

UNIVERSITY OF CALIFORNIA, MERCED
BIO/ESS 148: Fundamentals of Ecology – Syllabus
Spring 2017

Lecture time: Mondays and Wednesdays, 10:30-11:45 am

Lecture location: SSB 120

Discussion section times and locations:

Section BIO-148-02D: Wednesdays, 5:30-6:20 pm, Classroom Bldg., Rm. 279

Section BIO-148-03D: Wednesdays, 6:30-7:20 pm, Classroom Bldg., Rm. 276

Section BIO-148-04D: Mondays, 4:30-5:20 pm, Classroom Bldg., Rm. 127

Instructor: Justin D. Yeakel (jyeakel@ucmerced.edu)
Science and Engineering Bldg., Rm. 288
Office hours: Mondays and Wednesdays: 2:00 – 3:00 pm, or by appointment

Teaching Asst: Taran Rallings (trallings@ucmerced.edu)
Office hours: Mondays: 2:00-4:00 pm in SE1 258, or by appointment

Course Website: <http://jdyeakel.github.io/teaching/ecology>

I. **Course Description:** This course fulfills an upper division requirement for the Ecology and Evolutionary Biology (EEB) emphasis track of the Biological Sciences Major, as well an upper division requirement for the Earth Systems Science Major. This course provides an introduction to ecology - the scientific study of how organisms interact with each other and their physical environment. *Prerequisite: BIO 001 or BIO 005 or ESS 001 or ESS 005 or consent of instructor. Normal Letter Grade only.*

II. **Course Goals and Outcomes:**

a. **Course Goals:**

- Learn key concepts and major topics in ecology, including: how organisms interact with their environment; the dynamics and regulation of populations; the various types and character of the interactions among organisms; the nature, geography, and biodiversity of communities; the structure and function of ecosystems; and applied and large-scale ecological topics, such as conservation biology, landscape ecology and ecosystem management, and global change
- Understand the linkages between ecology and the other subfields of the biological sciences and earth systems science
- Understand the fundamentals of the methods used in ecological research
- Appreciation for the positive and negative impacts of humans on ecological systems
- Be able to communicate ecological knowledge to other scientists and laypersons, and apply basic concepts to comprehend and evaluate science in the popular press and in the primary scientific literature

b. **Learning Outcomes:** At the end of the course, students should be able to:

- Explain the fundamental ecological principles that pertain to individual organisms, to populations, to communities, to ecosystems, to landscapes, and to the globe (see table below)
- Develop a broad appreciation of the linkages among ecology, evolution, and earth systems

science.

- Describe and understand the various techniques used in ecology, from computation to experimental, and how these techniques are coupled with the scientific method to address ecological questions
- Comprehend the practical applications of ecological principles in human society and the potential impacts of humans on ecological systems
- Critically evaluate the scientific literature as well as the popular press, and take ownership of the course material to improve their functioning in society

See the table below for more detailed learning outcomes.

III. **Format and Procedures:**

This course is structured as follows: two 75-minute lecture sessions and one 50-minute discussion section per week. Discussion sections will provide students an opportunity to discuss in more detail scientific findings from peer-reviewed publications. *Your participation in discussion section is graded* (see Grading below).

We will also spend a Saturday morning in March exploring the Vernal Pools ecosystem just off campus to apply some of our newly gained ecological knowledge to the field. All students are required to attend and participate. Field observations from the Vernal Pools will be used to write a Field Report towards the end of the semester.

IV. **Course Requirements & Grading Procedures:**

a. ***Class Attendance and Participation Policy:***

I expect students to attend most lectures; however, I will not take attendance. Over the 25+ years I have been teaching university-level courses, I have found that a student's performance in a course is *closely* coupled to their attendance.

Attendance and participation in the discussion section is required and will be a component of the student's course grade (see Discussion syllabus for details).

b. ***Required and Supplemental Readings:***

Required Textbook: Cain, M.L., W.D. Bowman, and S.D. Hacker. 2014. *Ecology*, 3rd Edition. Sinauer Associates, Inc., Publishers. Sunderland, MA. 565+ p.

Readings will also be assigned for the Discussion section and instead of the book for some lectures. These are **required** and will be provided on the course website.

Note: other editions (1st or 2nd) of this textbook may be used but are not recommended.

Companion Website: <http://sites.sinauer.com/ecology3e/index.html>

This companion site is designed to help students using the Cain et al. *Ecology*, 3rd Edition textbook to master important concepts in ecology. It provides resources for reviewing each chapter, learning key terminology, working with data from actual experiments, and using simulations to explore model systems. The site also includes self-study quizzes to gauge your comprehension of each chapter.

c. ***Course Assignments and Projects:***

Late assignments (e.g., homework, field report) will not be accepted.

Homework: Periodically during the semester, 3 homework assignments will be assigned consisting of exercises provided by the Teaching Assistant/Instructor.

Field Report: A short field report will be written independently by each student describing major ecological patterns observed and concepts discussed during the field trip to the Vernal Pools.

Quizzes: Six *unannounced* quizzes will be given periodically during the lecture period. Only the five best scores will be used in the calculation of your final grade.

Exams: There will be two “midterm” exams during the semester and a comprehensive final. *There will be no make-up exams or early exams.* If you are sick during an exam, please bring a note from your doctor verifying your illness. Your grade for the missed exam will be based on your average score from the other exams. You cannot miss more than one exam for an excused illness and taking the final is mandatory in order to pass the course.

d. **Grading:**

Your final grade will be based on the following: discussion section participation: 10%, homework: 15% (three assignments each of 5%), field report: 10%, quizzes: 10% (6 quizzes with best 5 of 6 counted), midterms: 30% (two, 15% each), and comprehensive final exam: 25%. If you receive more than 90%, you definitely will receive an A in the course. If you receive less than 55% of the total points, you definitely will receive an F.

For everything in between, grades will be given using the *approximate* framework: A: 90 - 100%, B: 80 - 90%, C: 70 - 80%, D: 60 - 70%. This framework is subject to change given the distribution of the final grades.

V. **Academic Integrity:**

Academic integrity is the foundation of an academic community and without it none of the educational or research goals of the university can be achieved. All members of the university community are responsible for its academic integrity. Existing policies forbid cheating on examinations, plagiarism and other forms of academic dishonesty.

- a. Each student in this course is expected to abide by the University of California, Merced’s Academic Honesty Policy (<http://studentlife.ucmerced.edu/what-we-do/student-judicial-affairs/academic-honesty-policy>). Any work submitted by a student in this course for academic credit will be the student's own work.
- b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.
- c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.
- d. Examples of academic dishonesty include:

- receiving or providing unauthorized assistance on examinations
 - using unauthorized materials during an examination
 - plagiarism - using materials from sources without citations
 - altering an exam and submitting it for re-grading
 - fabricating data or references
 - using false excuses to obtain extensions of time or to skip coursework
- e. The ultimate success of a code of academic conduct depends largely on the degree to which the students fulfill their responsibilities towards academic integrity. These responsibilities include:
- Be honest at all times.
 - Act fairly toward others. For example, do not disrupt or seek an unfair advantage over others by cheating, or by talking or allowing eyes to wander during exams.
 - Take group as well as individual responsibility for honorable behavior. Collectively, as well as individually, make every effort to prevent and avoid academic misconduct, and report acts of misconduct which you witness.
 - Do not submit the same work in more than one class. Unless otherwise specified by the instructor, all work submitted to fulfill course requirements must be work done by the student specifically for that course. This means that work submitted for one course cannot be used to satisfy requirements of another course unless the student obtains permission from the instructor.
 - Unless permitted by the instructor, do not work with others on graded coursework, including in class and take-home tests, papers, or homework assignments. When an instructor specifically informs students that they may collaborate on work required for a course, the extent of the collaboration must not exceed the limits set by the instructor.
 - Know what plagiarism is and take steps to avoid it. When using the words or ideas of another, even if paraphrased in your own words, you must cite your source. Students who are confused about whether a particular act constitutes plagiarism should consult the instructor who gave the assignment.
 - Know the rules --- ignorance is no defense. Those who violate campus rules regarding academic misconduct are subject to disciplinary sanctions, including suspension and dismissal.

Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.

The instructor will make every effort to accommodate all students who, because of religious obligations, have conflicts with scheduled exams, assignments, or required attendance. Please speak with the instructor during the first week of class regarding any potential academic adjustments or accommodations that may arise due to religious beliefs during this term.

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Tentative Weekly Schedule: Please note that the Instructor reserves the right to change the schedule. You will be advised in advance of any changes.

Wk.	Weekly Topic & Learning Goals	Key Learning Outcomes	Readings	Assessments
1	18 Jan: The Web of Life and Course Logistics	Describe the general types of questions ecologists ask & the approaches used to address them	Cain et al. Ch. 1	
	Discussion: None			
2	23 Jan: Ecological Scales I	Cells to communities	Levin SA. <i>The problem of pattern and scale in ecology</i> . Ecology 73, 1943-1967 (link)	
	25 Jan: Ecological Scales II	Spatial and temporal scales		
	Discussion: Scale		Levin SA. <i>The problem of pattern and scale in ecology</i> (link)	Class participation
3	30 Jan: The Biosphere	Distinguish among the major Earth's biomes	Cain et al. Ch. 3	
	01 Feb: Energy in the Web of Life	Explain how different organisms acquire energy	Cain et al. Ch. 5	
	Discussion: Energy flow in webs		Chamberlain et al. <i>Pleistocene to recent dietary shifts in California condors</i> (link)	Class participation
4	06 Feb: Evolution I	Compare the different mechanisms for evolution & explain how evolution is interconnected with ecology	Cain et al. Ch. 6	
	08 Feb: Evolution II	Discuss the interplay between ecological and evolutionary dynamics		
	Discussion: Evolution		Kocher. <i>Ghost of speciation past</i> . (link)	Homework 1 due Chap. 1, 3, 5-6; class participation
5	13 Feb: Life history tradeoffs	Describe some of the tradeoffs in life history traits & how life history patterns vary within & among species	Cain et al. Ch. 7	
	15 Feb: Exam 1			Material from weeks 1-5
	Discussion: Review			Class participation
6	20 Feb	President's Day (no class)		
	22 Feb: Behavioral Ecology I	Optimal foraging theory, marginal value theorem, parental investment, mating	Cain et al. Ch. 8	
	Discussion: None			

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Wk.	Weekly Topic & Learning Goals	Key Learning Outcomes	Readings	Assessments
7	27 Feb: Behavioral Ecology II			
	01 Mar: Maximizing fitness	Determining behaviors and life history through fitness maximization	TBD	
	Discussion: Behavioral Ecology		Wolf et al. <i>Life history trade-offs favor the evolution of animal personalities.</i> (link)	Class participation
8	Mar 6: Population Growth & Regulation	Density dependence and basic population dynamics	Cain et al. Ch. 10	
	Mar 8: Population Growth & Regulation (cont.)	Life tables and population viability analysis		
	Discussion: Populations		Packer et al. <i>Ecological change, group territoriality, and population dynamics in Serengeti lions.</i> (link)	Class participation
	11 Mar: Vernal Pools	Details TBA		Mandatory Field Trip 9:00AM - 12:00AM
9	13 Mar: Population Dynamics	Summarize the different patterns of population growth & the factors that define these patterns	Cain et al. Ch. 11	
	15 Mar: Competition		Cain et al. Ch. 12	
	Discussion:		Dominy et al. <i>Frankenstein and the horrors of competitive exclusion</i> (link)	Homework 2 due Chap. 8, 10-12; class participation
10	20 Mar: Predation & Herbivory	Explain how predation & herbivory shape populations & describe some of the adaptations organisms have made to acquire food and avoid being eaten	Cain et al. Ch. 13	
	22 Mar: Exam 2			Material from weeks 6-10
	Discussion: Species Interactions & Review			Class participation
11	SPRING BREAK			
12	03 Apr: Parasitism	Describe some of the adaptations parasites and their hosts have evolved & describe how understanding host-pathogen dynamics can help control diseases	Cain et al. Ch. 13	

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Wk.	Weekly Topic & Learning Goals	Key Learning Outcomes	Readings	Assessments
	05 Apr: Mutualism & Commensalism	Describe the different types of species interactions & how positive interactions affect communities	Cain et al. Ch. 14	
	Discussion: Trophic and non-trophic interactions		Estes et al. <i>Killer whale predation on sea otters linking oceanic and near-shore ecosystems</i> . (link)	Report thesis due; Class participation
13	10 Apr: Ecological networks	The structure and function of ecological interaction networks	TBD	
	12 Apr: The Nature of Communities	Describe the nature of communities and how to describe their structure	Cain et al. Ch. 15	
	Discussion: Networks		Thebault et al. <i>Stability of ecological communities and the architecture of mutualistic and trophic networks</i> . (link)	
14	17 Apr: Change in Communities	Describe succession and the factors that cause communities to change	Cain et al. Ch. 17	
	19 Apr: Biogeography	Explain the patterns of species diversity & distribution at different spatial scales	Cain et al. Ch. 18	
	Discussion: Island biogeography theory		Brown et al. <i>Turnover rates in insular biogeography</i> . (link)	Homework 3 due Chap. 13-15, 17-18; class participation
15	24 Apr: Dynamics over space	Metapopulations and the rescue effect	Hanski. <i>Metapopulation Dynamics</i> . (link)	
	26 Apr: Species Diversity in Communities	Explain why the species diversity of communities varies and how this factor may affect community function	Cain et al. Ch. 19	
	Discussion: Community Dynamics		Hanski. <i>Metapopulation Dynamics</i> . (link)	Class participation
16	01 May: Harvesting		TBD	
	03 May: Food webs through time and the effects of humans		TBD	
	Discussion: Harvesting		Schindler et al. <i>Population diversity and the portfolio effect in an exploited species</i> . (link)	Field Report Due; Class participation
17	Exam 3: Saturday, May 06, 08:00 – 11:00 AM, SSB 120			½ Exam on Weeks 12-16; ½ Exam Comprehensive