Course guide
250555 - GCMFMEDMAR - Marine Environment Physics

Last modified: 22/05/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

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: MARC BERENGUER FERRER

Others: MARC BERENGUER FERRER, IVAN CACERES RABIONET, LAURA GONZÁLEZ BLANCO, DANIEL SEMPERE TORRES

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.

Generical:
13380. Develop a professional activity in the field of Marine Sciences and Technologies.
13381. Address in a comprehensive manner the analysis and preservation of the marine environment with sustainability criteria.

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 are 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.

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

In this course, the basic physical principles that occur in the marine physical environment are reviewed. Emphasis is placed on the concepts of oscillatory movement and fluid physics (kinematics, conservation equations, constituent equations in fluids, and Fluid Mechanics).

1.- Understand the laws of hydrostatics and fluid dynamics, as well as the principle of Archimedes and the continuity equation. Understand the basic principles of thermodynamics and fluid mechanics.
2.- Assimilate the concepts of basic wave phenomena (Snell's laws, diffraction, wave groups, dispersion relation). Doppler effect.
3.- Understand the theory of linear waves and the laws that govern the propagation of light and sound in the ocean.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	15,0	10.00
Hours large group	30,0	20.00
Self study	90,0	60.00
Hours small group	15,0	10.00

Total learning time: 150 h

CONTENTS

Hydrostatic and fluid dynamics

Description:
Properties of fluids. Pressure
Fluids - specific density and gravity - compressibility
Flotation and Archimedes' principle
Exercises
Types of flow. Continuity equation. Bernoulli's equation and energy conservation. Viscosity. Reynolds' number.
Exercises
Fluid practice

Full-or-part-time: 52h 48m
Theory classes: 10h
Practical classes: 10h
Laboratory classes: 2h
Self study : 30h 48m

Waves

Description:
Types of waves and their properties. Energy and intensity.
Mathematical representation
Exercises
Reflection, transmission and interference. Stationary waves Resonance
Refraction. Snell's law. Diffraction
Exercises
Wave groups and Doppler effect
Propagation of sound and light
Exercises

Full-or-part-time: 48h
Theory classes: 14h
Practical classes: 6h
Self study : 28h

Evaluation

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

Thermodynamics

Description:
Temperature, heat and energy transfer. Specific heat Latent heat Ideal gas equation.
First law of thermodynamics. Isothermal, adiabatic and isobaric processes. Work. Ideal gases. Heat transfer. Conduction, convection and radiation.
Exercises
Thermal machines Reversible and irreversible processes. Entropy Second law of thermodynamics.
Exercises

Full-or-part-time: 28h 47m
Theory classes: 8h
Practical classes: 4h
Self study : 16h 47m

GRADING SYSTEM

The grade of the course is obtained as the weighted arithmetic mean of the grades of the reports of 2 laboratory sessions and of 2 exams. The weights for these elements are:

Laboratory reports: 20%
Mid-term exam: 30%
Final exam: 50%

The exams (evaluation tests) consist of several exercises to apply the concepts and learning objectives of the course.

All students will be allowed to take the re-evaluation exam on the date set by the academic calendar, even if they have missed to submit some of the elements of the continuous evaluation.

The re-evaluation will consist of a single exam on the contents of the course. The maximum grade will be 5.0, and the final grade of the course will be the maximum between the grades of the continuous evaluation and the re-evaluation exam.

Those students not attending the re-evaluation exam on the day set in the accademic calendar will not have the right to do the exam on a later date. Extraordinary tests will be allowed for students who cannot do a test of the continuous evaluation for force majeure causes. This will need to be certified and approved by the Director of studies, per the requirement of the professor responsible of the course.

EXAMINATION RULES.

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

BIBLIOGRAPHY

Basic:

- Giancoli, D.C. Física para ciencias e ingeniería. 4a ed. México: Pearson educación, 2008. ISBN 9789702612254.
- Sears, F.; Zemansky, M.; Young, H.; Freedman, R. Física universitaria. 13 ed. Pearson Consumo, 2014. ISBN 9786073221245 (VOL. 1) ; 9786073221900 (VOL. 2).
- Serway, R.A. ; Vuille, C. Fundamentos de física. 10a ed. México: Cengage, 2018. ISBN 9786075265629.