

Course guide

2500050 - GECENGPORT - Port Engineering

Last modified: 01/10/2023

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

Degree: BACHELOR'S DEGREE IN CIVIL ENGINEERING (Syllabus 2020). (Optional subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: FRANCESC XAVIER GIRONELLA I COBOS

Others: CORRADO ALTOMARE, FRANCESC XAVIER GIRONELLA I COBOS, XAVIER PASCUAL LORENTE, JUAN PABLO SIERRA PEDRICO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14412. Capacity for construction and conservation of maritime works. (Specific technology module: Civil Construction)

Generical:
14380. Scientific-technical training for the exercise of the profession of Technical Engineer of Public Works and knowledge of the functions of advice, analysis, design, calculation, project, construction, maintenance, conservation and exploitation.
14383. Ability to project, inspect and direct works, in their field.
14384. Capacity for the maintenance and conservation of hydraulic and energy resources, in its field.
14386. Capacity for maintenance, conservation and exploitation of infrastructure, in its field.
14389. Knowledge of the history of civil engineering and training to analyze and assess public works in particular and construction in general.
14390. Identify, formulate and solve engineering problems. Pose and solve construction engineering problems with initiative, decision-making skills and creativity. Develop a systematic and creative method of analysis and problem solving. (Additional school competition).
14391. Conceive, project, manage and maintain systems in the field of construction engineering. Cover the entire life cycle of an infrastructure or system or service in the field of construction engineering. (Additional school competition).

TEACHING METHODOLOGY

The course consists of 3 hours a week of classes during the second semester, divided into classes of theory, practice and real cases. Support material is used in the format of a detailed teaching plan through the ATENEA virtual campus: contents, programming of assessment and guided learning activities and bibliography. In general, teachers will teach their lectures in catalan. Professor Corrado Altomare, in english, professors Xavier Pascual, Joan Pau Sierra and Xavi Gironella, in catalan.

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.

LEARNING OBJECTIVES OF THE SUBJECT

Development at the level of specialisation of the basic concepts acquired in ports and coastal engineering. Knowledge of design tools (probabilistic, physical modelling, numerical modelling). Hydrodynamic and structural parameters. Breakwaters in slope. Vertical breakwaters. Interior Port works. Port activity. Dredging and fillings.

- 1 Capacity for the design of port structures.
- 2 Ability to understand port activity and exploitation.

Development at the level of specialization of the basic concepts acquired from engineering of ports and coasts in the preceding matter on water technologies. Introduction. Hydrodynamic and structural parameters. Maritime works of slope breakwaters. Maritime works of vertical breakwaters. Physical modelling in maritime engineering. Probabilistic design. Plant design. Interior port works. Case studies.

Ability to design port structures.
Ability to understand port activity and operation

STUDY LOAD

Type	Hours	Percentage
Self study	63,0	56.00
Hours large group	22,5	20.00
Hours small group	4,5	4.00
Guided activities	4,5	4.00
Hours medium group	18,0	16.00

Total learning time: 112.5 h

CONTENTS

Introduction

Description:

Approach of the subject and development of the course. Generalities. Review of basic concepts. Classification and typology of port works (dikes, docks, dredging, ...).

Full-or-part-time: 4h 48m

Theory classes: 2h

Self study : 2h 48m

Hydrodynamic and structural parameters

Description:

Definition of the main parameters involved in the design of external maritime structures. Waves-Structure Interaction. Main formulations of run-up, run-down, overtopping, reflection and transmission.

Full-or-part-time: 4h 48m

Theory classes: 2h

Self study : 2h 48m

Rubble mound breakwaters

Description:

Sections. Types of breakwaters. Stability of the main armour, the berm and the crown wall. Toe protections. Head breakwater design. Construction process.

Practices

Full-or-part-time: 20h 24m

Theory classes: 4h

Practical classes: 4h 30m

Self study : 11h 54m

Caisson breakwaters

Description:

Sections. Methodologies to analyze forces. Stability calculation. Sliding, classic overturning, foundation capacity, sinking , plastic overturning. Construction process.

Practices

Full-or-part-time: 20h 24m

Theory classes: 4h

Practical classes: 4h 30m

Self study : 11h 54m

Physical modeling in maritime engineering

Description:

Concepts of similarity. Scale and laboratory effects. Instrumentation, applications and examples.

Practices

Full-or-part-time: 7h 11m

Theory classes: 2h

Practical classes: 1h

Self study : 4h 11m

Probabilistic design

Description:

Introduction to probabilistic design. Concepts on probabilistic methods of levels III, II and I. Monte Carlo simulation.

Practices

Full-or-part-time: 14h 23m

Theory classes: 2h

Practical classes: 4h

Self study : 8h 23m

Plant layout design

Description:

Dimensions, orientation and draft of the harbour mouth.

Full-or-part-time: 4h 48m

Theory classes: 2h

Self study : 2h 48m

Inner harbour structures

Description:

Actions to consider in the design of quays, jetties. Flooring quays.
Practices

Full-or-part-time: 14h 23m

Theory classes: 3h

Practical classes: 3h

Self study : 8h 23m

Case studies

Description:

Maritime engineering projects. Real cases.

Full-or-part-time: 7h 11m

Theory classes: 3h

Self study : 4h 11m

Evaluations

Full-or-part-time: 9h 36m

Laboratory classes: 4h

Self study : 5h 36m

GRADING SYSTEM

The rating of the course is obtained from a system of continuous assessment which includes conducting a series of tests and a set of practices.

Continuous assessment includes the completion of two exams during the semester to help with a weight of 60% in the final and the completion of a set of practices of different issues that contribute to the remaining 40%.

Criteria for re-evaluation qualification and eligibility: students that failed the ordinary evaluation and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment tests due to certifiable force majeure will be ensured extraordinary evaluation periods.

These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

BIBLIOGRAPHY

Basic:

- Morang, A. [et al.]. Coastal engineering manual [on line]. Washington: US Army Corps of Engineers, 2003 [Consultation: 02/02/2021]. Available on: <http://www.a-jacks.com/Coastal/GeneralInfo/CEM/CEM.aspx>.
- CIRIA, CUR. Manual on the use of rock in coastal and shoreline engineering. London ; Gouda: CIRIA, CUR, 1991. ISBN 0860173267.

Complementary:

- Ministerio de Obras Públicas y Transportes (MOPT). [Dirección General de Puertos]. ROM 0.3-91: Oleaje : Anejo I. Clima Marítimo en el litoral español. Madrid: MOPT, 1992. ISBN 847433814X.

- ROM 0.4-95: acciones climáticas II: viento [on line]. Madrid: MOPTMA : Puertos del Estado, 1995 [Consultation: 17/11/2020]. Available on: <http://www.puertos.es/es-es/BibliotecaV2/ROM%200.4-95.pdf>. ISBN 8488975090.
- Ministerio de Fomento - Puertos del Estado. ROM 1.0-09 : recomendaciones del diseño y ejecución de las obras de abrigo (Parte 1ª. Bases y factores para el proyecto. Agentes climáticos [on line]. Madrid: Puertos del Estado, 2009 [Consultation: 16/09/2016]. Available on: www.puertos.es/es-es/BibliotecaV2/ROM%201.0-09.pdf. ISBN 9788488975737.
- 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.
- Ministerio de Fomento-Puertos del Estado. ROM 4.1-94 : Proyecto y construcción de pavimentos portuarios [on line]. Madrid: MOPTMA : Puertos del Estado, 1994 [Consultation: 16/09/2016]. Available on: www.puertos.es/es-es/BibliotecaV2/ROM%204.1-94.pdf. ISBN 8488975031.
- Ministerio de Fomento-Puertos del Estado. ROM 0.5-94 : Recomendaciones geotécnicas para el proyecto de obras marítimas y portuarias [on line]. Madrid: MOPTMA : Puertos del Estado, 1994 [Consultation: 30/05/2012]. Available on: http://www.puertos.es/programa_rom/rom_05_94.html. ISBN 848897504X.
- Negro, V.; Varela, O. Diseño de diques rompeolas: conceptos generales, comportamiento estructural y funcional, proceso constructivo. 2a ed. ampl. y rev. 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.
- Ministerio de Obras Públicas y Urbanismo (MOPU). Dirección General de Puertos y Costas. ROM 0.2-90: acciones en el proyecto de obras marítimas y portuarias [on line]. Madrid: Ministerio de Obras Públicas y Urbanismo, 1990 [Consultation: 17/11/2020]. Available on: <http://www.puertos.es/es-es/BibliotecaV2/ROM%200.2-90.pdf>. ISBN 8474337011.