Course guide
250433 - ENGPOROFF - Port and Offshore Engineering

Last modified: 03/10/2023

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

Degree: MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).

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

LECTURER

Coordinating lecturer: JUAN PABLO SIERRA PEDRICO

Others: MANUEL GRIFOLL COLLS, JOSE LUIS MONSO DE PRAT, JUAN PABLO SIERRA PEDRICO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
8233. 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:
8559. 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.
8560. 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.

8561. 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.

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.

LEARNING OBJECTIVES OF THE SUBJECT

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

STUDY LOAD

Type	Hours	Percentage
Hours large group	25,5	20.38
Hours medium group	9,8	7.83
Self study	80,0	63.95
Hours small group	9,8	7.83

Total learning time: 125.1 h

CONTENTS

Port engineering

Description:
Types of ports and port engineering problems and projects
Types of works. Docks. Jetties. Dolfins
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
Visit the Maritime Engineering Laboratory tests to monitor different processes of interaction of waves - structure.

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
Observe in laboratory the interaction between waves and port structures

Full-or-part-time: 31h 12m
Theory classes: 8h
Practical classes: 1h
Laboratory classes: 4h
Self study : 18h 12m

Port management and exploitation

Description:
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.

Full-or-part-time: 36h
Theory classes: 9h
Practical classes: 4h
Laboratory classes: 2h
Self study : 21h

Environmental factors

Description:
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.
Practice on water quality in port areas

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 itheir dispersion
Applying the theoretical knowledge acquired on water quality in ports.

Full-or-part-time: 14h 23m
Theory classes: 4h
Practical classes: 2h
Self study : 8h 23m

Offshore Engineering

Description:
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

Full-or-part-time: 16h 48m
Theory classes: 4h
Practical classes: 3h
Self study : 9h 48m

Evaluation

Full-or-part-time: 9h 36m
Laboratory classes: 4h
Self study : 5h 36m

GRADING SYSTEM

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.

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:
- 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 [on line]. Madrid: Ministerio de Fomento. Puertos del Estado, 2000 [Consultation: 30/05/2012]. Available on: http://www.puertos.es/programa_rom/rom_31_99.html. ISBN 8449805139.
- Lun, Y.H.V.; Lai, K.-H.; Cheng, T.C.E. Shipping and logistics management [on line]. London: Springer, 2010 [Consultation: 15/01/2020]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=993452. 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 [on line]. Waltham: Gulf Profesional, 2012 [Consultation: 01/04/2020]. Available on: https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=953180. 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 [on line]. Salamanca: Ministerio de Fomento. Puertos del Estado, 2001 [Consultation: 30/05/2012]. Available on: http://www.puertos.es/programa_rom/ROM_00_espa.html. ISBN 8488975309.
- Brunn, P. (eds.). Design and construction of mounds for breakwaters and coastal protection. Amsterdam: Elsevier, 1985. ISBN 0444423915.