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 tropical 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 PRE-REQUISITES

It is recommended, but not required, that students complete a basic biology course prior to entering this course

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 Ecology
    - Ocean life zones (division of marine environments)
    - Energy transfers in marine environments
    - Plankton Ecology
    - Productivity and production
    - Hervibores (grazing), planktivores, Piscivores, Carnivores

UNIT 5. TROPICAL MARINE ECOSYSTEMS

1. Seaweeds & Seagrass
    - Description of main groups
    - Distribution
    - Importance
    - Species adaptations and interactions
2. The Rocky Shore, Estuaries and Intertidal Zone
    - Importance
    - Species adaptations and Interactions
3. Mangroves
    - The estuarine environment
    - Mangroves and mangrove forest
    - Distribution
    - Species adaptations and interactions
    - Importance
4. Hydrothermal Vents
5. 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)

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

Audience

This course is structured for International Students attending the Study Abroad program at Universidad Veritas. However, courses are not exclusive to foreigners so a few native student could enroll in this course.

Electronic devices:

The use of cell phones, smart phones, or other mobile communication devices is disruptive, and is therefore prohibited during class. **Please turn all devices OFF and put them away when class begins.** Devices may be used ONLY when the professor assigns a specific activity and allows the use of devices for internet search or recording. Those who fail to comply with the rule must leave the classroom for the remainder of the class period.

Attendance

Students are only allowed 2 absences (justified or not). The student will fail the course if he/she has more than 2 absences. Students will have a 0 on any assignment evaluated in class (presentations, evaluations, field trips, etc.) if he/she is absent in this class, unless an official document is presented to justify the absence the class after the absence. In this case the assignment will be done this day. **An unjustified absence to a fieldtrip will immediately mean failing the course.** You can only have two total absences in your elective courses HOWEVER, **if you miss more than one day of class in a given month**, YOU WILL NOT RECEIVE CREDIT for that particular course.

Behavior

Professors have the right to expel a student from the classroom should he / she:

1) be disruptive in the classroom
2) be under the influence of alcohol or even smell like alcohol

3) Behave in a disrespectful way.

If you tend to be late for class, you will lose 25% of your total grade

LAB HOURS (complementary to the Field sessions there will be approximately 6 to 10 hours of class conducted in the Laboratory)

1. Students will learn to correctly operate a compound microscope, know its basic parts, and be able to put it away properly
2. Students will learn to differentiate between microscopic organisms at the Kingdom level (Protista, Fungi, Animalia)and the conditions in which can survive
3. Students will be able to observe in the stereoscope, study and hypothesize about the adaptations of seed structures to aid in their dispersal.
4. Students will learn to recognize the different morphological adaptations or interaction with animals, which may have the plants in order to survive

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 consist of a powerpoint presentation.

For the presentation each group member has to talk at least for 5 minutes and the presentation should be at least 15 min and no longer than 30 min. One grade will be assigned for the group as a whole.

For All Presentations:

It will be evaluated based on preparation (knowledge assimilation), presentation style (organization, smoothness, and clarity), slides (clarity, aesthetics), finishing the presentation in time, and answering questions. All presentations must be made on the assigned date, if not the grade will be 0 (unless the absence is justified).

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 professor (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,

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 (not including images) with #12 Times New Roman font, in letter size pages

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

For all Written Assignments

All written assignments will be uploaded to Moodle. All assignments will have a deadline to be sent, and **will not be received after this deadline, without exceptions**. It is each student's responsibility to be aware of the deadline (shown on Moodle for each assignment).

EVALUATION SYSTEM

Theory

Individual Presentation	7%
Debates, quizzes, internet practice	16%
Attendance and Participation	10%
Midterm Test (Units 1 and 2)	11%
Final Test (Units 3 to 5)	11%
Group Research Presentation	10%
Article Discussions	5%

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, and 2 field trips as laboratories.

Day	Unit	Activities and Assignments
Tuesday (29)	1.1	Discuss course syllabus & trip logistics.
Thursday (1)	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.
Tuesday (6)	1.3 – 1.4	
Thursday (8)	2.1	**Debate**: Biodiversity importance
Tuesday (13)	2.2	**Article discussion**: Borneo's Strangler Fig Trees
Thursday (15)	2.2	1st. Quiz (Unit 1.1 to 2.1) **Article discussion**: Ants and Plants
Tuesday (20)	2.2	**Article discussion**: Sneaky Orchids **Internet practice**: Look for specific examples of seed dispersal adaptations. Each student should hand in the information found at the end of the class
Thursday (22)	2.3	**Article discussion**: The Art of Deception **Article discussion**: Trap-Jaw Ants: Set for Prey
Tuesday	2.3	**Article discussion:** Vanishing Amphibians

(27)		
Thursday (29)	2,3	**Article discussion:** Winged Victors
Tuesday (3)	3.1	2nd Quiz (Unit 2.2) **Article discussion**: Ndoki-Last Place on Earth Movie: Jungles
Thursday (5)	**Midterm Test**	(Units 1 and 2)
Tuesday (10)	3.2 – 3.4	Movie: Dry Forests
Thursday (12)	3.5 – 3.6	**Article discussion:** Africa´s Skeleton Coast
Tuesday (17)	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.
Thursday (19)	4.2	**Article discussion:** Hawaii´s Unearthly Worms
Tuesday (24)	5.1 - 5.2	3rd Quiz (Unit 2.3 to 4.1) **Article discussion:** Blue Whales
Thursday (26)	5.3	**Article discussion**: Forests of the Tide
Tuesday (1)	5.4	**Article discussion**: Deep Sea Vents Movie: Deep Sea Vents
Thursday (3)	5.5	**Article discussion**: Great Barrier Reef
Tuesday (8)		4th Quiz (Unit 4.2 to 5.5) Movie
Thursday (10)	6	
Tuesday (15)	6	
Thursday (17)	**Final Test**	Units 3, 4 and 5

BIBLIOGRAPHY

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Stiles, G.F. & Skutch A. 2007. Guía de aves de Costa Rica. 4ta. edición Trad. L. Roselli, illus. D. Garner. Instituto Nacional de Biodiversidad, Heredia, Costa Rica. 576 pp.

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