

## Course guide

### 280803 - 280803 - Oceanography

**Last modified:** 09/05/2023

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

**Degree:** MASTER'S DEGREE IN NAVAL AND OCEAN ENGINEERING (Syllabus 2017). (Compulsory subject).

**Academic year:** 2023    **ECTS Credits:** 5.0    **Languages:** Catalan, Spanish

#### LECTURER

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**Coordinating lecturer:** MANUEL ESPINO INFANTES

**Others:** Primer quadrimestre:  
MANUEL ESPINO INFANTES - MUENO  
FRANCESC XAVIER GIRONELLA I COBOS - MUENO

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

MUENO\_CE8. Knowledge of the elements of physical oceanography (waves, currents, tides, etc.) necessary for the analysis of the behavior of oceanic structures, and of the elements of chemical and biological oceanography that must be taken into account for maritime safety and for the treatment of pollution, and the environmental impact produced by ships and marine devices

**Generical:**

MUENO\_CG1. Ability to solve complex problems and to make responsible decisions based on the scientific and technological knowledge acquired in basic and technological subjects applicable in naval and ocean engineering, and in management methods  
MUENO\_CG6. Ability to conduct research, development and innovation in naval and ocean products, processes and methods  
MUENO\_CG14. Ability to analyze, assess and correct the social and environmental impact of technical solutions  
MUENO\_CG15. Ability to organize and direct multidisciplinary work groups in a multilingual environment, and to generate reports for the transmission of knowledge and results

**Transversal:**

CT3. TEAMWORK: Ability to work as a member of an interdisciplinary team, either as a member or performing management tasks, with the aim of contributing to projects pragmatically and sense of responsibility, assuming commitments considering the resources available.  
CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty, and critically evaluate the results of this management.  
CT5. THIRD LANGUAGE Learning a third language, preferably English, with adequate oral and written and in line with the future needs of the graduates.

**Basic:**

CB6. Possess knowledge and understanding that provide a basis or opportunity be original in the development and / or application of ideas, often in a research context.  
CB7. That the students can apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their study area.  
CB8. Students should be able to integrate knowledge and handle the complexity of making judgments based on information that, being incomplete or limited, includes reflections on the responsibilities social and ethical linked to the application of their knowledge and judgments.  
CB9. That students can communicate their conclusions and the knowledge and Latest rationale underpinning to specialists and non Specialty clearly and unambiguously.  
CB10. Students must possess the learning skills that enable them continue studying in a way that will be largely self-directed or autonomous.

## TEACHING METHODOLOGY

Lectures  
Solving exercises and problems

## LEARNING OBJECTIVES OF THE SUBJECT

To familiarize the student with the concepts of physical, chemical, geological and biological oceanography necessary for the performance of his future activity in the field of Naval and Oceanic engineering in a manner that respects the marine environment and sustainable from a technical, economic and environmental point of view.

## STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	36.00
Self study	80,0	64.00

**Total learning time:** 125 h

## CONTENTS

### 1. Introduction to Oceanography

#### Description:

Presentation of the subject.

Introduction to the concepts of physical oceanography, chemical oceanography, geological oceanography and biological scenography.

History of the Oceanography.

#### Full-or-part-time: 6h

Theory classes: 3h

Self study : 3h

### 2. Marine Geology

#### Description:

The bathymetry of the ocean: continental margins and ocean basins.

Geophysical techniques for prospecting the ocean floor.

Sedimentation in the ocean.

Techniques for sampling sediment in the background.

#### Full-or-part-time: 8h

Theory classes: 2h

Practical classes: 1h

Guided activities: 2h

Self study : 3h

### 3. Physical and chemical properties of sea water

**Description:**

Conservative properties of sea water: Salinity, Temperature and Density.

Dissolved gases: Oxygen, Carbon Dioxide.

Transmission of light and sound in the ocean.

Measuring techniques: CTD equipment and sampling bottles

**Full-or-part-time:** 15h

Theory classes: 4h

Practical classes: 1h

Guided activities: 5h

Self study : 5h

### 4. Meteorology and ocean circulation

**Description:**

Atmospheric processes and general wind circulation.

Surface ocean currents: wind currents, inertial currents, geostrophic currents and mesoscale currents.

Thermohaline deep circulation.

Techniques for measuring ocean currents.

**Full-or-part-time:** 26h

Theory classes: 7h

Practical classes: 2h

Guided activities: 10h

Self study : 7h

### 5. Waves, Tsunamis and Seiches

**Description:**

Free surface waves in the ocean.

Regular wave: Linear theory of waves.

Generation and propagation of the waves.

Irregular swell: Statistical and spectral description of the swell,

Propagation in someres waters.

Long waves: Tsunamis and Seiches.

Interaction of waves and currents.

Free surface wave measurement techniques.

**Full-or-part-time:** 19h

Theory classes: 6h

Practical classes: 3h

Guided activities: 5h

Self study : 5h

## 6. Tides and currents

### Description:

Characteristics of the tide waves.

Generation and propagation of astronomical tides: tidal equilibrium theory and dynamic tidal theory.

Harmonic tide prediction method.

Meteorological tide.

Tidal currents.

### Full-or-part-time: 16h

Theory classes: 4h

Practical classes: 2h

Guided activities: 5h

Self study : 5h

## 7, Marine Ecology

### Description:

Habitats in the Ocean.

Classification of marine organisms.

Functioning of marine ecosystems.

Trophic chains and types of ecosystems.

Coastal outcrops and productivity in the ocean.

### Full-or-part-time: 9h

Theory classes: 2h

Practical classes: 2h

Guided activities: 2h

Self study : 3h

## 8. Marine pollution

### Description:

Definition of contamination.

Oil spills in the sea.

Waste water discharge.

Environmental impact of dredging.

Models of transport of contaminants.

Acoustic impact of geophysical surveys.

Models of propagation of noise in the sea.

### Full-or-part-time: 26h

Theory classes: 3h

Practical classes: 3h

Guided activities: 11h

Self study : 9h

## GRADING SYSTEM

The final grade is the sum of the following partial grades:

Final qualification = (0.6 x Final test qualification) + (0.4 x Qualification of the course exercises)

## BIBLIOGRAPHY

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### Basic:

- Ocean circulation [on line]. 2nd ed. Oxford: Butterworth-Heinemann, 2001 [Consultation: 01/09/2022]. Available on: <https://www.sciencedirect-com.recursos.biblioteca.upc.edu/book/9780750652780/ocean-circulation>. ISBN 0750652780.
- Waves, tides, and shallow-water processes. Repr. with corr. Oxford: Butterworth Heinemann in association with The Open University, 1997. ISBN 0750628278.
- Pinet, Paul R. Invitation to oceanography. 6th ed. Burlington: Jones & Bartlett Learning, 2013. ISBN 9781449648022.

### Complementary:

- Pugh, David; Woodworth, P. L; Woodworth, Philip. Sea-level science : understanding tides, surges, tsunamis and mean sea-level changes [on line]. Second edition. Cambridge: Cambridge University Press, 2014 [Consultation: 26/09/2023]. Available on: <https://www-cambridge-org.recursos.biblioteca.upc.edu/core/books/sealevel-science/C5E551D95DA4E8AF116FED9F0DEB289B#>. ISBN 9781139235778.
- Pond, Stephen; Pickard, George L. Introductory dynamical oceanography. 2nd ed. Oxford: Pergamon, 1983. ISBN 0080287298.
- Varela, Ramiro A; Rosón Porto, Gabriel. Métodos en oceanografía física. Barcelona: Anthias, 2008. ISBN 9788493316747.