



Center International Programs & Sustainability Studies

Course name: Ecology and Conservation of Coral Reef

Course code: ENV 3210

Total contact hours: 60

COURSE DESCRIPTION

Coral reefs are vital organisms for the health of marine ecosystems; the good state of the food chain depends on them and, therefore, the marine resources on which millions of families in the world depend; Despite this, too little or nothing is known about them in everyday life. In addition to this, this year (2023) the largest coral bleaching event in recent years has occurred in Costa Rica, this terrible event gives added value to the course, since education is the only way to prevent these events are repeated.

This ignorance about these ecosystems means that people are unaware of the basic measures to help in their conservation. Learning about them is not only knowing about their ecology and taxonomy, but also understanding the impact of our actions and the ways to help in the preservation of this ecosystems.

In this course you will learn about the origin of corals, their biology and ecology, as well as the species associated with them. The identification of the main species that make it up will also be covered; the characteristics to measure their health status, sampling and monitoring methods, and the ecological and social importance of reefs.

The main purpose of this course is to generate knowledge about coral reefs, to understand their importance, and the ways we have to collaborate in it wellbeing.

COURSE PRE-REQUISITES

Students must have basic swimming skills.

CLOTHING AND FOOTWEAR REQUIREMENTS

For the field trips, students will need water shoes to walk on the rocky shore (do not use crocs), and a long-sleeve rash guard shirt to protect their skin from the sun. Students will require a snorkeling set (mask and snorkel, optionally fins)

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 can we raise people's awareness about the importance of coral reefs and the impact that our actions have on these ecosystems, and how can we create a positive change in their conservation?

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

- Natural history of coral reefs.
- Biology of coral reefs.
- Differentiation between Caribbean and Pacific coral reefs.
- Impact of fisheries, pollution, and global warming over the coral reefs.
- Methods to measure coral reefs' health.

- Conservation, regeneration, and monitoring of coral reefs.

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

- Ability to understand basic concepts of biology and evolution.
- Ability to identify different coral species.
- Ability to recognize the human activities that are affecting the coral reef health.
- Ability to apply common methods in coral reef research.
- Ability to analyze the health of a coral reef.
- Ability to take actions to preserve coral reefs.

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

- Teamwork and leadership.
- Systemic thinking.
- Logical and communicative intelligence.
- Problem solving.
- Learning how to learn.
- Assertive communication.
- Work with communities.
- Sustainable development.

COMPETENCIES, CRITERIA AND EVIDENCE

The competencies for the Universidad LCI Veritas 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.

Competencies	Key competencies	Learning Assessments
<p>Analyzes information about biology and ecology of coral reefs to understand their importance in human life and the marine ecosystems using common research methods.</p>	<ul style="list-style-type: none"> ○ Manage the natural history of coral reefs to understand their origin by reading scientific notes. 	<ul style="list-style-type: none"> ○ Oral test ○ Teamwork
	<ul style="list-style-type: none"> ○ Explains the biology of coral reefs to demonstrate your knowledge through short tests. 	<ul style="list-style-type: none"> ○ Laboratory demonstration ○ Case studies
	<ul style="list-style-type: none"> ○ Records the different taxonomic groups of corals found in Costa Rican seas to understand their complexity using diversity indices and other measurement and monitoring methods. 	<ul style="list-style-type: none"> ○ Field journal ○ Picture-practice ○ Discussion table ○ Field trip report
	<ul style="list-style-type: none"> ○ Investigate the natural and anthropogenic factors that affect coral reefs to understand conservation problems by comparing them with different case studies. 	<ul style="list-style-type: none"> ○ Video forum ○ Field trip report ○ Group presentation
	<ul style="list-style-type: none"> ○ Develops the most common sampling and monitoring methods for coral reefs to acquire practical knowledge through implementation on field trips. 	<ul style="list-style-type: none"> ○ Practice with real data ○ Field journal ○ Field trip report

	<ul style="list-style-type: none"> ○ Propose some initiatives that help the recovery of coral reefs to look for viable options in Costa Rica, debating with the group about the pros and cons. 	<ul style="list-style-type: none"> ○ Video-forum ○ Group and individual presentations
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. 	<ul style="list-style-type: none"> ○ Group and individual presentations ○ Field trip report ○ Video-forum ○ Field journal
Integrates the necessary knowledge, skills and attitudes to learn interpersonal communication techniques.	<ul style="list-style-type: none"> ○ Relates well to others. ○ Manage and solve conflicts. ○ Negotiates reliably and empathetically. ○ Speaks responsibly. ○ Listens attentively. 	<ul style="list-style-type: none"> ○ Group and individual presentations ○ Field trip report ○ Video-forum ○ Field journal
Builds the necessary knowledge, skills and attitudes to learn how to communicate orally and in written form in the different disciplines that make up the curriculum.	<ul style="list-style-type: none"> ○ Communicates thoughts of the discipline orally, graphically, and in written form. 	<ul style="list-style-type: none"> ○ Group and individual presentations ○ Field trip report ○ Video-forum ○ Field journal

CONTENT

Unit I. Introduction to coral reefs.

- Evolutionary origin of coral reefs
- Natural history of coral reefs
- Main groups of corals in tropical seas

Unit II. Coral reef biology

- Anatomy and physiology of corals
- Symbiotic relationships
- Reproduction of corals

Unit III. Characterization of the coral reefs of Costa Rica

- Differences between the Caribbean Sea and the Costa Rican Pacific Ocean
- Taxonomy and identification of Costa Rican corals
- Main species associated with coral reefs: Caribbean and Pacific

Unit IV. Sampling techniques and research methodology

- Biodiversity indexes
- Grid method to calculate cover, composition, and dominance
- Chain method to measure complexity and growth
- Method of observation and counting of associated species

Unit V. Coral problematics and threads.

- Over-fishing and destructive fishing methods
- El Niño Phenomenon and Climate Change
- Pollution and use of the seas

Unit VI. Conservation and regeneration of coral reefs

- Coral cultivation and reforestation
- Monitoring of water and solid pollution
- Individual actions to protect corals

METHODOLOGY

The methodology is planned as experiential learning using Paolo Freire's educational guidelines, from a constructivist perspective and the competency-based model.

Classes are interactive, stimulating the collective construction of knowledge; so the students can recognize the context in which they are and how they can use it to understand the course topics for their future careers.

The expository method is used throughout the course both by the professor and by students, individually and in groups, always promoting the participation of the students through their direct intervention in discussions, extension of concepts and analysis of the topics exposed. Furthermore, since research is a pillar of the subject, the subjects to be discussed and exhibited in class and the different assignments are firstly investigated at a bibliographic level by the students as a prerequisite to present group and individual work products.

The role of the professor is to mediate, facilitate and guide the teaching and learning process, allowing students to build and self-regulate learning based on their previous and significant knowledge. As a result, the student is active, and the teaching-learning process is collective and socialized. It also fosters social integration, the development of group work skills, community feeling and respect, without neglecting individualization.

EDUCATIONAL RESOURCES

To guarantee good development of the course, therefore, to ensure learning, the following resources are available: an updated bibliographic database, multimedia equipment that students can use for their presentations; whiteboards and other school equipment for weekly sessions, and readings provided by the educator. Most of the lessons will take place in the classroom. However, during independent work periods, students can attend the institution.

A campus library, study rooms, and computer labs are available for the student's independent work time. In addition, free Wi-Fi connection for students, educators, and staff are provided on campus, allowing students to work not only in the library or computer labs but also around campus.

LEARNING ASSESSMENT

Evaluation compiles and evaluates evidence by taking into account 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, and the details will be provided in **CANVAS LMS**. 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
Practices	15%
Field journal	25%
Field trip	10%
Final reports (15% Pacific 35% Caribbean)	50%
Total	100%

LEARNING STRATEGIES

The following learning strategies will be developed:

1. Practices

After some classes, there will be a short practice to test the students' knowledge. The objective of these will be to execute the theoretical knowledge of the lesson and learn to use the methods and techniques that we will use on field trips.

2. Field journal

In some lessons (as shown on the chronogram), the topics covered during class will be relevant for field trips, for this reason, students must create a personal file where they write down the information that they consider important when working in the field, for example, the characteristics of the most common corals, a summary of the methods and techniques that will be used in sampling, drawings or images of the organisms associated with the reef, among others.

3. Field Trip

Performance during field trips will also be evaluated, to ensure equitable work among students. Field trips involve a lot of effort and work, so it is necessary to ensure that each student does their part.

4. Field trip Reports

The field tour report aims to present the results obtained from field sampling and to evaluate the learning of the course. This report must be written in the format of a scientific article and must contain all parts (Heading (title of the research, authors, institution), summary in English and Spanish, introduction, materials and methods, results, discussion, conclusions, and bibliography in APA). The report will be made in couples and only a written document, there is no presentation. To evaluate this document, the following rubric will be used.

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

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Arias-Godínez, G., Jiménez, C., Gamboa, C., Cortés, J., Espinoza, M., & Alvarado, J. J. (2019). Spatial and temporal changes in reef fish assemblages on disturbed coral reefs, north Pacific coast of Costa Rica. *Marine Ecology*, 40(1), e12532.

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CHRONOGRAM

Week	Contents	Evidence of learning
Week 1	<ul style="list-style-type: none"> ○ Discussion of the course program and dates, organization of field trips 	○ N/A
	<p>Introduction to coral reefs</p> <ul style="list-style-type: none"> ○ Evolutionary origin of coral reefs ○ Natural history of coral reefs 	○ Round table
Week 2	<p>Introduction to coral reefs</p> <ul style="list-style-type: none"> ○ Main groups of corals in tropical seas 	○ Individual/group presentation
	<p>Coral reef biology</p> <ul style="list-style-type: none"> ○ Anatomy and physiology of corals 	○ Creation of examples of coral organs and structures
Week 3	<p>Coral reef biology</p> <ul style="list-style-type: none"> ○ Symbiotic relationships 	○ Video-forum
	<p>Coral reef biology</p> <ul style="list-style-type: none"> ○ Reproduction of corals 	○ Video-forum
Week 4	<p>Characterization of the coral reefs of Costa Rica</p> <ul style="list-style-type: none"> ○ Differences between the Caribbean Sea and the Costa Rican Pacific Ocean 	○ Group exposition

	<p>Characterization of the coral reefs of Costa Rica</p> <ul style="list-style-type: none"> ○ Taxonomy and identification of Costa Rican corals 	<ul style="list-style-type: none"> ○ Field journal (First advance)
Week 5	<p>Characterization of the coral reefs of Costa Rica</p> <ul style="list-style-type: none"> ○ Main species associated with coral reefs: Caribbean and Pacific 	<ul style="list-style-type: none"> ○ Field journal (Second advance)
	<p>Sampling techniques and research methodology</p> <ul style="list-style-type: none"> ○ Biodiversity indexes 	<ul style="list-style-type: none"> ○ Practice with excel. ○ Field journal (Third advance)
Week 6	<p>Sampling techniques and research methodology</p> <ul style="list-style-type: none"> ○ Grid method to calculate cover, composition, and dominance 	<ul style="list-style-type: none"> ○ Practice with PVC squares ○ Field journal (Fourth advance)
	<p>Sampling techniques and research methodology</p> <ul style="list-style-type: none"> ○ Chain method to measure complexity and growth 	<ul style="list-style-type: none"> ○ Practice with metal chain ○ Field journal (Fifth advance)
Week 7	<p>Sampling techniques and research methodology</p> <ul style="list-style-type: none"> ○ Method of observation and counting of associated species 	<ul style="list-style-type: none"> ○ Practice of observation with Nintendo Switch ○ Field journal (Final advance)
	<p>Field Trip to the Pacific Ocean</p>	<ul style="list-style-type: none"> ○ Participation on the activities ○ Field trip report
Week 8	<p>Coral problematics and threads</p> <ul style="list-style-type: none"> ○ Over-fishing and destructive fishing methods 	<ul style="list-style-type: none"> ○ Guest expositor and forum
	<p>Coral problematics and threads</p> <ul style="list-style-type: none"> ○ El Niño Phenomenon and Climate change 	<ul style="list-style-type: none"> ○ Video-forum
	<p>Coral problematics and threads</p> <ul style="list-style-type: none"> ○ Pollution and use of the seas 	<ul style="list-style-type: none"> ○ Debate

Week 9	<ul style="list-style-type: none"> ○ Field Trip to the Caribbean Sea 	<ul style="list-style-type: none"> ○ Participation on the activities ○ Field trip report
Week 10	<ul style="list-style-type: none"> ○ Conservation and regeneration of coral reefs ○ Coral cultivation/reforestation 	<ul style="list-style-type: none"> ○ Guest expositor and forum
	<ul style="list-style-type: none"> ○ Conservation and regeneration of coral reefs ○ Monitoring of water and solid pollution 	<ul style="list-style-type: none"> ○ Practice with measuring instruments
Week 11	<ul style="list-style-type: none"> ○ Conservation and regeneration of coral reefs ○ Individual actions to protect corals 	<ul style="list-style-type: none"> ○ Debate
	<ul style="list-style-type: none"> ○ Aquarium coral reef 	<ul style="list-style-type: none"> ○ Observation of samples
Week 12	<ul style="list-style-type: none"> ○ Review of the final project, presentations 	<ul style="list-style-type: none"> ○
	<ul style="list-style-type: none"> ○ Final grades and class 	<ul style="list-style-type: none"> ○

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