Design of Coastal and Harbour Structures: Deterministic and Probabilistic (250614)

General information

School:	ETSECCPB
Departments:	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits:	5.0 ECTS
Programs:	MÀSTER UNIVERSITARI ERASMUS MUNDUS EN ENGINYERIA I GESTIÓ COSTANERA I MARÍTIMA, pla 2022 - (codi pla 1525)
Course:	2023/2024

Main teaching language at each group

- Group 10Q2 English (Q2)

Faculty

Responsible faculty: Francesc Xavier Gironella I Cobos

Teachers: Corrado Altomare, Francesc Xavier Gironella I Cobos

Generic objectives

This course provides a comprehensive description and goals of definitions and procedures needed in the planning and design process for coastal protection and harbour structures, providing enough engineering training to accomplish the an acceptable project.

Skills

Specific skills

MetOcean main physical processes and their effects on the port and waterways infrastructure.

Numerical and laboratory modelling techniques.

Geotechnical aspects related to foundations for?port and waterways structures.

Environmental issues before and after construction of e.g. a port.

How climate change uncertainties can be managed to reduce risks when designing and operating resilient infrastructure.

Perform time and frequency domain analysis of MetOcean data to provide operational and design values.

Design navigational infrastructure with resilience and adaptation to climate change in mind.

Perform risk management (concepts and techniques).

Know how to make the stakeholders and community to work together to make a project acceptable and wanted.

Coastal hydrodynamics and processes.

Short-term and long-term wave climate.

Physical models for coastal processes, structures and their interactions.

Design coastal interventions.

Understand and predict the impacts of coastal interventions.

Offer alternatives to hard coastal engineering.

Analyse and interpret collected field data in order to understand the physical drivers at short, mid and long-time or climatic scales.

Apply state-of-the-art wave, flow and morphological models.

Compute the risk, vulnerability and hazard analysis including the decadal (climatic) scale.

Generic skills of subject

Design methods for ports, waterways and other coastal facilities.

Design and operation of inland waterways hydraulic structures and riverbanks.

Develop knowledge and understanding of the coastal environment at an advanced level, applying classic (hard and soft) coastal engineering complemented with building with nature concepts, with ability to analyse, evaluate, assess and synthesis of data and information from different sources with contemporary techniques and technologies.

Handle engineering problems dealing with waves, currents, their interactions, their effects on the coastline and man-made interventions, spanning from short (storms) to decadal scales, to incorporate the climate change dimension.

Propose creative and innovative solutions by themselves or as a work group for current and future problems by enhancing their own interpersonal understanding, work as a team and oral and written communication skills.

ECTS credits: total hours of student work

		Dedication	
		Hours	**Percent**
Supervised Learning	**Theory**	23.00	51.1%
	Assignments	15.00	33.3%
	Laboratory	7.00	15.6%
	Supervised activities	0.00	0.0%

Self-Learning	80.00	

Contents

Introduction

Dedication

3.0h. Theory

Description

Deterministic and probabilistic Concepts and Parameters

Wave propagation

Dedication

3.0h. Laboratory

Description

Goda's Methodology

SWASH

Deterministic design

Dedication

7.0h. Theory + 7.0h. Assignments

Description

Useful life, risk and return period concepts

Useful life, risk, and return period

Rubble Mound Structure. Armour layer and Filter.

Rubble Mound Structure. Armour layer and Filter.

Rubble Mound Structure. Crown-wall design.

Rubble Mound Structure. Crown-wall design.

Rubble Mound Structure. Berm and toe design.

Rubble Mound Structure. Berm and toe design.

Caisson Breakwater.Hydrodinamic Forces. Hiroi, SainFlou, Goda, Takahashi

Caisson Breakwater.Hydrodinamic Forces. Hiroi, SainFlou, Goda, Takahashi

Caisson Breakwater. Bearing capacity

Caisson Breakwater. Bearing capacity

Caisson Breakwater. Plastic Overturning

Caisson Breakwater. Plastic Overturning

Wave overtopping

Dedication

8.0h. Theory + 4.0h. Assignments + 2.0h. Laboratory

Description

Basics, methods and design

Basics, methods and design

Aplication Case

Probabilistic design

Dedication

5.0h. Theory + 4.0h. Assignments + 2.0h. Laboratory

Description

Concepts, Levels, Tree diagrams.

Monte Carlo aplication

Rubble Mound and Vertical Structures

Rubble Mound and Vertical Structures

Activities

Grading rules (*)

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

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

Test rules

Teaching methodology

The course consists of 2 hours per week of classroom activity (large size group) and 0.8 hours weekly with half the students (medium size group).

The 2 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 0.8 hours in the medium size groups is devoted 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.

The rest of weekly hours devoted to laboratory practice.

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.

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.

Basic bibliography

- Puertos del Estado. **ROM 0.0: procedimiento general y bases de cálculo en el proyecto de obras marítimas y portuarias: parte I**. Puertos del Estado. Salamanca. 2001. ISBN 8488975309.
- Morang, A. [et al.]. **Coastal engineering manual**. U.S. Army Corps of Engineers. Washington. 2003.