Marine Environment Physics (250555)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	6.0 ECTS
Programs	GRAU EN CIÈNCIES I TECNOLOGIES DEL MAR (pla 2018)
Course	2024/25

Main teaching language at each group

- Group 11 Catalan (Q2)
- Group 12 Catalan (Q2)

Faculty

Responsible Faculty: Marc Berenguer Ferrer
Faculty: Marc Berenguer Ferrer, Ivan Caceres Rabionet

Objectives of Education

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.

Competencies

Especific

To know and apply the lexicon and concepts of the Marine Sciences and Technologies and other related fields.
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.

Generic

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

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	30.0 h	50.00 %
	Medium group	15.0 h	25.00 %
	Laboratory classes	15.0 h	25.00 %
	Guided Activities	0.0 h	0.00 %
Self Study		90.0 h	

Contents

Hydrostatic and fluid dynamics

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

Waves

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

Evaluation

Thermodynamics

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

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.

Grading Rules

(*) The evaluation calendar and grading rules will be approved before the start of the course.

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.

Test Rules

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

Office Hours

Thursday from 12:00 to 13:00

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.