



Center for International Programs and Sustainability Studies

Course name: Tropical Ecology

Course code: ENV 3044

Total contact hours: 60

Pre-requisites: Presential modality

COURSE DESCRIPTION

Costa Rica is a Neotropical country with an immensely rich biological diversity and an unique representative area to study terrestrial and aquatic ecosystems present in their Pacific and Caribbean slopes. Along this class, students gain insight into basic ecological principles and concepts and explore a variety of ecosystems present in the tropics, their animals, plants and fungi, and the multiple and complex ecological interactions that can be found here. Schrewdness on the different interactions between biotic and abiotic factors in tropical environments, while considering human effects on tropical ecosystems, is achieved. Emphasis is given to the study of the ecosystems found in Costa Rica, but other tropical ecosystems are studied as support for understanding key ecological concepts. Additionally, issues related to conservation of biodiversity and sustainability in the tropics are discussed. Therefore, this course provide students with a general overview of tropical ecology, a systematic examination of the interactions and relationships between organisms and their tropical environment.

COURSE PRE-REQUISITES

It is recommended, but not mandatorily required, that students come from a college-major field related to biology, sustainability or environmental sciences.

AUDIENCE

This course is structured for international students attending the Study Abroad Program at an LCI Education university campus. However, courses are not exclusive to foreigners so local degree-seeking students may enroll in this course. Some of the courses are also taught in Spanish as part of our Bachelor's in Sustainability Management or Business Administration programs.

This is a theoretical-practical course and explores/responds to the following inquiry according to the professional/disciplinary profile:

How to apply ecology to understand ecological adaptations, coexistence, and interactions among the many number of species in tropical ecosystems?

In order to respond this question, we will study the following **generative topics**:

- What is ecology and what do ecologists' study in the tropics.
- Key ecosystem's components: Energy, interrelationships, species' functions, trophic levels and physical conditions of terrestrial and aquatic ecosystems.
- Why are the tropics so diverse and how can all of these species coexist?: Main tropical ecosystems and key fungi, fauna and flora interactions.
- The global importance of tropical rainforests in terms of biodiversity.
- Does diversity lead to more diversity?: Biodiversity and cultural biological diversity.
- Humans and nature in the tropics:
 - How do tropical ecosystems respond to disturbance?
 - Habitat fragmentation and human impact in tropical ecosystems
 - What are the major threats to tropical ecosystems?
 - How the application of ecological principles can facilitate conservation efforts?
 - How can tropical ecosystems and their biodiversity be sustained?: A hint on applied ecology, conservation biology and sustainability.

Along the course, the following **skills** will be fostered:

- Ability to understand the concepts of tropical ecology as a science.
- Ability to debate about the significance of the biodiversity in the tropics.
- Ability to identify complex ecological interactions present in the tropics.
- Ability to encourage the knowledge of ecology with the integration of other social and biological sciences.
- Ability to identify human impacts that threaten the biodiversity in the tropics.
- Ability to identify human changes that care about diversity at local and global level.

Among the **values** and **attitudes** that will be promoted among students are the following:

- Teamwork and leadership.
- Systemic thinking.
- Problem solving.
- Learning to learn.
- Excellence in performance evidence.
- Respect to nature and their ecosystem (organism, stakeholder, and local community)

COMPETENCIES, CRITERIA AND EVIDENCE

The competencies for the Veritas University are reflexive and integral actions that respond to the professional profile and to the problems of the context, with suitability and ethical commitment, integrating the know-how, and the knowledge to know in a perspective of improvement.

Below are both the disciplinary and general competencies, linked to their criteria and evidence of performance for this course. The student:

Competencies	Key competences	Learning Assessments
Using the guidance of ecology as a science, understands the adaptations, coexistence, and complex ecological interactions in tropical ecosystems, involving the importance of biotic and abiotic components and their ecological properties.	Considers the concept of tropical ecology as a science since its biotic' and abiotic' components.	<ul style="list-style-type: none"> ○ Thematic discussions ○ Assigned readings
	Analyses the importance of ecological studies regarding to the ecological adaptations, coexistence, and interactions.	<ul style="list-style-type: none"> ○ Oral presentations ○ Essays ○ Interactive video-watching
	Applies basic ecological knowledge by means of the study of biodiversity in different ecosystems, using standard ecological-surveys and community analyses.	<ul style="list-style-type: none"> ○ Field trip report ○ Laboratory practices ○ Final research presentation
General/Core		
Integrates knowledge, skills and attitudes to learn continuously and through one's life pursuing an efficient development in the knowledge-based society.	<ul style="list-style-type: none"> ○ Learning to learn. ○ Systemic thinking. ○ Excellence in performance evidence. 	<ul style="list-style-type: none"> ○ Readings' discussion ○ Readings analysis ○ Laboratory practices ○ Essays' writing
Integrates the knowledge, skills, and attitudes necessary to learn the skills of teamwork and leadership, including mentoring and evaluation.	<ul style="list-style-type: none"> ○ Teamwork and leadership. ○ Problem solving. ○ Respect to nature. 	<ul style="list-style-type: none"> ○ Ecological sampling on field conditions ○ Field reports work ○ Oral presentations

COURSE CONTENTS

UNIT 1: THE TROPICAL ECOLOGY STUDY

Module I.1: Basic concepts

- Organization of the biotic components
- Ecology as a science
- Plant and animal ecology
- Tropical ecology foundations

Module I.2: Environmental space classification

- The life zones system
- Tropical rainforests
- The habitat in Costa Rica
- Wilderness protected areas

Module I.3: Ecology in tropical field conditions

- First lab/practice
- Fieldtrip induction
- Fieldtrip preparation
- The field-ecologist work

Module I.4: Learning activities for ecological adaptations & biodiversity sampling

- Two group oral presentations (20%)
- Two short individual descriptive-essays (10%)

UNIT 2: APPLYING TROPICAL ECOLOGY IN THE COSTA RICAN NEOTROPICS

Module 2.1: Biodiversity in the tropical environment

- Biodiversity
- Biocultural diversity
- World Hotspots
- Reasons for high biodiversity in the tropics

Module 2.2: Diversity and ecological analyses (practice in Computer lab or in classroom)

- Assessing and monitoring species in tropical environments

- Organizing data (data obtained on field and literature data)
- Diversity and ecological indexes
- Biodiversity metrics, calculators and resources

Module 2.3: Data analyses (practice in Computer lab or in classroom)

- Fieldtrip feed-back and equipment maintenance
- Alfa and Beta Diversity indexes
- Multivariate community analyses
- Writing an ecological fieldtrip report

Module 2.4: Learning activities for applying tropical ecology in the Costa Rican Neotropics

- Fieldtrip practices including data analyses: (15%) (no submission).
- Group Fieldtrip Report (20%) (PPT, video, blog or similar, presented on class)

TRANSVERSAL-UNIT: Fieldtrips/workshops for enhancing tropical ecology practices looking forward and learning about biodiversity. Selected dates: _____

UNIT 3: ANALYZING TROPICAL ECOLOGY AND HUMAN IMPACT

Module 3.1: Tropical terrestrial ecology

- Physical conditions
- Main world biomes
- Tropical land biomes
- Examples of major Tropical land biomes

Module 3.2: Tropical wetlands and aquatic ecosystems

- Physical conditions
- Differences between tropical terrestrial and aquatic ecosystems
- Major world aquatic biomes: Marine biomes
- Major world aquatic biomes: Freshwater biomes

Module 3.3: Human impact in tropical ecosystems

- Impact: The negative and positive sides
- Type of footprints
- Footprints in different regions
- Applied ecology: Conservation and Sustainability

- *Competencies achieved; course evaluation; grades.*

Module 3.4: Learning activities for analyzing tropical ecology and human impacts

- Individual argumentative essay (paper) (5%)
- Final Research Project Presentation (group work, just the PPT) (30%)

METHODOLOGY

The methodology of theoretical and participative classes, together with readings, discussions, assignments, and research on field conditions will provide a clearer approach for personal and professional development, understanding better ecological complexity in the tropics. Teacher's role is mainly to mediate, facilitate and guide the teaching and learning process, allowing students to build and self-regulate their own learning, based on their previous knowledge. The student is active, the teaching-learning process is collective and socialized, as it fosters social integration and enhance multimedia learning and respect. Activities are planned at a basic and intermediate level to promote several active-learning assignments, like teamwork exercises in class and basic-field practices; besides, essays and research projects will be also guided throughout the class.

Along the course the expository method is used both by the professor and by students, individually and in groups, always promoting the participation of the students through their interventions in discussions, extension of concepts and analysis of the topics exposed. This course wills intent to integrate an open opportunity to expand more awareness into current biodiversity issues. The importance of promoting education to enable nature concern, the need to explore, test and choose tools to be applied on tropical field conditions which would provide the needed ecological foundations, contribute to the further below showed learning strategies.

EDUCATIONAL RESOURCES

To guarantee good development of the course, therefore, to guarantee learning, the following resources are available: An updated bibliographic database, multimedia

equipment that students can use for their individual presentations; whiteboards and other school equipment for weekly sessions, and readings provided by the educator. All of these complement the suggested projects and provide the students with higher possibilities of knowledge ownership. Lessons will take place in the classroom and on the field. Students have access to the institution's library during opening hours' study areas or computer labs and any other convenient area on the university's campus for individual study. Likewise, the university provides free Wi-Fi access to all students, professors, and staff throughout the campus. The university also places the CANVAS Learning Management System at the disposition of students and staff ensuring pedagogical flexibility making it easier to integrate new technologies into the courses and always ensure seamless and effective communications between the student and professor through an app center.

LEARNING ASSESSMENT

Evaluation compiles and evaluates evidence by considering feedback providing pre-established criteria. The course evaluation must be aligned with the competencies and the teaching methodology. There is a rubric for each evaluation resource. Even though the rubric grants a grade, it is also a quantitative and qualitative description of the students' performance. The rubrics include the core and discipline key competences.

ASSIGNMENTS	PERCENTAGE VALUE
Ecological adaptations, assignments: <ul style="list-style-type: none"> ○ Group oral presentation (PPT) ○ Individual paper (descriptive essay) 	10% 5%
Biodiversity sampling in the tropics, assignments: <ul style="list-style-type: none"> ○ Group oral presentation (PPT) ○ Individual paper (descriptive essay) 	10% 5%
Field practices in ecology (no submission)	15%
Group field trip report done and presented (PPT)	20%

Human impact in the tropics, assignment:	
○ Individual paper (argumentative essay)	5%
Final research presentation done in groups (PPT)	30%
Total	100%

The following items will be considered for all the presentations: Preparation and content; Organization and style; Student's critical opinion; Punctuality; Fostering classmates' discussions and/or participation.

General format for written assignments: Even though a specific rubric is provided for each assignment, there is a general format for all written assignments: Header with name, class, and date; Letter size page; Arial 11 and double spacing; Margins 3x3 centimeters; APA format for bibliography sources.

Whenever required, assignments should be submitted electronically through:

- CANVAS LMS PLATFORM (priority form)
- Whenever necessary, can be send to: Professor's mail.

LEARNING STRATEGIES AND RUBRICS

The following learning strategies will be developed:

1.- Two group oral presentations:

By means of digital presentations (power-point) each group of students will explain the content pertaining to a research topic assigned in advance by the teacher. Main topics are *ecological adaptations* and *biodiversity sampling*, where teacher will assign book-chapters to review. From assigned topics, it is intended that students through teamwork formulate critical and logical ideas that can then be transmitted orally and encourage the rest of the audience (classmates) to issue different points of view. The students must include at the

end of their presentation the bibliographic sources in APA format, Sixth Edition. **At the end of Unit 1, two group oral presentations with a value of 10% each, for a total value of 20%, will be presented.**

2.- Two individual descriptive essays:

Descriptive essays work as an academic writing tool that will allow students to express one or more topics by formally including adequate description. The point is to show evidence of readings and to demonstrate the ability to compose descriptions clearly. The students must present at the end of each paper the bibliographic sources in APA format, Sixth Edition, with references and their respective connection link. The essay is strictly individual and of student authorship. Topics are the same as for the group oral presentations. For the ***ecological adaptation essay*** students can use the same lecture done in his/her *ecological adaptations group oral presentation* (as a main guide to talk about the ecological adaptations) and need to find more papers to support on a specific selected ecological adaptation; as this is an individual homework, students in a group can split the different adaptations in a species/biological group. For the ***biodiversity sampling essay*** students can use the same chapter done in his/her *biodiversity sampling group oral presentation* (as a main guide to talk about the sampling biodiversity) and need to find more papers to support on a specific technique or selected method; as this is an individual homework, students in a group can split different ways regarding how to sample biodiversity. **At the end of unit 1, students will share a brief synthesis about their “ecological adaptations” and “biodiversity sampling” descriptive essays (5% each, for a total of 10%)**

Competences to be achieved along Unit 1:

- Student considers the concept of tropical ecology as a science since its biotic and abiotic components.

- Student analyses the importance of ecological studies regarding to the adaptations, coexistence, and interactions.

☛ **Unit 1 assignments contribute 30% of the final grade.**

3.- Fieldtrip practices:

Laboratory practices are learning and analysis activities in which the scientific method is applied. Each practice will have specific objectives and certain methodology to follow, previously established. The idea of fieldtrips –natural lab settings– is that students can obtain first-hand experience on field and learn to carefully observe some species, the environment in which these species are found and in turn, their interaction with the local community; performing all the steps that ecologists do: preparation, data taking on field conditions and data analyses. Three topics will be analyzed on practices: one session for preparing and learning about ecological adaptations and field procedures in the tropics, and two sessions for biodiversity sampling and analysis. Each field/lab session will be assessed with a value of 5% based on the information acquired and evaluated on pictures taken, labeling, recognizing, and describing data samples exhibited. Field practices are evaluated along Unit 2, even when they start on Unit 1 and the data analyses part might continue till Unit 3. This is because along the second unit the core of the field work will be done and fieldtrips will be performed.

The **1st Practice** main aim is learning to observe and or monitoring birds/other wildlife and their ecological adaptations. Along this practice students will learn to use different tools (both online and printed) for identifying, monitoring, and following basic ecological studies with different wildlife species. Also, general guidance will be given regarding the use of certain equipment to be use on the fieldtrip. During the second unit (second month of the 12-week term) a fieldtrip will be done where students actually will practice their monitoring and observation skills, and they will gather data about available wildlife. No collection of samples (neither plants/fungi, nor animals) is allowed. This constitutes the **2nd Practice**. From the trip, data will be obtained which need to be processed and analyzed on Computer Labs later, after the trip. The data analyses constitute the **3rd Practice**. Data analyses also

can be performed on personal computers brought to class using the BYOD method (bring your own device). **Three (3) group laboratory practices each one with a 5% value of total grade, for a total of 15%, with no submission but field work preparation, visitations and practices on wilderness conditions, will be assessed at the end of Unit 2.**

☞ As this is an on-site and on-going evaluation, no submissions are required.

4.- One group fieldtrip report:

All the information and experience acquired during the fieldtrips need to be translated into different types of digital material (like images, videos, voice recording, etc.) where students describe the selected species' activities performed/observed, and what they have learned about them. The fieldtrip report is done in groups and aims to show results, discussions, and student's critical opinion. Usually field ecologists need to present fieldtrip reports prior to their final project reports, this is related with budget, where sponsors want to know that actual field work was performed and that materials and equipment use was translated in good quality data. Fieldtrip reports follow a narrative and more colloquial style. In our case it will be presented by means of a blog, or a video, or a PPT or a written report; PPT is preferred (or any similar media). These results are presented at the end of unit 2 and after receiving feedback from class, several slides of this presentation might also work for the Final Project (which is expected to have more data work and analysis following a technical-scientific style as is explained below). The report go by the following guidelines:

- i. **Introduction:** This section provides the reader the general knowledge of the topic related to the practice, written, or narrated in an understandable and logic way. Quotes from scientific articles from recognized journals or from class learnings is a plus.
- ii. **Objectives:** Lab objectives will be provided. It must be 1 general and 2-3 specific objectives which follow the SMART technique (simple, measurable, achievable, reliable, timing), and may form part of the introduction.
- iii. **Methodology:** This section describes how the activity was performed and, also it must detail the materials used in the lab (binoculars, compass, field guides etc.); this section

might include the preparation required before going to the field and the materials and equipment used for data analyses after the trip.

- iv. **Results:** This section includes the observations (observed animal behaviors, etc.). For each focus species/biological group, students shall provide a basic ecological description which can have support on reliable internet sources, books, scientific journals, etc..
- v. **Discussion and conclusions:** This is the most important section. It means to compare and contrast field observations against literature information, describing differences and similarities found about the specimens/genera/families/biodiversity. It is expected that students will read about the families and species observed to provide logical conclusions about ecological adaptations, distribution, and other ecological features. The discussion must be written in prose and the conclusion as a list.
- vi. **Sources:** References use the APA style. Make sure to use only reliable scientific sources.

After finishing Unit 2 lectures, one group fieldtrip report will be orally shared in class, representing 20% of the final grade

Competences to be achieved along Unit 2:

- Student applies basic ecological knowledge by means of the study of biodiversity in different ecosystems, using standard ecological-surveys and community analyses.

☛ ***Unit 2 assignments contribute 35% of the final grade.***

5.- One individual argumentative-essay:

A descriptive-essay is an academic writing tool that allows students to paint a picture in words, this is, to reveal the meaning of a subject through detailed observation, while an argumentative-essay allows each student to express own ideas, interpret, and evaluate one or more topics by formally including adequate justification and critical opinion. This class includes one argumentative essay, which main aim is to help students to understand the study or tropical ecology. Students, individually, may issue their own opinion by formally interpreting and evaluating a specific topic, correlating his/her research and his/her own

knowledge to argue a possible application in real life. At the end of Unit 3 students can choose freely the papers about the broad topic of human impacts in the tropics; nevertheless, some papers are provided as general guides. Students need to come to class prepared to share a synthesis about his/her essay.

6.- Final research:

This work aims to confront the student to a scientific research, which implies introducing and familiarizing with the different activities that are carried out in an investigation in real life. Constructive critique and cooperation are also promoted. The research carried out by the **student groups** is developed in phases throughout the course; topics are related with same topics covered on the trip (insects/ants; birds; herps/mammals; each of this group with their habitat). By means of different census techniques and data analysis the students can learn species monitoring and diversity analysis. **At the end of unit 3, all the findings will be presented and explained to the rest of the class through a group oral presentation which has a total value of 30%.**

Competences to be achieved along Unit 3:

- Student analyzes terrestrial ecosystem using standardized surveys and community analysis with diversity indexes.

☛ **Unit 3 contributes 35% of the final grade.**

ATTENDANCE

Regarding classes:

1. Students are only allowed a two (2) **non-consecutive (back-to-back) class absences**. A student shall fail the course if more than two absences are registered by the professor. Administration does not control attendance.
2. Three **late arrivals** to class (arrival after the first 15 minutes) are treated as one

absence. Attending class 30 minutes late without an official justification will also count as an absence.

3. In the case of an **absence from any assignment evaluated in class** (presentations, evaluations, field trips, etc.) a student will be given a grade of zero unless an official document is presented within **one week** of the absence.
4. If a student presents an official document to excuse the absence, the missed assignment is to be presented on that same day.

Regarding field trips:

5. An unjustified **absence on a field trip** will immediately result in the loss of all points assigned to that specific trip. However, if an official document justifying the absence is presented, 50% of the assignment points may be obtained upon presentation of a complementary research assignment, to be agreed upon with the professor, within one week of the field trip.
6. An absence on a field trip may be justified should two course field trips coincide. In such a case, and to avoid losing points, students shall be able to opt for carrying out a research assignment.

CODE OF CONDUCT

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

1. Be disruptive in the classroom.
2. Behave in a disrespectful way.
3. Be under the influence of alcohol.
4. Be under the influence of any illegal drug.
5. Shows hygiene or odor problems that may disturb other students.

ELECTRONIC DEVICES

The use of cell phones, smartphones, 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. Using devices while the professor or other peers are lecturing, or presenting is perceived as a lack of interest and disrespectful.

STUDY ABROAD PROGRAM POLICIES

The student must comply with the provisions of the Study Abroad Program Policies available on the Canvas platform.

BIBLIOGRAPHY

- Avalos, G. (2018). *Still searching the rich coast: Biodiversity of Costa Rica, numbers, processes, patterns, and challenges*. Apple Academic Press: Global Biodiversity (pp. 101-135).
- Balasubramanian, A. (2019). *Branches in ecology*. Mysore, India: Centre for Advanced Studies in Earth Science.
- Brown, J. H. (2014). Why are there so many species in the tropics? *J. Biogeogr* 41, 8-22.
- Chaffin, B. C. (2016). Biological invasions, ecological resilience, and adaptive governance. *Journal of Environmental Management*, 1-9.
- Ecology Center. (2022). *Tropical Forests: Theories to Explain High Diversity in the Tropics*. <https://www.ecologycenter.us>.
- Frischkorn, K. (July 6, 2017). *Why do we see more species in tropical forests?.* <https://www.smithsonianmag.com/>

Forget, P. M., C. Reeb, J. Migliore and H. Kuhlmann (editors). (2018). *Challenges in tropical ecology and conservation: Global perspectives*. Paris: Annual Meeting of Society for Tropical Ecology, The European Conference.

Janzen, D. (1983). *Costa Rican Natural History*. The University of Chicago Press. CLASSIC.

Kricher, J. (1997). *A Neotropical Companion: An Introduction to the Animals, Plants, and Ecosystems of the New World Tropics*. NJ: Princeton University Press. CLASSIC.

CHRONOGRAM

General schedule both for regular terms (12 weeks) and intensive summer-terms with four sessions (S-sess) per week for the tropical ecology course.		
Term	Contents	Evidence of learning per unit
UNIT 1: THE TROPICAL ECOLOGY STUDY		
Week 1 (S-sess. 1, 2)	Module I.1: Basic concepts <ul style="list-style-type: none"> ○ Syllabus; class expectations; experiences; Unit 1 assignments ○ Ecology science: Levels of system's organization; biotic and abiotic elements; genes, organism, population, community; biological interactions; trophic levels, food chains and food webs. ○ Tropical ecology: What are the tropics, what do ecologists study and how do they work. ○ Evolutionary ecology, landscape ecology and population ecology; examples of ecological studies at different scales. 	<ul style="list-style-type: none"> ○ Essays' paper and sharing ○ Thematic discussions ○ Participative lectures
Week 2 (S-sess. 3, 4)	Module I.2: Environmental space classification <ul style="list-style-type: none"> ○ The life zones system: Holdridge Life zones, main life zones in America and in Costa Rica ○ Tropical rainforests: Key characteristics, biotic and abiotic features, main current threats ○ Habitat focus: Geography and climate of Costa Rica; biophysical division in Costa Rica ○ Wilderness protected areas: International, regional and 	<ul style="list-style-type: none"> ○ Fieldtrip planning and preparation

	national categories.	
Week 3 (S-sess. 5)	<p>Module 1.3: Ecology in tropical field conditions (first lab/practice)</p> <ul style="list-style-type: none"> ○ Fieldtrip induction and preparation: Syllabus for Caribbean and/or Pacific trips ○ Use of materials: Field guides, pamphlets, online-tools for observing and assessing herps, birds, mammals, insects, animals and plants. ○ Use of equipment: Binoculars, logbook, hands, compass, cover-frame, notebook/i-pad, eyes. ○ The field-ecologist work: <ul style="list-style-type: none"> ▪ Tips for data taking on field conditions: Learning how to walk (meters measurement), observe and register data on tropical outdoors condition with equipment and in groups; the biologist's field notebook, general data-taking templates, digital registers. ▪ Safety rules: Avoiding sunburn, insects' and other animals' bites, correct hydration, equipment and boots care and more. 	
Week 4 (S-sess. 6)	<p>MODULE 1.4 – EVALUATION WEEK</p> <p>Learning activities on ecological adaptations and biodiversity sampling</p>	Specific dates
UNIT 2: APPLYING TROPICAL ECOLOGY IN THE COSTA RICAN NEOTROPICS		
Week 5 (S-sess. 7, 8)	<p>Module 2.1: Biodiversity in the tropical environment</p> <ul style="list-style-type: none"> ○ Biodiversity: Concept, components, scale, importance ○ Biocultural diversity: Values, intangible elements ○ World Hotspots: Biological diversity in Costa Rica, the Mesoamerican Isthmus Hotspot diversity. ○ Reasons for high biodiversity in the tropics: Key issues, Biodiversity and sustainability. 	<ul style="list-style-type: none"> ○ <i>Fieldtrip activities</i> ○ <i>Fieldtrip report group presentation</i>
Week 6 (S-sess. 9, 10)	<p>Module 2.2: Diversity and ecological analyses (practice)</p> <ul style="list-style-type: none"> ○ Assessing and monitoring species in the tropics ○ Organizing data (fieldtrip and literature data) ○ Diversity and ecological indexes 	<ul style="list-style-type: none"> ○ <i>Thematic discussions</i> ○ <i>Practices</i>

	<ul style="list-style-type: none"> ○ Biodiversity metrics, calculators and resources 	
<p>Week 7 (S-sess. 11, 12)</p>	<p>Module 2.3: Data analyses (practice)</p> <ul style="list-style-type: none"> ○ Fieldtrip feed-back and equipment maintenance ○ Alfa and Beta Diversity indexes ○ Multivariate community analyses ○ Writing an ecological fieldtrip report 	
<p>Week 8 (S-sess. 13)</p>	<p style="text-align: center;">MODULE II.4 – EVALUATION WEEK</p> <p style="text-align: center;">Learning activities for applying tropical ecology in the Costa Rican Neotropics</p> <p style="text-align: center;">UNIT 2 INCLUDES THE FIELDTRIPS AND PRACTICES</p>	Specific dates
UNIT 3: ANALYZING TROPICAL ECOLOGY AND HUMAN IMPACT		
<p>Week 9 (S-sess. 14, 15)</p>	<p style="text-align: center;">Module 3.1: Tropical terrestrial ecology</p> <ul style="list-style-type: none"> ○ Physical conditions: What limits life on land biomes? ○ Main world biomes: Tropical forests: rainy, seasonal, savannas and deserts; Temperate: temperate forests, grasslands, woodlands & shrublands, and Northwestern coniferous forest; Boreal forest (Taiga); Tundra; Mountains and ice caps. ○ Tropical land biomes: Montane forest and subalpine Paramo (Andes, Puno); Tropical Rain Forests (including cloud forests and transitional ones); Savannahs & Deserts; Tropical Dry Forests; Mangrove (coastal wetland estuarine forests) ○ Examples of major Tropical land biomes 	<ul style="list-style-type: none"> ○ <i>Essay's paper</i> ○ <i>Final project presentation in groups</i> ○ <i>Participative lectures</i> ○ <i>Class discussions</i>
<p>Week 10 (S-sess. 16, 17)</p>	<p style="text-align: center;">Module 3.2: Tropical wetlands and aquatic ecosystems</p> <ul style="list-style-type: none"> ○ Physical conditions: What limits life on aquatic biomes? ○ Differences between tropical terrestrial and aquatic ecosystems: Energy transfers, water and sun light availability, comparing life on land versus life on water. ○ Major world aquatic biomes: Marine biomes (oceans, coral reefs and estuaries) ○ Major world aquatic biomes: Freshwater biomes (wetlands, ponds and lakes, stream and rivers) 	<ul style="list-style-type: none"> ○ <i>Interactive documentary watching</i>

<p>Week 11</p> <p>(S-sess. 18, 19)</p>	<p>Module 3.3: Human impact in tropical ecosystems</p> <ul style="list-style-type: none"> ○ Impact: The negative and positive sides ○ Type of footprints: Carbon and ecological footprints ○ Footprints in different regions: Developed nations versus nations in development ○ Applied ecology: Conservation and sustainability issues ○ <i>Competencies achieved; course evaluation; grades.</i> 	
<p>Week 12</p> <p>(S-sess. 20)</p>	<p style="text-align: center;">Module III.4: EVALUATION WEEK</p> <p style="text-align: center;">Learning activities for analyzing tropical ecology and human impacts</p>	<p style="text-align: center;">Specific dates</p>

Please note that this chronogram is tentative and subject to change.