grade will be determined by a semester-long experiment that you conduct with a team. The points you receive for group activities

will be based on the quality of the product and your contributions to it. Your contribution will be assessed through my own assessments as well as assessments provided by your team members.

The following rules apply to work conducted in teams:

- 1) Each person is responsible for making sure that all team members have the opportunity to participate. An over-dominant member can be just as detrimental to a team project as a student that does not carry their weight.
- 2) Respect the diversity of your group. You will each bring different strengths to your team, and each person is obligated to help their team members to the best of his/her ability (and within reason). If you have a strong background, experience, or natural gift for addressing a specific problem, you are expected to share your knowledge with your teammates so that they grow in that area as well.
- 3) Develop strategies for data management and curation, and group writing projects that are fair to all team members. Your teams will need to standardize methods for data collections, share/archive/distribute data, and collaborate to develop the products of your work.
- 4) For group activities in class, each team prepares a single product that reflects the consensus and best efforts of the entire team. Each team member will sign the product, thereby indicating s/he contributed, understands the contents, agrees with the conclusions, and accepts responsibility for the product.
- 5) Be respectful of each other's time. Team members should directly engage with one another during team activities and focus their attention on the work at hand - i.e., avoid outside distractions such as email, Facebook, and internet surfing.

Pre-class assignments

We will primarily be doing activities in class that require you to have completed background reading and assignments prior to coming to class. Any readings that are not from your required textbooks will be made available through Canvas, and you will typically have a brief assignment due to evaluate your comprehension of the readings before coming to class each day. **These assignments will typically be due at 10:00 AM on the day of class so I can review your responses prior to class.**

Lab module projects

In addition to the semester-long class research project (see below), we will complete three different modules that each have a separate, smaller research project. Each module involves fieldwork, labwork, and data analysis. You will work on a paper for the first research module (the milkweed project) over most of the semester, which then provides a model for your final paper (see below). You will work in teams for each module, though you will be graded individually. No late assignments will be accepted without my permission for an alternative deadline.

The research project

Each student will work in small team (2-4 students) to conduct a greenhouse experiment that evaluates how the annual herb *Lasthenia fremontii* (Fremont's goldfields) adjusts its dispersal strategy based on its environmental conditions. The project is designed to guide you through several of the course learning goals (see above), and to give you experience designing, implementing, and evaluating your own research project. This project will involve designing and conducting the experiment, managing and analyzing your data, and writing up the final results. Your goal should be to generate a publishable data set from this project! If your project is appropriately designed and carefully implemented, it can be incorporated into a scientific paper that will ultimately be submitted for publication, and you will be a co-author.

Grades

Your grade for this course will be based on the grand total of the points you receive for all individual and group activities conducted over the course of the semester. Virtually everything you do in this class has the potential to earn points toward your grade, so the general rule of thumb is to attend class and lab, engage in group activities, and complete all assignments to the best of your ability. Final grades will be assigned using the following percentile cutoffs:

A	92.0 – 100%
A-	90.0 – 91.9%
B+	88.0 – 89.9%
B	82.0 – 87.9%
B-	80.0 – 81.9%
C+	78.0 – 79.9%
C	72.0 – 77.9%
C-	70.0 – 71.9%
D+	68.0 – 69.9%
D	62.0 – 67.9%
D-	60.0 – 61.9%
F	< 60.0%

The total number of points possible over the semester will depend on the pace of the class and the number and scope of pre-class assessments, in-class activities, writing and presentation assignments that I ultimately provide. The major assessments of the class, and their *anticipated* contributions to your grade, are summarized below:

<u>% of total points</u>	<u>Activity</u>
20%	Pre-class assignments, peer reviews, other misc. activities
25%	Module I: Dispersal trait plasticity and function (milkweed)
10%	Module II: Natural Selection (galls)
10%	Module III: Gene Flow and Genetic Variation (cattails)
35%	Class research project (including final paper)

You will have the opportunity to replace your mid-semester (milkweed) paper with an additional paper on Module II or Module III.

Concerns or Questions about Grades

The focus of this class should be on gaining research experience, not grades. You will earn a high grade in this class if you work hard, serve as a reliable and contributing member of your teams, manage your time well, and respond well to feedback. Ideally, all questions or concerns about grades should be discussed with me in person in an individual appointment.

Course Rules

Classroom behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics

dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on [classroom behavior](#) and the [Student Code of Conduct](#).

Honor code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu; 303-492-5550). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the [Honor Code Office website](#).

Cell Phone & Laptop Computers in Class

You will need to bring your laptop to class and lab for many of the activities we will conduct in this course. Please do NOT use your cell phones and computers during class and lab except when required for course activities.

Attendance

Your attendance and participation are expected for lecture and lab periods. You will quickly understand that it is vital to your success in this course - and to that of your teammates - that you are reliably present and engaged during class and lab sessions. In-class assignments or group work will often be conducted and collected during class, and you can only earn the associated points if you are present and participating in the assigned activities. Only I can excuse a student from a course requirement or responsibility, and *unexcused absences will result in the loss of points associated with the class or lab session that is missed.*

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, I will allow you to complete missed work, be flexible with deadlines, and generally ensure that you will not be penalized for an absence due to a religious observance as long as you provide me with at least 2 weeks of advanced notice so I have time to make the necessary arrangements. See the [campus policy regarding religious observances](#) for full details.

In the case of an unanticipated or emergency absence, contact me by email as soon as you are able to do so; this will allow me to notify any team members that may be relying on your participation in class or lab. You will be allowed to make up any missed work as long as you provide documentation for the emergency that accrued during the absence (e.g., a note from a medical provider such as Wardenburg Health Services if the absence is due to illness or injury).

Missed or Late Work

Late assignments will not be accepted unless I have granted you an extension prior to the original deadline.

Accommodation for Disabilities

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](#). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see [Temporary Medical Conditions](#) under the Students tab on the Disability Services website.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct intimate partner abuse (including dating or domestic violence), stalking, protected-class discrimination or harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, [anonymous reporting](#), and the campus resources can be found on the [OIEC website](#).

Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

Drop Deadlines

Information on dropping the course can be found at:
<http://www.colorado.edu/registrar/registration-grades/adddrop-courses>