IB 372 A FA21: Ecology and Evolution (Dalling, J)

Course Overview

Ecology:

During the first eight weeks of the semester this course explores concepts in each of the sub-disciplines of ecology from the individual, population, community, and ecosystem levels. Additional consideration is given to the fields of microbial ecology and paleo-ecology. Through lecture, lab and homework assignments, students are introduced to the principles of experimental design and basic data analysis. These tools are used in a series of weekly labs held in university natural areas and a weekend field trip to southern Illinois. The ecology portion of the class includes a three-week, independent project in which groups of 1-3 students collect and analyze data to test a hypothesis, present the results of the project to the class, and write-up the paper in journal format.

Evolution:

The second eight weeks of the semester will focus on topics within evolution spanning scales from genomes to communities, with a particular emphasis on population and quantitative genetics, and phylogenetics. Asynchronous lectures will introduce the key concepts, while live lab sessions will build on the first half of the course, whereby students will explore different types of datasets and test evolutionary-based hypotheses in the R environment. Homework will consist of weekly reading questions designed to teach students how to read and synthesize primary research articles, as well as lab assignments. Weekly live discussions will be based on the research articles assigned for homework and will be led by students after the initial session. Similar to the ecology portion of the class, students will form groups of 2-3 to conduct an independent project involving picking a dataset, testing a novel hypothesis, and presenting the results to the rest of the class.

Course Goals and Objectives

This course provides a foundation of major concepts in ecology and evolution that provide a basis of understanding for 400 level classes in Integrative Biology

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

- Be able to explain core ecological concepts and describe characteristics of populations, communities, ecosystems, and identify the questions that ecologists address at each level of organization.
- Understand the role of the physical environment, species interactions, dispersal and evolutionary history in determining the spatial distribution of organisms
- Be able to describe and interpret different metrics central to both ecology and evolution, and be able to apply them to sample datasets.
- Understand when it is appropriate to use different statistical tests on both ecological and evolutionary data (e.g., correlation, regression, contingency tables, analysis of variance, model comparison), be able to apply them using the program R (R studio), and understand how to interpret the results of statistical tests presented in both ecological and evolutionary literatures.
- Be able to distinguish between an observation, a hypothesis and a prediction, and have gained experience formulating hypotheses based on observations of the natural world.
- Understand how to read and organize scientific papers, and be able to write a report and present the main findings of an independent study with appropriately structured format and content.

Academic Calendar

A course week is defined as the period between Monday, 12:00 a.m.–Sunday, 11:55 p.m. (CT).

For more information, see the university's academic calendar.

This is a **5-credit hour** course. The course is **16 weeks long.** Please be aware that this course is **accelerated in nature**; the course covers the material that would normally be covered in two semesters in the IB major. You should dedicate approximately **10 hours per week** to working on the course itself, but actual time commitments will vary depending on your input, needs, and personal study habits. You are required to log on to the course website and check your email a minimum of 4 days per week, but as discussions develop, you will probably need to do so more frequently.

Required Texts

For the ecology section of the class we recommend

Ricklefs “Economy of Nature” 6th or subsequent edition. Freeman Publishers.

We recommend that you purchase a used copy - available for $10-$15. The introductory material in the course will be available for you to download from this moodle site. More advanced material will come directly from the primary literature. The Ricklefs book provides a reference to support the introductory material.

For the evolution section of the class, we will mostly be drawing material from:

Herron & Freeman, “Evolutionary Analysis” 5th Edition. Pearson Publishers

Although some lecture material will come from:

Emlen & Zimmer, “Evolution: Making Sense of Life” 2nd or subsequent edition. Freeman Publishers

Course Components

This course will consist of the following components:

Module Overviews

Each module will begin with a module overview, which will explain what the module is about, what learning goals you are expected to achieve, how long the module will take, and in what activities you will participate. Each module is designed with similar structure and activities unless otherwise specified. Module instructional activities are explained in greater detail below. Due dates of specific assignments appear on each module's overview page.

Readings and Lessons

Each module will contain a list of lessons (recorded lectures), quizzes, and assigned readings. In some cases, optional or supplemental readings may be listed for further study.

Live Sessions via Zoom

Our class will meet via Zoom. More information about Zoom, including the Zoom meeting schedule, is provided in the Orientation Module of the course. In most cases, there are assigned readings prior to the Zoom meeting. Groups of students are assigned particular readings and must meet virtually with their reading group to discuss their assignment and plan how they will present their findings to the rest of the class.

Assignments

This course will also include homework assignments. These are designed to reinforce concepts presented in the lectures and readings and give you an opportunity to explore these concepts in greater depth.

Quizzes

Our online classes consist of short videos interspersed with quizzes - often with just one or two questions. These help you reflect on and learn the material, connect it to other concepts you have covered in this or other classes... and earn some credit! We have attempted to provide some guidance on how long these activities should take to complete.

Exams

This course includes both mid-term and final exams. The first mid-term covers the material from the Ecology component of the class. Since basic concepts (definitions, terms etc) are covered in quizzes the exam instead focuses on data interpretation. We will give you some data that you have not seen previously and ask you to interpret the results, suggest a hypothesis or design an experiment. This is a timed exam. You will receive access to the exam paper via moodle at the specified time and will need to upload your exam paper at the end of the specified period.

Course Projects

This course includes two independent projects (one for ecology, one for evolution). These are a substantial proportion of your grade and should therefore also occupy a substantial amount of the time you dedicate to the course. More details are provided on the orientation page.

Accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, students should contact both the instructor and the Disability Resources and Educational Services (DRES) as soon as possible. You can contact DRES at 1207 S. Oak Street, Champaign, (217) 333-1970, or via email at disability@illinois.edu.

Grading Scale

Your percentage over the semester will guarantee the following letter grade assignment. However, after reviewing student performance of the class overall, and relative to previous years, we may adjust the grade scale downwards.

Percentage	**Letter Grade**
97-100	A+
94-96.5	A
90-93.5	A-
87-89.5	B+
84-86.5	B
80-83.5	B-
77-79.5	C+
74-76.5	C
70-73.5	C-
67-69.5	D+
64-66.5	D
60-63.5	D-
Below 59.5	F

Course Content

IB 372 Honors Ecology and Evolution
Credit Hours: 5
Lecture: M,W,F 10-10:50 AM; Lab: T 1-5 PM
Pre-requisite: IB271 organismal biology; good standing in the IB Honors program

Section 1: First half of the semester -- Ecology

Instructor: Prof. James Dalling, 149 Morrill Hall, Department of Plant Biology
Office phone: (217) 244 8914
Email: dalling@illinois.edu

Ecology Section description

During the first seven weeks of the semester this course explores concepts in each of the sub-disciplines of ecology from the individual, population, community, and ecosystem levels. Additional consideration is given to the fields of microbial ecology and paleo-ecology. Through lecture, lab and homework assignments, students are introduced to the principles of experimental design and basic data analysis. These tools are used in a series of weekly labs and culminates with a three-week, independent project in which groups of 1-3 students collect and analyze data to test a hypothesis of their own choosing and write-up a paper in journal format.

Course topics, assignments and due dates (by week)

Week	Class Topic	Assignments and Labs	Week assignment due
1	Introduction to Ecology	Ecological Statistics lab	-
	Environmental constraints	Statistics Homework 1	Week 3
	Life History Traits	Statistics Homework 2	Week 4
2	Species Diversity	Stream lab	Week 4
	Population Structure		
	Competition		
3	Mechanisms of competition	Independent project orientation	
	Predation	Scientific writing Homework	Week 6
4	Predation dynamics	Independent project data collection	
	Mutualisms		
	Trophic cascades		

5	Biodiversity	Independent project data collection	
	Ecosystem Ecology		
	Global change ecology		
6	Paleoecology		
	Biogeography		
	Conservation Biology		
7	Microbial ecology	Independent project presentations	
	Mid-term review		
	Mid-term exam		

Course topics, assignments and due dates (by week – Evolution section)

Week	**Monday**	**Tuesday**	**Wednesday**	**Friday**
Week 8: October 11- 15	Intro, Evolution	No lab	Natural selection	Evolutionary trees
Week 9: October 18- 22	Week 8 HW discussion	Lab I Evolutionary trees	Population genetics	Population genetics
Week 10: October 25 - 29	Week 9 HW discussion	Lab II Population Genetics	Sexual selection	Social behavior
Week 11: November 1 - 5	Week 10 HW discussion	Lab III Sexual selection	Life-history evolution	Mid term exam
Week 12: November 8 - 12	Evolutionary medicine	Lab IV Social and Life-history evolution	Week 11 HW + exam discussion	Speciation, Origin of life
Week 13: November 15 -19	HW 12 discussion	Research project	Fossils, Development, Human Evolution	Research project
		FALL BREAK		
Week 14: Nov 29- December 3	Research project	Research project	Week 13 HW discussion	Research project presentation?
Week 15: December 6 - 10	Research project/exam?	Research project/exam?	Research project/exam?	Research project/exam?