

Semester at Sea, Course Syllabus  
Colorado State University, Academic Partner

**Voyage: Spring 2017**  
**Discipline: Life Sciences**  
**Course Number and Title: LIFE 320 Ecology**  
**Division: Upper (300-499)**  
**Faculty Name: Dan Binkley**  
**Semester Credit Hours: 3**

**Prerequisites:** Introductory biology course or similar and calculus

### **COURSE DESCRIPTION**

Ecology is the domain of interactions between life and the environment. All species depend on environmental conditions and the supply of energy and matter, and upon intricate interactions with other species. These interactions vary with locations and over time, and conceptual and quantitative approaches are fundamental to understanding ecology at all scales. Topics include the influence of energy on plant and animal physiology and fitness, competition and facilitation interactions among species, patterns and drivers of biodiversity, and dynamics of ecological systems over space and time. Case studies will be included to illustrate ecological aspects of each country visited during the semester. Ecological interactions shape ecosystems, and these will be evaluated by using 6 framing questions:

1. What are the components of the system
2. What are the boundaries of the system
3. What are the internal processes and interactions that cause changes over time (chronic or episodic?)
4. What are the external drivers that cause change over time (chronic or episodic?)
5. How does the system influence larger systems?
6. How can we quantify the composition and changes in the system?

### **LEARNING OBJECTIVES**

- Acquire knowledge of the basic biological and environmental components and drivers in ecological systems.
- Understand how dynamics in ecosystems change over space and time, including the influence of interacting processes.
- Apply and analyze ecological insights to address specific case studies in ecology
- Synthesize and evaluate the balance between predictable, repeatable features of ecological systems and the importance of stochastic/contingent events.

### **REQUIRED TEXTBOOKS**

**AUTHOR:** R.L. Smith and T.M. Smith  
**TITLE:** Ecology and Field Biology  
**PUBLISHER:** Benjamin Cummings  
**ISBN #:** ISBN-10: 0321934180 • ISBN-13: 9780321934185

DATE/EDITION: 2015/9<sup>th</sup> (though earlier editions would also work for students)

## TOPICAL OUTLINE OF COURSE

Depart Ensenada—January 5

**A1—January 7:** Introduction and History of Ecology; What questions are addressed in ecology? Read Chapter 1

**A2— January 9:** The Abiotic Environment; radiation and temperature; How do the physics of radiation and energy explain the environments experienced by organisms? Environmental gradients in the Hawaiian Islands. Read Chapter 1 and 2

**A3— January 11:** The Abiotic Environment: hydrology; What determines the supply of water available in terrestrial ecosystems, and flows of water in aquatic ecosystems? Read Chapter 2

Honolulu—January 12

**A4—January 14:** Biogeochemical Cycles; How do materials cycle through parts of ecosystems, and how do these flows shape ecosystems? Read Chapters 21, 22

**A5—January 17:** Energy flow and productivity; How does energy become productivity? Read Chapter 20

No class January 19

**A6—January 20:** Adaption: Plants; How do plants cope with environmental challenges, with other plants, and with animals? Read Chapter 5, 6

**A7—January 22:** Adaption: Animals; How do animals cope with plants, and other animals? Monkey ecology in cold environments; snow monkeys in Japan. Read Chapter 7

Kobe – January 24 - 28

**A8—January 29:** Population Growth and Regulation; How much are population changes driven by predictable versus random factors? Ecological interactions: pandas and bamboo. Read Chapter 9

Shanghai – January 31 – February 5

**A9—February 6:** Population Genetics; How do the dynamics of individuals and species relate to genetics? Read Chapter 8

**A10—February 8:** Life History; How can the overall ecology of a species be understood and represented? Ecology of mangrove forests. Read Chapter 10

Ho Chi Minh City – February 10-14

**A11– February 15:** Competition and facilitation; How do organisms compete for resources, and benefit from other organisms? Read Chapter 13

No Class - February 17

**A12– February 18:** Predation, Parasitism and Mutualism; How do negative and positive effect ripple across species and through ecosystems? Read Chapter 15

Yangon – February 20-24

**A13– February 25:** Mid-term exam

**A14–February 27:** Landscape Ecology in space and time; What patterns are apparent in ecosystems over space, what processes shape these patterns, and how do they change over time? Wildlife conservation in India. Read Chapters 18, 19

Cochin – March 1-6

**A15– March 7:** Ecosystems: Marine Environments; How do the composition and dynamics of marine ecosystems change across the oceans? Coral Reef ecology in Mauritius. Read Chapter 24

No Class – March 9

**A16–March 10:** Soil ecology; What is the significance of 99% of ecosystem biodiversity occurring in the soil? Review Chapter 21 and 22

**A17–March 13:** Ecosystems: Grassland, Tundra and Forest; Why aren't all terrestrial ecosystems identical? Herbivore impacts on African ecosystems. Read Chapter 23

No Class – March 15

**A18–March 16:** Ecosystems: Freshwater Systems; How does hydrology influence the ecology of freshwater ecosystems? Review Chapter 24

**A19–March 18:** Biodiversity and Species Extinction; Does the count of species really matter? Read Chapter 26

Cape Town–March 19-24

**A20–March 26:** Restoration Ecology; What are the challenges in putting Humpty Dumpty back together again?

**A21—March 28:** Invasion Ecology; Why can some species become so successful in new territories? The ecology of chocolate agriculture in Ghana

No Class – March 29

Tema – March 31-April 3

**A22—April 4:** Human ecology: pastoralists, farmers, urbanites; What do these people have in common, and what are the key differences?

**A23—April 6:** Lessons from the Pleistocene and Holocene; What happens when dominant species go extinct. The coming and going of the Sahara.

**A24—April 8:** The Anthropocene, Global Change and the Future; Why your future is so bright!

Study Day – April 10

Casablanca – April 11-April 14

**A25 Finals – April 15:**

Arrive Hamburg—April 19

#### **FIELD WORK**

**Field Class proposals listed below are not finalized.** Confirmed ports, dates, and times will be posted to the [Spring 2017 Courses and Field Class](#) page when available.

Field Class attendance is mandatory for all students enrolled in this course. Do not book individual travel plans or a Semester at Sea sponsored trip on the day of your field class. Field Classes constitute at least 20% of the contact hours for each course, and will be developed and led by the instructor.

The island of Mauritius offers an excellent opportunity to access and observe marine organisms across a gradient of environmental conditions, from shoreline to the subtidal. Because of its small size Mauritius also allow us to observe the influence of human development on the marine environment. We will visit the Mauritius Oceanography Institute (MOI), mangroves, reefs and open ocean to observe firsthand the diversity of organisms present, their behaviors and adaptations to the marine environment. We will look for the evidence of interactions among plants, animals and their physical environments.

Academic Objectives:

1. Relate physical and biological aspects of the marine environment described in lecture to a real-world setting.
2. Experience the diversity of marine organisms.
3. Learn to pose scientific hypotheses concerning the marine environment.

## FIELD CLASS ASSIGNMENT

Students will be evaluated based on two products from the field trip:

- 1) An essay evaluating two streams of connection. The first stream deals with interactions at a single location from the day's field experience – what connections are most important at this location? The second stream is a connection across landscapes/seascapes – how is one point on the spectrum influenced by another “above” it, and how does it influence the one “below” it? (total length about 2 pages)
- 2) A journal entry exploring three key aspects of Mauritius ecosystems prior to human influences; how these aspects changed over the last 200 years; and how ecological insights inform choices about the future. (total length about 2 pages)

## INDEPENDENT FIELD ASSIGNMENTS

- 1) Students will maintain an Ecology Journal that will include 5 or more case studies in relation to port calls. Each case study will include a) the 3 key points that hosts/presenters emphasized that would relate to ecology; b) 3 features that were particularly interesting (or surprising) to the student; and c) identifying a key interaction with a strong impact on an ecological question. Evaluation will be based on completeness and quality.
- 2) Students will write a series of 3 essays (maximum 1 page each), with each essay taking one of the “ecological framing” questions used in this course, and examining how the question related to at least 3 of the port calls (similarities, unique features, overall insights). Evaluation will be based on quality of the insights developed.

## METHODS OF EVALUATION / GRADING SCALE

The following Grading Scale is utilized for student evaluation. Pass/Fail is not an option for Semester at Sea coursework. Note that C-, D+ and D- grades are also not assigned on Semester at Sea in accordance with the grading system at Colorado State University (the SAS partner institution).

Grading scheme:

Midterm exam: 20%

Independent field assignment 1: 15%

Independent field assignment 2: 15%

Field course assignment: 20%

Final exam: 30%

Pluses and minuses are awarded as follows on a 100% scale:

<u>Excellent</u>	<u>Good</u>	<u>Satisfactory/Poor</u>	<u>Failing</u>
97-100%: A+	87-89%: B+	77-79%: C+	Less than 60%: F
94-96%: A	84-86%: B	70-76%: C	
90-93%: A-	80-83%: B-	60-69%: D	

## ATTENDANCE/ENGAGEMENT IN THE ACADEMIC PROGRAM

Attendance in all Semester at Sea classes is mandatory, but it is at the instructor's discretion to assign a grade to the participation and attendance requirement. Remember to include

information concerning the evaluation of Field Assignments and the Field Classes, which must constitute at least 20% of the total grade in a course.

Students must inform their instructors prior to any unanticipated absence and take the initiative to make up missed work in a timely fashion. Instructors must make reasonable efforts to enable students to make up work which must be accomplished under the instructor's supervision (e.g., examinations, laboratories). In the event of a conflict in regard to this policy, individuals may appeal using established CSU procedures.

### **LEARNING ACCOMMODATIONS**

Semester at Sea provides academic accommodations for students with diagnosed learning disabilities, in accordance with ADA guidelines. Students who will need accommodations in a class, should contact ISE to discuss their individual needs. Any accommodation must be discussed in a timely manner prior to implementation. A memo from the student's home institution verifying the accommodations received on their home campus is required before any accommodation is provided on the ship. Students must submit this verification of accommodations pre-voyage as soon as possible, but no later than November 19, 2016 to [academic@isevoyages.org](mailto:academic@isevoyages.org).

### **STUDENT CONDUCT CODE**

The foundation of a university is truth and knowledge, each of which relies in a fundamental manner upon academic integrity and is diminished significantly by academic misconduct. Academic integrity is conceptualized as doing and taking credit for one's own work. A pervasive attitude promoting academic integrity enhances the sense of community and adds value to the educational process. All within the University are affected by the cooperative commitment to academic integrity. All Semester at Sea courses adhere to this Academic Integrity Policy and Student Conduct Code.

Depending on the nature of the assignment or exam, the faculty member may require a written declaration of the following honor pledge: "I have not given, received, or used any unauthorized assistance on this exam/assignment."

### **RESERVE BOOKS AND FILMS FOR THE LIBRARY**

None.

### **ELECTRONIC COURSE MATERIALS**

None.

### **ADDITIONAL RESOURCES**

None.



