

Course guide

250579 - RMVIRENORE - Live, Renewable and Non-Renewable Marine Resources

Last modified: 22/05/2024

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: 2024

ECTS Credits: 6.0

Languages: Catalan

LECTURER

Coordinating lecturer: MARIA LOURDES REIG PUIG

Others: PABLO BOU MIRA, OCTAVIO CESAR MÖSSO ARANDA, MARIA LOURDES REIG PUIG, AGUSTIN SANCHEZ-ARCILLA CONEJO

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.
- 13390. Establish a good practice in the integration of common numerical, laboratory and field techniques in the analysis of any problem related to the marine environment.
- 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.
- 13397. Carry out environmental impact, management and protection studies of the marine environment and adjacent coastal areas, including the corresponding infrastructures and their related impacts.
- 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.
- 13405. Carry out calculations, assessments, surveys and inspections in coastal and marine environments, as well as the corresponding technical documents.

Generical:

- 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 a week of face-to-face classes in the classroom (whole group) and 1-2 hours a week with half of the students (half group).

In the whole group sessions, the teachers explain the basic concepts and materials of the subject, present examples and do exercises. Some of the sessions, in particular those associated with the Marine Challenges, will propose a system of reverse class (flipped classroom), so that greater prominence will be given to students in order to provide content and propose activities related to the subject of work.

In the half group sessions, activities are carried out with greater interaction with the students. Practical exercises are carried out in order to consolidate general and specific learning objectives.

The rest of the weekly hours are devoted to laboratory practices.

Support material is used in the format of a detailed teaching plan through the ATENEA virtual campus: contents, programming of assessment and guided learning activities and bibliography.

Note: The language in which the course is taught will depend on the teacher. Specifically, Professor Pablo Bou and Professor Lourdes Reig will teach in Catalan and Professor César Möso will teach in Spanish.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

LEARNING OBJECTIVES OF THE SUBJECT

This subject will emphasize the management and sustainable exploitation of living resources, both renewable and non-renewable, for the needs of society without compromising the ecosystem services of the future. The main marine renewable living resources (fisheries, aquaculture, biotechnology) will be reviewed. Emphasis will be placed on the evaluation of the ecological status of ocean systems in terms of the provision of resources, the management and evaluation of fisheries and aquaculture resources, the technology applied to the management of these resources and the evaluation of the impact of their exploitation. Students will also be introduced to non-living renewable (tides, wind energy) and non-renewable marine resources (oil, gas, minerals).

- 1.- Provide information on these three types of resources in the marine environment, as well as the most common ways of exploiting them from a commercial point of view.
- 2.- Know the sustainability of the system, the balance of the living resources with their ecosystem, as well as the usual forms of exploitation and commercialization.
- 3.- Understand the risks associated with the exploitation of marine georesources and the different uses of the marine bed and subsoil.

This subject is focused on showing, familiarizing and training students with techniques of observation, monitoring, acquisition and treatment of marine data, as well as modeling techniques, physical and numerical, which allow to characterize practically all of the real problems that will have to address in the professional practice and that will allow the students to finish a generic training cycle but with advanced and transversal knowledge in Sciences and Technologies of the Sea.

Also, this subject aims to relate the main challenges of the marine environment (plastics, climate change, etc.) and determine the impact of each of the challenges on the different resources analyzed within the program of the subject. Through a participatory reverse class mechanism, students will be able to analyze each challenge-resource binomial and identify both its impact and the possible opportunities that arise from the interaction.

STUDY LOAD

Type	Hours	Percentage
Hours large group	40,0	26.67
Hours small group	20,0	13.33
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Presentation of the subject

Description:

To present the main objectives of the subject, the topics, the methodology as well as the evaluation system. The teachers participating in the subject will be presented.

Specific objectives:

Understanding the structure of the subject and the objectives pursued is a basic tool to achieve student involvement in it.

Full-or-part-time: 7h 11m

Theory classes: 3h

Self study : 4h 11m

Blue economy

Description:

The concept of the Blue economy and the areas it includes will be reviewed. The local and global strategies that are applying this concept and its relationship with the exploitation of marine resources will be reviewed.

Specific objectives:

Understand the concept of the blue economy (blue growth) and its implications for marine resources. Describe the meaning of the EEZ and related legislation.

Full-or-part-time: 2h 24m

Theory classes: 1h

Self study : 1h 24m

Living and non-living resources, renewable and non-renewable

Description:

The most important marine resources will be reviewed, classified by living and non-living, and by renewable if not renewable

Specific objectives:

Define the concepts of living and non-living marine resources, renewable and non-renewable, their classification and the most general concepts.

Full-or-part-time: 2h 24m

Theory classes: 1h

Self study : 1h 24m

Marine challenges

Description:

Participatory and debating work will be carried out in the classroom in order to identify current marine challenges. From here, work teams will be set up, each of which will be the spokesperson for a challenge for the rest of the course.

Each team will present to the class the chosen challenge, the basic information necessary to understand the current situation of the challenge and its specific problems. It will be presented using the petxa-kutxa methodology (20 images during 20 seconds each, 6 minutes and 40 seconds in total)

Specific objectives:

Identify the main maritime challenges today. An interactive work will be carried out to identify, define and assign the challenges to work groups for the rest of the course. Following several activities, the teams will relate the current marine challenges with the marine resources they will learn about the implications and explore the potential opportunities that may arise.

Each group will present the chosen marine challenge. Discussion of the challenge presented with the rest of the group will be promoted.

Full-or-part-time: 9h 36m

Practical classes: 4h

Self study : 5h 36m

Marine resources: exploitation, legal framework

Description:

To set the definition of the Exclusive Economic Zone, the 1982 Sea Convention, Geometry of the EEZ, and the rest of the Sea. The rights and responsibilities of coastal states are analyzed

Specific objectives:

Have an approach to the legal framework that regulates the sea and the exploitation of marine resources.

Full-or-part-time: 7h 11m

Theory classes: 3h

Self study : 4h 11m

Fisheries

Description:

The general concepts of the fisheries will be reviewed, as well as their main magnitudes at the local and global level, analyzing the current situation, its future prospects and the sustainability of the system.

The status of the stock and the bioecological characteristics of commercially exploited aquatic species will be presented. The ecosystem approach to stock management and the application of the code of conduct in fisheries will be reviewed.

Technological aspects related to fishing will be reviewed (fleet, fishing systems, equipment)

Students will get to know the reality of the fisheries sector, through a visit (fishing port, etc.) and a conference related to the subject. The choice of the visit and the topic of the conference will be defined jointly with the students and according to the availability of the moment

The main species of fishing interest will be recognized (it will be complemented by a visit to the Mercat Central del Peix de Barcelona in Mercabarna) and the origins and methods of capture and production will be identified.

Specific objectives:

To understand the current situation and future trends of the fisheries, locally and globally, as well as the main data, countries, and species. The sustainability of the fisheries will be analyzed

To understand the state of the stocks of the main fishing species, their management, and their perspectives. Understand fisheries management criteria that are being applied internationally (ecosystem approach, code of conduct)

To revise the technology that is currently being used in fisheries in all the elements involved (fleet, fishing system, equipment)

Get to know the reality of the fisheries sector, through a visit (fishing port, etc.) and a conference related to the subject.

To identify the main species of fishing interest, identifying their origin and the method of capture.

Full-or-part-time: 38h 24m

Theory classes: 8h

Practical classes: 4h

Laboratory classes: 4h

Self study : 22h 24m

Aquaculture

Description:

The concept of aquaculture will be reviewed. Its current situation and future trends will be described, locally and globally, as well as the main data, countries, and species. The sustainability of aquaculture will be analyzed.

The characteristics of the different types of facilities for fish, molluscs and algae will be reviewed, as well as their main utilities and conditioning factors.

Review the principles of aquaculture production: reproduction, nutrition, health, management, environmental requirements, as well as its implications for animal welfare and sustainability.

Growth estimation in fish stocks. Estimation of water requirements and cultivation volume. Simulation of the growth and evolution of a fish stock under cultivated conditions, using excel spreadsheets, estimating their needs for water flow (in land based facilities) and culture volume

Know the reality of the aquaculture sector, through a visit (Ebro Delta, fish farm, etc.) or a conference related to the subject. The choice of the visit and the topic of the conference will be defined jointly with the students and according to the availability of the moment

Routine controls carried out daily in a fish farm will be carried out.

Specific objectives:

Understand the concept of aquaculture. Know the current situation and future trends, locally and globally, as well as the main data, countries and species. Analyze the sustainability of aquaculture.

To analyze the main types of facilities for the production of fish, molluscs and algae, considering their requirements and characteristics

To understand the principles of aquaculture production: reproduction, nutrition, health, management, environmental requirements

Calculate the water requirements and volume of cultivation in a fish farm, knowing its growth and the evolution of the stock

Students will get to know the reality of the fisheries sector, through a visit (fishing port, etc.) and a conference related to the subject.

Learn the routine activities that allow you to control the environmental conditions in a fish farm

Full-or-part-time: 36h

Theory classes: 7h

Practical classes: 5h

Laboratory classes: 3h

Self study : 21h

Marine biotechnology

Description:

The concept of marine biotechnology, its current situation, trends and the main magnitudes, countries, species will be presented. The sustainability of marine biotechnology will be analyzed.

The most developed cases of application of marine biotechnology will be analyzed: use of waste, production of micro and macroalgae, extraction of substances of industrial, pharmaceutical or food interest

The reality of the biotechnology sector will be known through a visit and a conference related to the subject. It will be defined jointly with the students and according to the availability of the moment

Specific objectives:

Understand the basic principles of marine biotechnology, its current situation and future trends.

To understand the main applications of marine biotechnology, as well as the main systems, species and processes from which substances of industrial, pharmaceutical or food interest can be obtained

The reality of the biotechnology sector will be approached, through a visit and a conference related to the subject.

Full-or-part-time: 19h 12m

Theory classes: 4h

Practical classes: 4h

Self study : 11h 12m

Non-living resources

Description:

Introduce Seabed Mining, Oil Basins, Hydrocarbons, Pleasure Deposits Manganese Nodules, Phosphorites, Polymetallic Sulfides.
Brief introduction to Thermal, Wind and Tidal energy

Specific objectives:

Seabed mining will be introduced
Brief introduction to Thermal, Wind and Tidal energy

Full-or-part-time: 9h 36m

Theory classes: 4h

Self study : 5h 36m

Evaluation

Full-or-part-time: 12h

Laboratory classes: 5h

Self study : 7h

GRADING SYSTEM

Ordinary Evaluation (EO):

The grade of the continuous evaluation is the weighted arithmetic average of the exercises/problems (Pr) carried out during the course, of the activities directed as assignments or reports (Tr) and of the partial exams (Ex, which will have the same value).

There will be two partial exams and they will count for 70% of the grade. Practical activities will count for 15% and directed activities will count for 15%.

The final grade will be $EO = 0.7 * (\text{average of Ex1 and Ex2}) + 0.15 * (\text{average of Pr}) + 0.15 * (\text{average of Tr})$.

To pass, the grade of the EO must be greater than or equal to 5.

Re-evaluation (RE):

Criteria for qualification and admission to reevaluation (Re):

Students who have failed the ordinary assessment and who have regularly taken the assessment tests for the suspended subject will have the option to take a re-evaluation test in the period set in the academic calendar. Students who have already passed or students classified as not presented or who have not submitted all of the exercises/problems (Pr) and the assignments and reports (Tr) may not take the reevaluation test of a subject.

The reevaluation (RE) will consist of a single exam covering all the content of the course. The maximum mark for the re-evaluation will be five (5.0) and the final mark for the course will be the maximum mark between the continuous evaluation and the re-evaluation exam, i.e. $MAX(EO/RE)$.

The non-attendance of a student called to the reevaluation test, held in the fixed period, will not be able to give rise to the completion of another test at a later date. Extraordinary evaluations will be carried out for those students who, due to accredited force majeure, have been unable to do any of the continuous evaluation tests. These tests must be authorized by the corresponding head of studies, at the request of the teacher responsible for the subject, and will take place within the corresponding academic period.

EXAMINATION RULES.

If one of the laboratory or continuous evaluation activities is not carried out in the scheduled period, it will be considered a zero score. The tests will be carried out individually, with test-type questions that can be theoretical or problem-type questions. The exams can include short questions to be developed by the students and exercises to be solved.

BIBLIOGRAPHY

Basic:

- FAO. The state of world fisheries and aquaculture: sustainability in action [on line]. 2020. Roma: FAO, 2020 [Consultation: 04/03/2021]. Available on: http://www.fao.org/sof/sofia/index_es.htm. ISBN 9789251326923.
- La Barre, S.; Bates, S.S. (eds.). Blue biotechnology: production and use of marine molecules [on line]. Weinheim, Germany: Wiley-VCH, 2018 [Consultation: 17/03/2021]. Available on: <https://onlinelibrary.wiley.com/doi/book/10.1002/9783527801718>. ISBN 9783527801718.
- Timmons, M.B.; Guerdat, T.; Vinci, B.J. Recirculating aquaculture. 4th ed. Ithaca, NY: Ithaca Publishing Company LLC, 2018. ISBN 9780971264670.