

## Course guide

### 280822 - 280822 - Offshore Hydromechanics

**Last modified:** 25/10/2023

**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). (Optional subject).

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

#### LECTURER

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**Coordinating lecturer:** FRANCESC XAVIER GIRONELLA I COBOS

**Others:** Primer quadrimestre:  
CORRADO ALTOMARE - MUENO  
FRANCESC XAVIER GIRONELLA I COBOS - MUENO

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

ENO\_CEE2-1. Capacity for hydrodynamic analysis, stability and behavior in the sea of ??platforms and other offshore structures (specific competence of the specialty in Ocean Energies)

ENO\_CEE2-6. Capacity for the design and project of platforms for offshore wind turbines (specific competence of the specialty in Ocean Energy)

**Transversal:**

CT5. THIRD LANGUAGE Learning a third language, preferably English, with adequate oral and written and in line with the future needs of the graduates.

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.

**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

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Expository method / Master class  
Autonomous learning by solving exercises and problems  
Problem / project based learning

## LEARNING OBJECTIVES OF THE SUBJECT

Be able to handle and understand the lexicon and the concepts of the Marine Hydromechanics and other related scientific areas, and communicate them with the appropriate way and rigor.

Have the ability to contribute to training at different educational levels and dissemination of key aspects of the marine environment visualized as an environment that generates actions to artificial structures.

Be able to apply the techniques and calculation methods applicable to oceanic structures.

Evaluate, process, visualize and interpret data from the field of Marine Hydromechanics, and apply, where appropriate, statistical techniques and models.

Be able to understand and incorporate contributions of engineering to the approach and resolution of problems in the field of Marine Hydromechanics, and to develop collaborative skills.

## STUDY LOAD

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

**Total learning time:** 125 h

## CONTENTS

### 1. Introduction

#### Description:

The content and planning of the subject are considered.

It gives an overview of how to interpret and work with the actions of waves, wind and currents acting on ocean structures.

#### Full-or-part-time: 7h

Theory classes: 3h

Practical classes: 3h

Guided activities: 1h

### 2. Swell loads on static structures

#### Description:

Determination of design variables based on the type of structure.

Flexible and rigid structures.

Determination of loads due to swell.

Depth effects.

Wave propagation.

Stability study.

Impulsive loads: wave impact forces, breaking waves, run-up, overtaking

#### Full-or-part-time: 36h

Theory classes: 8h

Practical classes: 4h

Guided activities: 4h

Self study : 20h

### 3. Foundations in static structures

**Description:**

Foundation in deep water and shallow water.  
Undermining and protection. Behavior of the sun.

**Full-or-part-time:** 18h

Theory classes: 3h  
Practical classes: 3h  
Guided activities: 2h  
Self study : 10h

### 4, Slender structures

**Description:**

Slender structures and large structures.  
Inertial and drag forces.  
The number of Keulegan Carpenter.  
Morison equation in fixed structures and oscillating structures.  
Loads due to the most common wave combination.  
Hydrodynamic coefficients  $C_M$  and  $C_D$ .  
Forces Froude-Krylov.  
Separation between flow and oscillatory flow.  
Induced vibrations.

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

Theory classes: 6h  
Practical classes: 3h  
Guided activities: 3h  
Self study : 14h

### 5. Floating structures

**Description:**

Dynamic response of floating structures.  
Radiation-diffraction.  
Drift forces

**Full-or-part-time:** 18h

Theory classes: 4h  
Practical classes: 2h  
Guided activities: 2h  
Self study : 10h

### 6. Physical and numerical models for calculation and design

**Description:**

Knowledge of the tools used to design ocean structures

**Full-or-part-time:** 20h

Theory classes: 4h  
Practical classes: 2h  
Guided activities: 4h  
Self study : 10h



## GRADING SYSTEM

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

$$N_{\text{final}} = 0.3 \cdot N_{\text{pf}} + 0.0 \cdot N_{\text{pp}} + 0.7 \cdot N_{\text{ec}}$$

$N_{\text{final}}$ : Final qualification

$N_{\text{pf}}$ : Final test grade

$N_{\text{pp}}$ : Partial test grade

$N_{\text{ec}}$ : Qualification of the course exercises (continuous assessment)

## EXAMINATION RULES.

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### Theory classes

These classes develop the theoretical concepts on the main topics of marine hydromechanics. The material used will be available on the UPC Virtual Campus for free access by students prior to the teaching of the class. The main objective of these classes is to deal with those concepts that may be a priori confusing for students and to provide them with a reference guide for following the course.

### Directed activities

In class, the necessary work will be indicated and initiated to solve practical questions that the students will have to develop later and deliver to the teacher in an agreed date.

### Tutorials

The tutoring action will be carried out by offering availability via email. Although the computer tools allow a completely virtual tutorial, the teacher's visiting hours will be reported at the beginning of the course, as well as in the UPC Virtual Campus for personal tutorials.

### Autonomous learning

The beginning of each topic will be accompanied by a recommended reading. In addition, through the UPC Virtual Campus, a series of complementary resources will be added on the subject, which may include articles, Internet sites, videos or images of a different nature, so that the student can expand their knowledge.

## BIBLIOGRAPHY

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### Basic:

- Chakrabarti, Subrata K. Handbook of offshore engineering. 2 vol [on line]. London: Elsevier, 2005 [Consultation: 01/09/2022]. Available on: <https://www.sciencedirect-com.recursos.biblioteca.upc.edu/book/9780080443812/handbook-of-offshore-engineering>. ISBN 9780080443812.

### Complementary:

- ROM 0.2-90 : acciones en el proyecto de obras marítimas y portuarias [on line]. [Madrid]: MOPU, 1990 [Consultation: 01/09/2022]. Available on: <https://www.puertos.es/es-es/BibliotecaV2/ROM%200.2-90.pdf>.
- ROM 0.4-95 : acciones climáticas II : viento [on line]. [Madrid]: Puertos del Estado, 1995 [Consultation: 01/09/2022]. Available on: <https://www.puertos.es/es-es/BibliotecaV2/ROM%200.4-95.pdf>. ISBN 9788488975096.
- Mather, Angus. Offshore engineering : an introduction. 2nd ed rev. Whiterby Publishers, 2000. ISBN 9781856091862.