

Port and Offshore Engineering (250433)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA) Laboratori d'Enginyeria Marítima (LIM)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) PARS: ENGINYER/A DE CAMINS, CANALS I PORTS (pla 2022)
Course	2024/25

Main teaching language at each group

- Group 10EN1 English (Q1)

Faculty

Responsible Faculty: Juan Pablo Sierra Pedrico

Faculty: Manuel Grifoll Colls, Jose Luis Monso De Prat, Juan Pablo Sierra Pedrico

Objectives of Education

Specialization subject in which knowledge on specific competences is intensified.

Knowledge and skills at specialization level that permit the development and application of techniques and methodologies at advanced level.

Contents of specialization at master level related to research or innovation in the field of engineering.

TEAMWORK - Level 3: Managing and dynamic working groups, resolving their potential conflicts, evaluating the work done with other people and to evaluate the effectiveness of the team and the general presentation of the results

Competencies

Especific

Knowledge of and the ability to understand dynamic phenomena of the coastal ocean and atmosphere and respond to problems encountered in port and coastal areas, including the environmental impact of coastal interventions. The ability to analyse and plan maritime works.

Transversal

ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.

SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	25.5 h	56.67 %
	Medium group	9.75 h	21.67 %
	Laboratory classes	9.75 h	21.67 %
	Guided Activities	0.0 h	0.00 %
Self Study		80.0 h	

Contents

Port engineering

Types of ports and port engineering problems and projects
 Types of works. Docks. Jetties. Dolphins
 Practical exercise on interior works in ports.
 Currents in the port area. Influence of currents on the maneuverability. Influence of currents on the dispersion of pollutants. Numerical models of currents. Predicted operational currents.
 Practical exercise to apply the theory explained in class
 Run-up, overtopping, wave transmission and reflection

Specific Objectives

Describe some basic concepts of port, as well as problems and projects in port engineering.
 Understanding the different kinds and types of maritime works inside the ports.
 Being able to design broadly, a pier, basin or jetty and its main features.
 Understanding the currents inside the port area and its influence on engineering port.
 To study the phenomena of interaction between waves and port structures

Port management and exploitation

Models, agents and strategic planning
 Solid and liquid bulk terminals. Container, ro-ro, general cargo and multipurpose terminals.
 Practical exercise on designing a port terminal.
 Fundamentals of queuing theory and its application to port engineering
 Application of the theory explained in class to a practical case.
 Description of the theory of waiting systems and its application to the design of port terminals
 Practical application of the theory explained in class

Specific Objectives

Describe the different types of models, agents and plans available in the port planning process.
 Description of the different types of port terminals
 Being able to design, broadly speaking, a port terminal and its main characteristics.

Environmental factors

Climate change. Effects of climate change on the sea. Impacts on ports.
 Make a practical exercise to analyze the potential impacts of climate change on ports
 Types of pollutants. Sources of pollution. Processes involved in the dispersion of pollutants.

Specific Objectives

Know what effects climate change may have on the sea, and the impact such effects can have on the ports.
- Put into practice the knowledge acquired in the theoretical part of the topic.
- Raise awareness of potential impacts of climate change on ports
Learn about the most common pollutants in port waters and which are the processes involved in their dispersion
Applying the theoretical knowledge acquired on water quality in ports.

Offshore Engineering

History of offshore structures. Types of offshore structures. Artificial islands
Solicitations and responses. Probabilistic design. Design of fixed structures. Design of floating structures
Lashing systems. Lay-out. Construction methods. Materials. Foundations. Design of subsea pipelines
Estimation of energy resources. Systems for obtaining energy from tides, waves and currents
Analyze a case study of marine wave energy

Specific Objectives

Know that is a different structure and existing offshore.
Review, in a practical way, the different calculation methods of offshore structures.
Understanding the different aspects of the construction of offshore structures.
Know the different systems for extracting energy from the sea

Activities

Visit to Barcelona Port

Visit to the headquarters of the Port of Barcelona to find out about the main functions of the Port Authority.
Boat trip around the port to see what terminals there are, how they work and what their activities are.

Dedication

3h

Teaching Methodology

The course consists of 3 hours per week of classroom activity. Part of the time is devoted to theoretical lectures, in which the professor presents the basic concepts and topics of the subject, shows examples and solves exercises.

Part of the time is dedicated 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.

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.

Grading Rules

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

The final grade of the course is obtained, in 40%, from the practical assignments carried out during the course. The other 60% of the grade corresponds to the exam 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

Schedule a consultation meeting with the professors

Bibliography

Basic

- Cur/Ciria. Manual on the use of rock in coastal and shoreline engineering. Gouda/Londres: Ciria Special publication, 1991.
- Goda, Y. [Random seas and design of maritime structures](#). 3rd ed. World Scientific, 2000. ISBN 9789814282406.
- Herbich, J.B. (Ed.). Handbook of coastal engineering. New York: McGraw Hill, 2000. ISBN 0071344020.
- Tsinker, J.P. [Handbook of port and harbor engineering: geotechnical and structural aspects](#). Dordrecht: Springer Science + Business Media, 1997. ISBN 9781475708653.
- Coastal Engineering Manual (CEM). US Army Corps of Engineers, 2000.
- ROM 3.1-99: [proyecto de la configuración marítima de los puertos; canales de acceso y áreas de flotación](#). Madrid: Ministerio de Fomento. Puertos del Estado, 2000. ISBN 8449805139.
- Lun, Y.H.V.; Lai, K.-H.; Cheng, T.C.E. [Shipping and logistics management](#). London: Springer, 2010. ISBN 9781848829978.
- Headland, J.R. Port planning and engineering. Amer Inst of Chemical Engineers, 2012. ISBN 9780470049655.
- El-Reedy, M.A. [Offshore structures: design, construction and maintenance](#). Waltham: Gulf Profesional, 2012. ISBN 9780123854766.
- Multon, B. (ed.). [Marine renewable energy handbook \(ISTE\)](#). London ; Hoboken, NJ: ISTE ; John Wiley & Sons, 2012. ISBN 9781848213326.

Complementary

- Negro, V.; Varela O. [Diseño de diques rompeolas](#). 2a ed. Madrid: Colegio de Ingenieros de Caminos, Canales y Puertos., 2008. ISBN 9788438004029.
- Negro, V [et al.]. [Diseño de diques verticales](#). 2a ed. Madrid: Colegio de Ingenieros de Caminos, Canales y Puertos., 2008. ISBN 9788438003749.
- ROM 0.0: [procedimiento general y bases de cálculo en el proyecto de obras marítimas y portuarias](#). Salamanca: Ministerio de Fomento. Puertos del Estado, 2001. ISBN 8488975309.
- Brunn, P. (eds.). [Design and construction of mounds for breakwaters and coastal protection](#). Amsterdam: Elsevier, 1985. ISBN 0444423915.