Course guide
250589 - POTMATMAR - Platforms, Observatories and Technologies of Marine Materials

Last modified: 22/05/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: BACHELOR'S DEGREE IN MARINE SCIENCE AND TECHNOLOGY (Syllabus 2018). (Optional subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: JOAQUIN DEL RIO FERNANDEZ

Others: MARIA TERESA BAILE PUIG, MATIAS CARANDELL WIDMER, JOAQUIN DEL RIO FERNANDEZ, NÚRIA JIMÉNEZ GARCÍA, ENRIQUE MARTIN FUENTES, MARC NOGUERAS CERVERA, DANIEL MIHAI TOMA

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.
13399. Apply the state-of-the-art numerical and statisticat techniques in the coastal and marine fields for a correctly interpretation of data. (Specific competence of the Marine Technologies Mention)
13402. Use and apply indicators to assess impacts, both natural and anthropogenic, and propose corrective measures with monitoring and surveillance programs. (Specific competence of the Marine Technologies 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:
13384. Apply knowledge and academic experience to the control and monitoring of the marine environment and its coastal boundary, using the state-of-the-art tools in the Marine Sciences and Technologies.
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 4 hours a week of face-to-face classes in the classroom, laboratory or in the field.

Theoretical classes are dedicated where the teachers explain the basic concepts and materials of the subject, present examples and carry out exercises. Laboratory practices can be in the laboratory or also field activities.

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.

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 show the most relevant aspects in the design of "in situ", real-time measuring devices for marine purposes, with the aim of obtaining environmental information for longer observation periods and with better temporal resolution, to allow its application for the detection of changes in the marine environment related to climate variations. Emphasis will be placed on the principles of operation of OBSEA, and its application to real problems.

1. Introduction to the observation platforms (surface, water column or seabed) used in oceanography.
2. Know the observatories and programs deployed both at a European and global level: characteristics and objectives.
3. Have the ability to design and integrate each of the parts that make up an observatory.
4. Introduction to technology and materials used in the manufacture of structures, platforms or marine devices: carbon fiber, glass, steel, titanium, etc ...
5. Know the most common problems that affect the materials used in the sea: corrosion, electrolysis, biofouling
6. Be able to design and select the most suitable materials in the design of submerged equipment

This subject is oriented to the application of technologies of observation, remote perception and automatic exploration of the marine environment, which is essential for the motorization of the coastal water bodies and the obtaining of the necessary data for the control of practically all the activities human resources in the marine environment related to the exploitation of natural and aquacultural resources of the marine and coastal environment.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

Marine Materials Technologies

Description:
Introduction to the principles of Materials Science
Mechanical properties. Mechanisms of plastic deformation. Hardening mechanisms
Corrosion phenomena and their economic importance. Corrosion mechanisms
Types of materials. Structural materials. Functional materials

Specific objectives:
Introduce the student to Materials Science and Engineering
Know the main mechanical properties of materials and their interpretation.
Understand the influence of design and material selection on corrosion phenomena
Know the types of materials and their classification

Full-or-part-time: 33h 36m
Theory classes: 14h
Self study : 19h 36m

Marine platforms and observatories

Description:
The most relevant characteristics and objectives of the following initiatives are described: EMSO ERIC JERICO RI EMBRC Danubius RI eLTER RI Lifewatch ERIC Euro ARGO ERIC ICOS ERIC
The most relevant characteristics of the Eulerian measuring platforms are described: Moorings buoys Landers wired observatories

Full-or-part-time: 28h 47m
Theory classes: 12h
Self study : 16h 47m

Components and technical specifications of the elements that make up an observatory

Description:
The most relevant characteristics of the following elements used in any observation system are described: connectors, wiring, communications, power systems

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

Field and laboratory activities

Description:
The student will carry out tensile tests on two different materials: an aluminum alloy and a steel.
perform hardness tests on different materials. Carry out an impact toughness test
mounting situations that can lead to corrosion of materials
Mooring design: Matlab and Mooring Design & Dynamics toolkit
Performing bathymetries with echo sounder, field activity
In this activity students can put into practice all the contents of the subject by designing a marine observation platform and its oral presentation to the class class.a

Specific objectives:
Learn to determine the mechanical properties of a material from a real tensile test. Interpret and analyze the results
Know how to determine the most suitable hardness method for each material. Determine the relationship between toughness and mechanical resistance.
Know the main phenomena of corrosion
Design of a marine observatory taking into account the given design guidelines and the characteristics of the elements that make it up.

Full-or-part-time: 62h 24m
Laboratory classes: 26h
Self study : 36h 24m

Evaluation tests

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

GRADING SYSTEM

The qualification of the subject is obtained from the qualifications of the tests of partial and final evaluation, of the qualifications of follow-up and of continuous evaluation and of the qualifications corresponding to the activities in the laboratory and field.

The continuous assessment consists of doing different activities, both individual and group, of an additive and formative, carried out during the course (inside the classroom and outside).

The qualification of teaching in the laboratory is the average of such activities.

The assessment tests consist of a part with questions about concepts associated with the learning objectives of the subject in terms of knowledge or comprehension, and a set of application exercises.

NF = 50% Theory Note + 10% Monitoring Notes + 40% Laboratory Note

Theory note: evaluation tests
Follow-up notes: exercises and works presented during the course
Laboratory note: previous studies and reports on the lab and field practices.

Criteria of qualification and of admission to the re-evaluation: The students failed on the ordinary evaluation that have presented regularly in the proofs of evaluation and have attended and approved the 50% of the course corresponding to field, laboratory and monitoring activities will have the option of taking a re-assessment test in the period set in the academic calendar. Students who have already passed it or students who have been classified as not presented, or those who have not passed the laboratory / field activities, will not be able to take the re-assessment test for a subject. The maximum grade in the case of taking the re-assessment exam will be five (5.0). The non-attendance of a student summoned to the re-evaluation test, held in the set period may not lead to the performance of another test with a later date. Extraordinary assessments will be carried out for those students who, due to accredited force majeure, have not been able to take any of the continuous assessment tests.

These tests must be authorized by the corresponding head of studies, at the request of the teacher responsible for the subject, and will be carried out within the corresponding teaching period.

BIBLIOGRAPHY

Basic:

- Mandal, Nisith R. Ship Construction and Welding [on line]. 2017. Singapore: Springer, 2017 [Consultation: 19/12/2022]. Available on: https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-981-10-2955-4. ISBN 981-10-2955-5.
- Eyres, D.J. ; Bruce, G.J. Ship Construction [on line]. 7. Amsterdam: Elsevier, 2012 [Consultation: 19/12/2022]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780080972398/ship-construction. ISBN 1-283-73490-7.
- Askeland, D.R.; Wright, W.J. Ciencia e ingenieria de materiales. 7a ed. México: Cencage Learning, 2021. ISBN 9786075260624.
- Berteaux, H. O. Buoy engineering. New York: John Wiley & Sons, 1976. ISBN 9780471071563.
- Myers, J. J., Holm, C. H., & McAllister, R. F.. Handbook of ocean and underwater engineering. New York: McGraw-Hill, 1969. ISBN 9780070442450.