

## IB 372 Course Syllabus

### 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

The course has two sections, Ecology and Evolution, but lecture and lab coverage of the two sections dovetail, and part of the final exam is devoted to question spanning the entire course.

Instructor (ecology): Prof. James Dalling, 149 Morrill Hall, Department of Plant Biology

Office phone: (217) 244 8914

Email: [dalling@illinois.edu](mailto:dalling@illinois.edu)

Instructor (evolution): Prof. Stewart Berlocher, 304A Morrill Hall, Department of Entomology

Office phone: (217) 333 2929

Email: [stewartb@illinois.edu](mailto:stewartb@illinois.edu)

### Course description

The first half of the course explores ecology at the individual, population, community, and ecosystem levels, including microbial and paleo-ecology. Through lecture, lab and homework assignments, students learn principles of experimental design and data analysis. These tools are used in weekly labs in university natural areas and in a weekend field trip to southern Illinois. Ecology culminates in a 3-week, independent project in which students collect and analyze data to test a hypothesis of their own choosing and write a paper in journal format. The second half of the course focuses on evolutionary biology at the population and species levels, with attention to quantitative genetics, molecular evolution, the fossil record, evolutionary development (“evo-devo”), macroevolution, and human evolution. As with the ecology half, there are three weeks of research on molecular evolution capped by a presentation to the class and program, and a research paper in journal format.

Course texts (a limited number of copies are available in the IB Honors lounge, but we recommend purchasing your own copy):

Ricklefs “Economy of Nature” 6<sup>th</sup> or subsequent edition. Freeman Publishers

<https://www.amazon.com/Economy-Nature-Robert-Ricklefs/dp/0716786974>

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

<https://www.pearson.com/us/higher-education/program/Herron-Evolutionary-Analysis-5th-Edition/PGM296285.html>

### Student Learning Outcomes:

(1) 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.

(2) Be able to explain how natural selection has propelled the evolution of the enormous diversity of life, with its endless species, forms, and functions, and understand how to recognize the core questions that remain to be answered in evolutionary biology.

(3) Understand when it is appropriate to use different statistical tests on ecological data (correlation, regression, contingency tables and analysis of variance), be able to apply them using standard software, and understand how to interpret the results of statistical tests presented in ecological literature.

(4) Be able to distinguish between hypothesis and prediction, and formulate hypotheses based on observations of the natural world.

(5) Understand how scientific papers are organized, and be able to write a report of an ecological study with appropriately structured format and content.

#### Course calendar

Detailed information on weekly class topics, reading assignments, assignment due dates, pdf files of lecture notes, specimen mid-term exam, and lab and homework grading rubrics are available on the course Moodle page:

<https://learn.illinois.edu/course/view.php?id=23765>

#### Southern Illinois field trip

There is a mandatory two-day field trip to southern Illinois at the beginning of the semester in which we collect data for the first class lab. The class departs Champaign at 5PM on Friday afternoon and returns no later than 6PM on Sunday. The trip is typically scheduled for the weekend after Labor Day. I will email details of the trip prior to the beginning of the semester. Contact me regarding any dietary concerns, allergies, or other considerations that may limit your participation in this activity.

#### Course grading

The ecology section of IB372 accounts for 49% of the total course grade:

	Ecology	Evolution	Totals
Ecology mid-term	15		
Evolution 1st hour exam		8	
Ecology Final exam essay	5		
Evolution Final exam essay		6	
Evo non-essay Final exam		9	
Labs	12.5	12	
Independent project	13	11	

Indep project - presentation		3
In class quizzes	1	
Homework	2.5	2
Totals	49	51

---

Exams and quizzes	21	23	44
Lab + homework	28	28	56
TOTALS	49	51	100

### Course attendance policy

Students are expected to attend all classes. Anticipated absences from class must be discussed with me ahead of time.

An absence letter or a request for accommodation is required under the following circumstances:

- (i) Prolonged illness or injury
- (ii) Illness, injury or death of a family member
- (iii) Observance of religious beliefs
- (iv) Volunteer emergency work
- (v) Compelling circumstances beyond your control

If you have questions call or send me an email.

Further information on student accommodations is available on the student code:

[http://studentcode.illinois.edu/article1\\_part5\\_1-501.html](http://studentcode.illinois.edu/article1_part5_1-501.html)

### Academic Integrity

According to the Student Code, 'It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions.' Please know that it is my responsibility as an instructor to uphold the academic integrity policy of the University, which can be found here: [http://studentcode.illinois.edu/article1\\_part4\\_1-401.html](http://studentcode.illinois.edu/article1_part4_1-401.html)

### Disability accommodations

To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class are asked to see me as soon as possible.

### 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
	Species Diversity	Statistics Homework 2	Week 4
2	Life History	Stream lab	Week 4
	Population Structure		
	Population Dynamics		
3	Mechanisms of competition	Southern IL lab	Week 5
	Competition models	Scientific writing Homework	Week 6
	Predation and Herbivory		
4	Predation models	Independent project hypothesis	Week 5
	Mutualisms		
	Trophic cascades		
5	Biodiversity	Independent project (1)	Week 9 (first draft)
	Succession		
	Biogeography		
6	Ecosystem Ecology	Independent project (2)	Week 9 (first draft)
	Microbial Ecology		
	Paleoecology		
7	Conservation Biology	Paleoecology lab	Week 10
	TA Guest lecture		
	Hour exam 1		

Wk	Lec.	D	Date	Topic	Reading	Lab (Tuesday)
8	20	M	14-Oct	Introduction. Foundations of evolutionary biology	5:147-157	Lab 8 - quantitative genetics Goldenrod, <i>Drosophila</i>
8	21	W	16-Oct	Linkage disequilibrium, variation	8:291-306	
8	22	F	18-Oct	Inbreeding	7:275-283	
9	23	M	21-Oct	Finish inbreeding	7:275-283	Lab 9 - population genetics I Box 5.2; 6:179-191; 5:157-161
9	24	W	23-Oct	Mutation	6:216-221; 7:234-7	
9	25	F	25-Oct	Gene flow, F-statistics, Drift-migration equilibrium	7:246-252 (LD?)	
10	26	M	28-Oct	Quantitative Genetics - heritability	9:329-347 (twins)	Lab 10 - population genetics II - Box 6.5; 6:200-212 5:169-174
10	27	W	30-Oct	Artificial selection on continuous variation	9:348-350	
10	28	F	1-Nov	Fitness and natural selection	9:350-360, 3:81-90	
11	29	M	4-Nov	Natural selection, sexual selection	9:348-350	Lab 11 - phylogeny Mammalian skulls. Read Chapter 4: 109-132
11	30	W	6-Nov	Sexual Selection	Ch 11; 8:314-325	
11	31	F	8-Nov	Finish sexual selection, kin selection	Ch 12	
12	32	M	11-Nov	Population structure; Molecular Evolution I	7:260-272; 1:18-24	Lab 12 - research projects
12	33	W	13-Nov	Molecular Evolution II (not Box 5.2))	5:161-166	
12	34	F	15-Nov	Fiinish Molecular Evolution	15:594-601	
13		M	18-Nov	<b>Exam II</b>		Lab 13 - research projects
13	35	W	20-Nov	Speciation I	16	
13	36	F	22-Nov	Speciation II	16	
			25-29-Nov	Fall Break		Fall Break
14	37	M	2-Dec	Speciation III	16	Lab 14 - research projects
14	38	W	4-Dec	Finish speciation and evo-devo		
15	39	F	6-Dec	Fossils and macroevolution II	18: 691-705	
15	40	M	9-Dec	Human population structure I	20.3	Lab 15 - project presentations
15	41	W	11-Dec	Human population structure II		

Final Friday, Dec 13, 7-10 PM; consists of exam III part and comprehensive part.