



CIEE Monteverde, Costa Rica

Course name:	Costa Rican Natural History
Course number:	BIOL 3002 MTVE
Programs offering course:	Costa Rica, Monteverde - Sustainability and the Environment Program
Language of instruction:	English
U.S. Semester Credits:	2
Contact Hours:	30
Term:	Spring 2020

Course Description

Costa Rican Natural History is a field-based course that provides students an opportunity to observe, investigate, and understand the structure and function of tropical ecosystems (cloud forests, lowland rainforests, dry forests, wetlands, rivers and streams, and mangroves) and their most characteristic biotic and abiotic components. Biotic components will include key taxa or functional groups (plants, birds, arthropods, mammals, reptiles, amphibians; plant growth forms, herbivores, carnivores, etc.) that play critical roles determining community structure (e.g., richness, diversity, and composition) and ecological function (e.g., energy, nutrient, and water cycles) of each ecosystem. Abiotic components will include factors such as temperature, precipitation, seasonality, soil properties, geomorphology, salinity, and discharge, etc., as relevant to each ecosystem. Lectures and readings will supply a modern evolutionary-ecological framework for understanding each ecosystem, which will be then enhanced and extended through extensive firsthand experiences in the field. Field activities teach students how to observe and interpret natural history, i.e., the behavior of organisms in their natural context, understand species interactions such as pollination, seed dispersal, herbivory, and predation, apply concepts such as evolution through natural selection, and gain insight into ecosystem services such as water purification, atmospheric regulation, and erosion control.

Learning Objectives

Upon completion of this course, students will:

1. Be able to identify defining abiotic features (e.g., temperature, precipitation, seasonality, geomorphology, salinity) of major Costa Rican ecosystems, such as mangroves, cloud forests, montane rivers, streams and rivers, and rain forest;
2. Be able to describe and explain seasonal variation in the defining abiotic parameters, such as precipitation, temperature, discharge;
3. Be able to observe and record property and objectively the behavior of plants, animals, fungi in their natural context;
4. Understand and interpret the adaptive (evolutionary) significance of the natural history of typical taxa that characterize the habitats under study. Natural history includes interactions within and between species, adaptations for reproduction and survival, functional role in the community, taxonomic relationships between species, and possible ecosystem services provided and conservation significance;
5. Understand the role of climate and weather in shaping seasonality and ecosystem variation in the mountains of Costa Rica. This includes trade winds, weather systems of the Atlantic and Pacific Oceans, etc.;



6. Have an expanded understanding of the concept of ecosystem services, as well as knowledge of specific ecosystem services provided by the different habitats and taxa under study;
7. Have a greater appreciation of the value of these ecosystems, and a personal investment in their protection, both at home and abroad.

Course Prerequisites

Previous college-level coursework or other significant preparation in the physical or natural sciences or related fields, as assessed by CIEE.

Methods of Instruction

The Learning Objectives will be introduced through PowerPoint lectures and documentaries, and reinforced and further developed through field excursions and activities, as well as readings and oral reports prepared and presented by peers ("Species Reports"; see details below).

Assessment and Final Grade

Participation:	10%
Species reports (5 total):	40%
Quizzes (5 total):	25%
Final Exam:	25%

Course Requirements

Participation (10%). Attendance is noted for each lecture, discussion session, and field activity. As the semester proceeds, students earn points for thoughtful commentary, questions, and participation in discussions.

Species Reports (40%). Students will individually investigate published reports on a species' natural history information from hardcopy sources or online sources (e.g., Encyclopedia of Life, National Institute of Biodiversity, and the Tree of Life Web Project), then paraphrase the information in a set of written notes. When the species is observed in the field, the student will present the information to peers. In total, five Species Reports are presented. A grading rubric will be supplied before the assignment.

Quizzes (25%). Students will supply short, written answers (a few words-short paragraph) to a series of questions related to lectures, orientation hikes or outdoor activities, readings, or documentaries, and will include at least one question from the species reports. In total, five quizzes will be prepared. The quizzes will also serve as study guides for the tests.

Final Exam (25%): This consists of short-answer-questions (100 points) related to lectures, orientation hikes or outdoor activities, readings, or documentaries.

Attendance

Regular class attendance is required throughout the program. Attendance is noted for each lecture, discussion session, and field activity.

Students must notify their instructor, beforehand, if possible, if they will miss class for any reason. Students are responsible for any materials covered in class in their absence. Students



who miss class for medical reasons must inform the instructor and the Academic Director (or a designated staff member) and provide appropriate documentation as noted below. A make-up opportunity will be provided to the extent this is feasible.

Due to the intensive and experiential nature of the program, all unexcused absences will result in a lower final grade for the course. Each unexcused absence will cause 3 percentage points to be dropped from the final grade. For example, a student with an 88% final grade (B+) and 1 unexcused absence will see it reduced to 85% (B).

Students who transfer from one class to another during the add/drop period will not be considered absent from the first session(s) of their new class, provided they were marked present for the first session(s) of their original class. Otherwise, the absence(s) from the original class will carry over to the new class and count against the grade in that class.

CIEE program minimum class attendance standards are as outlined below. Center-specific attendance policies may be more stringent than the policies stated below. The Center / Resident Director sets the specific attendance policy for each location, including how absences impact final grades. Such policies are communicated to students during orientation and via Study Center documents.

In the event that the attendance policy for host institution courses differs from CIEE's policy, the more stringent policy will apply.

- Excessively tardy (over 15 minutes late) students will be marked absent.
- Students who miss class for personal travel will be marked as absent and unexcused. No make-up opportunity will be provided.
- An absence will only be considered excused if:
 - A doctor's note is provided.
 - A CIEE staff member verifies that the student was too ill to attend class
 - Evidence is provided of a family emergency.
- Attendance policies also apply to any required co-curricular class excursion or event.

Weekly Schedule

Week 1 Topic: Mangrove Ecosystems

Session 1.1: Lecture. Mangrove Ecology. Characteristics of, "mangrove swamps"; geographic distribution of mangroves; typical taxa for Costa Rican mangroves; eco-physiological adaptations to living in a brackish, hypoxic environment; adaptations for seed dispersal for mangrove trees; critical ecosystem services supplied by mangrove ecosystem; history of specific taxa of Costa Rican mangrove ecosystems

Readings:

Frankie & Vinson (2004). Chapter 11.

Session 1.2: Activity. Orientation boat tour and hike through mangrove ecosystems

Assessments:

Species Report 1



Week 2 **No classes**

Week 3 **Topic: Cloud Forest Ecosystems**

3.1: Lecture. Cloud Forest Ecosystems. Characteristics of tropical montane cloud; geographic distribution of tropical montane cloud forests; identify important cloud forest plant growth forms and cloud forest pollinators/dispersers/seed predator; eco-physiological adaptations of epiphytes and hemi-epiphytes to living in the canopy of cloud forests; adaptations for pollination by common cloud forest pollinators; adaptations for seed dispersal by common cloud forest dispersers; concept of keystone species; concept of coevolution; terms such as epiphyte, hemi-epiphyte, mycorrhizae, velamen, succulence, pseudobulbs, trichomes, aerial roots, anther, stigma, style, seed, fruit, flower, frugivorous, terrestrial, arboreal, scansorial.

Readings:

Forsyth & Miyata (2001). Chapter 4.

3.2: Activity. Hike in cloud forest and carry out an interactive exercise on pollination and dispersal. Students deliver Species Reports.

Assessments.

Species Report 2;

Quiz 1 – Mangrove Ecosystems Quiz

Week 5 **Topic: Tropical Dry Forests**

5.1: Lecture. Ecology and Conservation of Tropical Landscapes: Pacific Dry Forests; Geographic distribution; characteristic abiotic features: temperature, rainfall, and wind on seasonal basis. Characteristic ecological features and adaptations of vegetation: deciduousness; tree stature; tree growth patterns; growth forms; fruiting, flowering, pollination, and dispersal; fruits and seeds; interconnectivity of tropical ecosystems; organism migrations; conservation and threats.

5.2: Activity. Hike through Tropical Dry Forest. Students deliver Species Reports of ecosystem representative species. Short introduction to marine ecosystems of the Pacific Northwest of Costa Rica.

Assessments:

Species Report 3;

Quiz 2 – Cloud Forest Ecosystems quiz

Week 7 **No classes**

Week 8 **Assessment**

8.1: Quiz (no lecture)

Assessments

Quiz 3 – Tropical Dry Forest Ecosystems quiz



Readings:

Frankie, Mata, & Vinson (2004). Chapter 15

Weeks 9-10 No classes

Week 11 Topic: Lowland Rainforest

11.1: Lecture. Ecology of Caribbean Lowland Wet and Moist Forests: Geographic distribution; characteristic abiotic features: temperature, rainfall; characteristic ecological features; basics of the ecology, natural history; geographic distribution; types of species interactions (competition, predation, amensalism, neutralism, commensalism, mutualism); extinction or co-existence through speciation; obligate or facultative niche partitioning. Terms such as chemical defense, aposematism, Batesian mimicry, Müllerian mimicry, cryptic coloration.

11.2: Activity. Hike through Caribbean Lowland Wet and Moist Forests

Readings:

Kricher (1997). Chapter 3, and Chapter 11 (pg. 245-250)

Species Report 4

Quiz 4: Caribbean lowland rainforest ecology

Week 12 Topic: Marine Ecosystems

12.1: Lecture. Marine Ecology – Caribbean Coral Reef Ecology. Definition and basic components of marine and coral reef ecosystem; distribution and physical features; coral reef ecosystem services; floral and faunal ecology of coral reef ecosystems; patterns of biodiversity; climate change and coral reef conservation.

12.2: Activity. Boat tour and snorkeling the coral reefs of Bocas del Toro archipelago in the Caribbean coast of Panama.

Assessment:

Species Report 5;

Quiz 5: Marine ecosystems

Week 13 Topic: Review for final exam

Week 14 Final Exam

Course Materials

Readings (Textbooks)

Kricher, J. C. (1997). *A neotropical companion: an introduction to the animals, plants, and ecosystems of the New World tropics*. Princeton University Press.



- Frankie, G. W., Mata, A., & Vinson, S. B. (2004). *Biodiversity conservation in Costa Rica: Learning the lessons in a seasonal dry forest*. University of California Press.
- Forsyth, A., & Miyata, K. (2011). *Tropical Nature: Life and Death in the Rain Forests of Central and South America*. Simon and Schuster.

Other required and recommended readings will be made available online.

Online Resources

- BBC. (2006). Planet Earth II: Jungles. <http://naturedocumentaries.org/6813/planet-earth-jungles-bbc/>
- Encyclopedia of Life. (2017) Available from <http://www.eol.org>. Accessed 20 July 2017.
- InBio (National Institute of Biodiversity). (2017). Available from <http://www.inbio.ac.cr/en>. Accessed 20 July 2017.
- The Tree of Life Web Project. (2017). Available from: <http://tolweb.org>. Accessed 20 July 2017.