

CENTER FOR INTERNATIONAL PROGRAMS

Course name: Tropical Ecology

Course code: ENV 3044

Total contact hours: 60 hours

COURSE DESCRIPTION

This course will provide students with a general overview of tropical ecology. Students will gain insight about basic ecological concepts and be able to explore a variety of ecosystems, their animals and the multiple and complex ecological interactions that can be found in these areas. Costa Rica is a tropical country with an immensely rich biodiversity and for this reason a very representative area to these studies. Emphasis will be given to the study of the ecosystems found in Costa Rica, but others will be discussed as well.

OBJECTIVES

- 1) Become acquainted with the concepts and issues addressed to ecology.
- 2) Learn the characteristics of the major ecosystems on earth.
- 3) Observe different ecosystems and seek examples of important interactions.
- 4) To become familiar with the biodiversity of the tropics.
- 5) Understand the importance of the balance and the harmony among different types of ecosystems.
- 6) Understand the natural and human made impacts on natural ecosystems.
- 7) Comprehend the importance of conservation and management of natural systems.

COURSE CONTENTS

UNIT 1. ECOLOGY: BASIC CONCEPTS.

1. Ecology as a science
 - Organisms and their environment
 - Conditions
 - Resources

2. Ecosystem components
 - Biotic and abiotic elements
 - Organization of the biotic components
 - Populations
 - Communities
 - Biotic interactions
3. Matter and energy flow
 - Thermodynamic laws
 - Entropy and life
4. Trophic Levels
 - Food chains and food webs
 - Biological pyramids
 - Nutrient and water cycling

UNIT 2. TROPICAL TERRESTRIAL ECOLOGY

1. Physical Conditions
 - Climate of the neotropics
 - Biogeography of the Central American Isthmus
 - Geography and Climate of Costa Rica
 - Tropical Biodiversity
 - Life zones
2. Plant Ecology
 - Forest structure
 - Gap phase regeneration
 - Maintenance of plant diversity
 - Seasonal rhythms in flowering, fruiting, germination
 - Pollination systems
 - Tropical plants
3. Animal Ecology
 - Tropical animals
 - Herbivory: impact on plant defenses
 - Seed dispersal and seed predation
 - Defense against predation
 - Diapause and migration

UNIT 3. TROPICAL TERRESTRIAL ECOSYSTEMS

1. Rain Forests
2. Dry Forests
3. Montane Forests
4. Páramo
5. Savannas
6. Deserts

UNIT 4. INTRODUCTION TO TROPICAL MARINE ECOLOGY

1. Physical and Chemical Ocean characteristics
 - Composition of sea water
 - Formation of winds, waves, tides, surface and deep currents
 - Physiological adaptations of organisms to physical and chemical properties
2. Marine phyla
 - Invertebrates
 - Vertebrates
3. Marine Ecology
 - Ocean life zones (division of marine environments)
 - Energy transfers in marine environments
 - Plankton Ecology
 - Productivity and production
 - Herbivores (grazing), planktivores, Piscivores, Carnivores

UNIT 5. TROPICAL MARINE ECOSYSTEMS

1. Coral Reefs
 - Coral Reefs: Rain forest of the oceans
 - Distribution of coral reefs
 - Function and importance of coral reefs
 - Biogeography communities
 - Species and interactions
 - i. Coral reef fishes behavior
 - ii. Competition between species (corals, algae, etc)
 - iii. Symbiotic interactions (coral/algae)
2. Seaweeds & Seagrass
 - Description of main groups
 - Distribution
 - Importance
 - Species adaptations and interactions
3. The Rocky Shore and Intertidal Zone
 - Importance
 - Species adaptations and Interactions
4. Mangroves
 - The estuarine environment
 - Mangroves and mangrove forest
 - Distribution
 - Species adaptations and interactions
 - Importance
5. Interaction Between Tropical Coastal Ecosystems
6. Hydrothermal Vents

UNIT 6. ANTHROPOGENIC INTERVENTION

1. Natural and Human Impacts on Coastal Ecosystems

2. Indigenous populations and forest use
3. Value of tropical forests
4. Causes of tropical deforestation
5. Consequences of forest destruction
6. Forest fragmentation and conservation
7. Development and conservation

METHODOLOGY

Attendance

The student's attendance to every class is mandatory. If a student gets sick or has some other important problem, he/she has to bring a document justifying their absence. After 2 unjustified absences, students will fail the course.

Assignments

Individual Presentation

Students will have to make an individual presentation (power point) through the course. The presentation must be about any subject concerning tropical ecology, approved by the professor. It must last about 15 min and should be emailed to the professor the day before. The professor, depending on the subject will assign the date for the presentation. The class will assign 30% of the grade and the professor will assign the remaining 70%.

Group Research Assignment

The assignment will be a research on any subject from unit 6, and it will include a power point presentation and a research paper.

The paper should be at least 10 double-spaced pages (not including images) and include at least 5 references. It will be evaluated based on well defined focus, structure and conclusions. The grade obtained in this paper will be the same for all the group members.

For the presentation each group member has to talk at least for 5 minutes and will be independently evaluated.

For All Presentations:

It will be evaluated based on preparation (knowledge assimilation), presentation style (organization, smoothness, and clarity), slides (preparation and organization), finishing the presentation in time, and answering questions.

Debates:

Debates will be by groups which will depend on the number of students in the class. Half of the students will adopt the PRO side while the other half adopts the CON side. There will be 25 min per debate: 4 min per side for opening statements, 4 min per side for counter-arguments to each other's opening statement, and 4 min per side for closing remarks. The grade for the debate will be assigned by the course professors (70%) and the class (30%).

Fieldtrips

This course includes two mandatory Laboratory Field Trips: (choices will depend on climate and animal activity); probably one in the Pacific side, and one in the Caribbean side of the country.

Lodging and main meals are covered by the course, but students should bring some extra money to buy water and other individual needs. Bring also swimming suit, towel, long and short pants, walking shoes, repellent and sun block.

The mandatory fieldtrips in this course are not excursions. Only students enrolled in this course may attend. Field work might include volunteer work such as trail cleaning, late night species monitoring, long walks on beaches or dense vegetation areas and other tasks that might be considered harsh or strenuous for students who have not taken an environmental science course or have not done fieldwork. Students must be on time for all fieldtrip related activities including departure, return and scheduled meal times. All though many of the reserves and parks have nearby modest lodge accommodations some of the stations or research areas might require tent lodging. Some of the national parks and reserves are in far away areas of the country or places with difficult access so students who get motion sickness from long bus rides might be uncomfortable in these fieldtrips.

Fieldtrip Grade

Students will carry small note books to write down anything they see or learn while in the field and what they think about it. Each person's journal will be unique to them, not only in that you will each notice different things, but you will each interpret similar things differently. This journal will help the students write their fieldtrip report, which is a formal paper of your journal information.

The fieldtrip report (70% of the fieldtrip grade) contains information of what the student sees and learns in the fieldtrip and what they think about the fieldtrip. The report should be no less than two 1.5-spaced pages.

Additionally, the behavior during the fieldtrip (30% of the fieldtrip grade) will be evaluated (punctuality, participation, etc.)

EVALUATION SYSTEM

Theory

Individual Presentation	7%
Class Participation (debates, quizzes, etc)	7%
Midterm Tests (Units 1 and 2)	21%
Final Test (Units 3 to 5)	21%
Group Research Paper (4%) and Presentation (10%)	14%

Laboratory

Field trip 1	15%
Field trip 2	15%

Tentative Lesson Schedule

The course consists of 12 weeks of theory, two days a week, two hours a day, 50 hours in total, and 2 field trips as laboratories.

Day	Unit	Activities and Assignments
Wednesday	1.1	Discuss course syllabus & trip logistics.
Monday	1.2	Internet practice: Look for specific examples of interspecific interactions. Each student should hand in the information found at the end of the class.
Wednesday	1.3 and 1.4	
Monday	2.1	
Wednesday	2.2	1 st . Quiz (Unit 1.1 to 1.4) Internet practice: Look for specific examples of seed dispersion adaptations. Each student should hand in the information found at the end of the class.
Monday	2.2	Article discussion: Borneo's Strangler Fig Trees
Wednesday	2.2	Debate: Biodiversity importance Article discussion: Ants and Plants
Monday	2.3	Article discussion: Trap-Jaw Ants: Set for Prey
Wednesday	2,3	Article discussion: Poison-Dart Frogs
Monday	2,3	Article discussion: Winged Victors 2 nd Quiz (Unit 2.1 & 2.2)
Wednesday	3.1	Article discussion: Ndoki-Last Place on Earth
Monday	Midterm	Units 1 and 2

	Test	
Wednesday	3.2 – 3.4	Movie on Costa Rica's Ecosystems
Monday	3.5	
Wednesday	3,6	Article discussion: Africa's Skeleton Coast
Monday	4.1	Internet practice: Look for specific examples of physiological adaptations of organisms to physical and chemical properties. Each student should hand in the information found at the end of the class.
Wednesday	4.2	3 rd Quiz (Unit 2.3 to 3.6) Article discussion: Hawaii's Unearthly Worms
Monday	4.3	
Wednesday	5.1	Article discussion: Great Barrier Reef
Monday	5.1	Movie on Coral Reefs
Wednesday	5.2-5.4	Article discussion: Forests of the Tide
Monday	5.5 and 5.6	Movie on Hydrothermal Vents Article discussion: Deep Sea Vents 4th Quiz (Unit 4.1 to 5.1)
Wednesday	6	Research Assignment Presentations
Monday	6	Research Assignment Presentations
Wednesday	Final Test	Units 3, 4 and 5

BIBLIOGRAPHY

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- Nibakken, J.W. & M.D. Bertness. 2005. Marine Biology: An Ecological Approach. 6th ed. Benjamin Cummings, San Francisco, 579p.
- Janzen, H.D. 1983. Costa Rican Natural History. The University of Chicago Press. 789p.
- Kricher, J. 1997. A Neotropical Companion: An Introduction to the Animals, Plants, and Ecosystems of the New World Tropics. 2nd ed. Princeton University Press, Princeton, NJ.