Course guides

250572 - PROCBIOOCE - Ocean Biological Processes

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 745 - DEAB - Department of Agri-Food Engineering and Biotechnology.
Degree: BACHELOR’S DEGREE IN MARINE SCIENCE AND TECHNOLOGY (Syllabus 2018). (Compulsory subject).
Academic year: 2020 ECTS Credits: 6.0 Languages: Spanish

LECTURER

Coordinating lecturer: MARTA BALSELLS FERNÀNDEZ-PEDRERA
Others: MARTA BALSELLS FERNÀNDEZ-PEDRERA

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
13388. To know and apply the lexicon and concepts of the Marine Sciences and Technologies and other related fields.
13392. Evaluate the bio- and geo-diversity of the marine environment, identifying habitats and ecosystems with multidisciplinary criteria.
13394. Address the most relevant processes and their interactions related to their physical / chemical / biological / geological components, applying technical and scientific knowledge and criteria.
13395. To set, evaluate and propose solutions to the different conflicts of use and exploitation in the marine and coastal environment resources based on scientific and technical criteria.
13396. To set, analyze and optimize the functionality of actions and infrastructures in the marine environment. (Specific competence of the Marine Science and Engineering Mention)
13403. Develop a conceptual framework to address the sustainability of the marine environment and the related socio-economic activities at different scales, explaining the effects of climate change.
13404. Set, plan and execute basic and applied research in the field of Marine Sciences and Technologies.
13405. Carry out calculations, assessments, surveys and inspections in coastal and marine environments, as well as the corresponding technical documents.
13406. Write technical reports and disseminate knowledge about the different components of the marine system, considering the applicable legal framework.
13407. Apply the necessary tools to analyze the economic and legal aspects of human actions and the related impacts on the marine environment, including technical advice and representation of companies and administrations.

Generical:
13380. Develop a professional activity in the field of Marine Sciences and Technologies.
13382. Apply state-of-the-art methods and techniques in oceanography and marine climate, jointly covering the physical, chemical, geological and biological aspects.
13383. Develop a conceptual framework that links the scientific-technological and management aspects for marine resources, explaining the interactions with marine infrastructures and management plans in coastal areas.
13385. Apply knowledge and academic experience to the biotic and abiotic resources of the marine environment, explaining their interactions with the socio-economic activities that take place in it.
13386. Encompass and teach studies in the different research lines that converge in Marine Sciences and Technologies.
13387. Combining preservation with economic activity within the framework of current legislation promoting the development of a social and environmental awareness.
TEACHING METHODOLOGY

The course consists of 2.3 hours per week of classroom activity (large size group) and 1.2 hours weekly with half the students (medium size group).

The 2.3 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1.2 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

LEARNING OBJECTIVES OF THE SUBJECT

This subject addresses aspects that allow to know the connection that exists between physical-chemical and biological processes in the ocean by analyzing the changes in spatial and temporal patterns of the flow of matter and energy in the pelagic communities, its relation to the physicochemical dynamics of water masses, the processes that govern primary and secondary oceanic production. The complexity and heterogeneity of the marine nekton and its relationship with the habitat are also studied. Fish communities from different oceanic environments, their trophic relationships, migratory processes and the state of conservation of fish and marine mammals are also analyzed.

1.- Understand and analyze the connection that exists in the ocean between physicochemical and biological processes.
2.- Analysis of changes in spatial and temporal patterns, as well as the flow of matter and energy, in the pelagic communities that populate the oceans, in relation to the physical-chemical dynamics of the ocean.
3.- Understand the processes that govern the primary and secondary oceanic production and their impacts both in the water column and in the atmosphere, as well as in the food chain.

This subject is oriented to a high-level interdisciplinary training, by addressing in depth all the major areas of the Marine Sciences (Physical, Geological, Chemical and Biological Oceanography), as well as providing a solid foundation in programming and problem solving methods through the use of computer calculation programs that allow a comprehensive understanding of the marine environment, its problems and the possible solutions to them.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
### CONTENTS

#### Introduction to oceanic biological processes

**Description:**
Introduction to oceanic biological processes

**Specific objectives:**
to know the distribution of the different marine ecosystems, in addition to the distribution of the chemical elements and their abundance in relation to the biological processes, the cycles of matter and the trophic networks that they address in the marine environment, as well as some of the oceanographic research techniques.

**Full-or-part-time:** 9h 36m
- Theory classes: 4h
- Self study: 5h 36m

#### Energy flows and interactions between processes

**Description:**
Energy fluxes and interaction processes
Laboratory

**Specific objectives:**
The objective of this topic is to know the primary and secondary processes of the marine environment, as well as the snow and regenerated production existing in ocean ecosystems. The seasonality of primary production and the adaptations of different organisms to environmental processes will also be studied.

In order to interpret the adaptations to pelagic life presented by the specimen, two different species will be observed in the laboratory, a pelagic fish with a typically benthic one, and these species will have to be drawn and compared. Biometric study of a specimen of a species of fish, to assess the state of a fishery resource, which allows estimating the age of first maturity, growth evaluations and being able to determine the size and age of the first allowable catch. It will also be necessary to know its stomach content to establish trophic networks in a body of water and to be able to estimate the function that a species fulfills considering its size and age.

**Full-or-part-time:** 57h 35m
- Theory classes: 4h
- Laboratory classes: 20h
- Self study: 33h 35m

#### DISSOLVED GAS, OM AND NUTRIENTS

**Description:**
Dissolved gases, OM and nutrients
Oceanic biological processes

**Specific objectives:**
know in detail the different cycles of nutrients existing in the marine environment, as well as their interaction in ecosystems and organisms, as well as the different gases dissolved in seawater and the production of organic matter
Approach to a research topic. Identification of relevant questions and methods to find answers by discussing scientific articles on the subject.

**Full-or-part-time:** 38h 24m
- Theory classes: 6h
- Practical classes: 10h
- Self study: 22h 24m
# Export

**Description:**
Export

**Specific objectives:**
Know the biological pump and the different methodological aspects, as well as the spatio-temporal variability in export at sea. Attenuation of vertical flow and shallow and deep sedimentation occurred in the ocean. Coast-ocean differences

**Full-or-part-time:** 14h 23m  
Theory classes: 6h  
Self study : 8h 23m

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# Marine habitats

**Description:**
Marine environments

**Specific objectives:**
The objective of this topic is to know the different habitats existing in the marine environment and their interaction with the rest of the oceanographic variables, as well as their characteristics and exceptionalities that allow a specific community in each of them.

**Full-or-part-time:** 14h 23m  
Theory classes: 6h  
Self study : 8h 23m

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# INTERACTION PHYSICAL AND BIOLOGICAL PROCESSES

**Description:**
biological and physical processes interactions

**Specific objectives:**
The objective of this topic is to know the relationship between the physical processes of the marine environment and the biological processes that occur in the ocean, in order to establish the complex connections that organisms in this environment are subjected to.

**Full-or-part-time:** 9h 36m  
Theory classes: 4h  
Self study : 5h 36m

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# GRADING SYSTEM

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.
BIBLIOGRAPHY

Basic:

Complementary: