

SAN JOAQUIN DE FLORES INSTITUTE



<b>COURSE</b>	<b>Marine Biology</b>
<b>CREDITS</b>	<b>3</b>
<b>CLASS HOURS</b>	<b>48</b>
<b>CLASS SCHEDULE</b>	
<b>PERIOD</b>	
<b>COURSE START AND END DATE</b>	
<b>PROFESSOR (include email address)</b>	
<b>OFFICE HOURS</b>	

**DESCRIPTION:**

This course intends to provide students with basic knowledge about marine ecosystems and their most representative organisms, general biotic and abiotic interrelations, some biological and systematic aspects, and spatial distribution patterns. Students will have a comprehensive vision of marine organisms, their surroundings, the dynamics of marine environment and the implications for human development. Theoretical lessons will be complemented with field trips as a practical resource.

**OBJECTIVES:**

**General**

Provide students with an explicit and understandable characterization of marine ecosystems, associated flora and fauna, and the biotic-abiotic interactions that influence the presence of organisms on each marine ecosystem.

**Specific**

- Define a marine ecosystem through its physical, chemical and biological characteristics, as well as its marine zonation.
- Learn about the flora and fauna that integrate marine ecosystems.
- Learn about some organism adaptations according to the marine environment where they are developed.
- Define the relation between different marine ecosystems and their importance in the dynamics of the marine environment.

- Analyze the main implications of climate changes on marine ecosystems.
- Analyze some effects caused by human influence on marine resources and environments.

## CONTENTS

1. Introduction to marine environment
2. Classification of marine environments
3. Trophic structure 1. Food chains in the water column
4. Trophic structure 2. Food chains in the benthos
5. Marine ecosystems and their main organisms
6. Marine ecosystems: reefs
7. Marine ecosystems: beaches
8. Marine ecosystems: estuaries
9. Marine ecosystems: open and deep sea
10. Temporary changes in marine ecosystems
11. Marine ecosystems affected by human activities

## EVALUATION

<b>Quizzes.</b> Short tests will be used to evaluate the comprehension of studied subjects and the communication level of the professor.	10%
<b>Final exam.</b> A final written exam will be used to evaluate the cognitive development of students at the end of the course.	20%
<b>Field trips.</b> Two field trips will be arranged. Attendance is mandatory, since the objective is to have a general vision of marine organisms in their natural environment and appreciate the function of marine ecosystems.	30%
<b>Final project.</b> Students must present a final project at the end of the course, developing a subject related to marine biology.	40%

## **METHODOLOGY**

The course will have theoretical sessions and field trips, where the professor will impart lectures, integrating the opinions of the students as much as possible to verify the knowledge acquired during theoretical sessions. Students will have a final presentation about a related subject (either selected by the students or assigned by the professor).

Two field trips will be arranged: one to the Caribbean and one to the Pacific in order to compare the different environments, both regarding the distribution of organisms and the most common flora.

## **COURSE SPECIFICATIONS**

- A. This course is aimed at students who wish to acquire knowledge about the relation of marine systems and the organisms within them.
- B. There are no previous requisites. The course has a value of 3 credits and requires a minimum amount of hours for individual study.
- C. Classes will be complemented with field trips, written tests, short exams and oral presentations.
- D. The concepts analyzed in class will be applied during the field trips, according to the advance of the subjects.

## **CHRONOGRAM OF EVALUATIONS:**

<b>Nº</b>	<b>ACTIVITIES</b>	<b>%</b>	
1	Quiz # 1	2.5%	Week 3
2	Quiz #2	2.5%	Week 6
3	Field trip	15%	Week 7
4	Quiz # 3	2.5%	Week 10
5	Field trip	15%	Week 13
6	Quiz # 4	2.5%	Week 14
7	Final exam	20%	Week 15
8	Final project	40%	Week 16

**CHRONOGRAM OF ACTIVITIES:**

<b>SESSION NUMBER</b>	<b>DATE</b>	<b>SUBJECT</b>	<b>CONTENT</b>	<b>ACTIVITY</b>
<b>Week 1</b>		<b>Unit 1. Introduction to the Marine Environment.</b> - Marine biodiversity in Costa Rica. - Applications of Marine Biology.	1.1. Life in the oceans. 1.2. Importance of marine systems as a resource. 1.2. Study of marine organisms from a microscopic to macroscopic level, its use on the application of scientific-technological development and its relation with man.	<b>Introduction and selection of final project subject.</b>
<b>Week 2</b>		<b>Unit 2. Marine Biodiversity. General knowledge about:</b> - Marine flora. -Marine algae: microalgae and macroalgae. -Mangroves.	2.1. Microalgae as a source of food for larger organisms. 2.2. Macroalgae as an ecosystem. 2.3. The ecological and economic importance of mangroves in Costa Rica. 2.4. Industrial uses.	
<b>Week 3</b>		<b>Unit 2. Marine Biodiversity. General knowledge about:</b> - Marine fauna. -Marine fish -Reptiles	3.1. Main representative marine species of the different ecosystems in Costa Rica. 3.2. The function of organisms in marine environments.	<b>Quiz # 1</b>
<b>Week 4</b>		<b>Unit 2. Marine Biodiversity. General knowledge about:</b> - Marine fauna. -Marine birds - Marine mammals	3.1. Main representative marine species of the different ecosystems in Costa Rica. 3.2. The function of organisms in marine environments.	
<b>Week 5</b>		<b>Unit 3. Marine ecosystems and their main organisms</b>	4.1. Beaches (mud, sand or rock) Representative characteristics, associated organisms and organism adaptations.	

<b>Week 6</b>		<b>Unit 3. Trophic structure</b>	3.1. Food chains in the water column. 3.2. Trophic structure of the benthos. General adaptations.	<b>Quiz # 2</b>
<b>Week 7</b>		<b>Field trip to the Pacific</b>		<b>Recognize the different characteristic ecosystems and organisms of the area.</b>
<b>Week 8</b>		<b>Unit 3. Trophic structure</b>	3.3. Locomotion, defense, buoyancy, camouflage, sensory system, echolocation. 3.4. Food chain controls.	
<b>Week 9</b>		<b>Unit 4. Marine ecosystems and their main organisms</b>	4.2. Estuaries (mangroves and coastal lagoons) Types, organism adaptations, estuary habitats, vegetation zonation, ecological and economic importance, composition, nutrients, seasonality, eutrophication (salinity, temperature, oxygen, food), organism classification, composition, flotation mechanisms, predation.	
<b>Week 10</b>		<b>Unit 4. Marine ecosystems and their main organisms</b>	4.3. Open and deep sea Zonation, environmental characteristics (salinity, temperature, oxygen, food), organism classification, composition, flotation mechanisms, predation, organism adaptation.	<b>Quiz # 3</b>
<b>Week 11</b>		<b>Unit 4. Marine ecosystems and their main organisms</b>	4.4. Reefs Environmental factors, types of reefs, reproduction, distribution, ecological and economic importance, competition.	
<b>Week 12</b>		<b>Unit 5. Temporary changes in marine ecosystems</b>	5.1. Effects of temporary changes (cycles) that affect the water column above warm seas, estuaries, upwelling, tropical waters and benthic zones.	

			5.2. Long term effects: atmospheric changes, reduction in fishing stock, eutrophication, toxic pollution, exotic species propagation and algae upwelling.	
<b>Week 13</b>		<b>Field trip to the Caribbean</b>		<b>Recognize the different characteristic ecosystems and organisms of the area.</b>
<b>Week 14</b>		<b>Unit 6. Human Impact</b>	6.1. Mariculture: technological advances. 6.2. Fishing, overfishing, endangered species, main fishing areas. 6.3. Pollution (solid waste), relation of plastic in the marine environment. 6.4. Global warming.	<b>Quiz # 4</b>
<b>Week 15</b>		<b>Final exam</b>		
<b>Week 16</b>		<b>Final project</b>		<b>Final project</b>

## **BIBLIOGRAPHY:**

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