Course guide
250601 - SOSCOS:DR - Coastal Sustainability: Defence and Realignment

Last modified: 22/05/2025

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

Degree: MASTER'S DEGREE IN WATER ENGINEERING (Syllabus 2025). (Optional subject).

Academic year: 2025 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: VICENTE GRACIA GARCIA

Others: VICENTE GRACIA GARCIA
Sánchez Artús, Xavier

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
17488. MetOcean main physical processes and their effects on the port and waterways infrastructure.
17492. Port planning and operation.
17493. Environmental issues before and after construction of e.g. a port.
17494. Entrepreneurship and corporate social responsibility.
17495. How climate change uncertainties can be managed to reduce risks when designing and operating resilient infrastructure.
17498. Perform risk management (concepts and techniques).
17499. Know how to make the stakeholders and community to work together to make a project acceptable and wanted.
17500. Coastal hydrodynamics and processes.
17501. Short-term and long-term wave climate.
17502. Sediment transport and morphology.
17504. Coastal and oceanographic numerical modelling.
17506. Coastal vulnerability within a sustainable framework.
17508. Developing beach management strategies for real-world coastal systems.
17509. The basis behind climate change and its effect on the coast.
17511. Design coastal interventions.
17512. Understand and predict the impacts of coastal interventions.
17513. Offer alternatives to hard coastal engineering.
17514. Analyse and interpret collected field data in order to understand the physical drivers at short, mid and long-time or climatic scales.
17515. Apply state-of-the-art wave, flow and morphological models.
17516. Compute the risk, vulnerability and hazard analysis including the decadal (climatic) scale.

Generical:
17480. Design methods for ports, waterways and other coastal facilities.
17481. Dredging and disposal solutions for contaminated sediments.
17482. Design and operation of inland waterways hydraulic structures and riverbanks.
17483. Social responsibility of business and entrepreneurship.
17484. 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.
17485. 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.
17486. 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.

TEACHING METHODOLOGY

The course consists of 3 hours per week of classroom activity consisting in formal lectures, classroom exercises with computers and round tables to discuss the results of the proposed home work.

LEARNING OBJECTIVES OF THE SUBJECT

Students will acquire the necessary knowledge for the design of coastal protection works and strategies and the evaluation of their impacts in the adjacent coasts. This includes an overview of mechanisms and processes that generate coastal conflicts. It also covers the functional design solutions to these problems, both as a function of its origin and nature of the area where they operate.

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STUDY LOAD

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

Total learning time: 125 h

CONTENTS

Introduction

Description:
Description of the subject, introduction of concepts related to coastal management, and evaluation method
Define the time and spatial scales responsible for coastal changes in order to subsequently define the most appropriate management works

Specific objectives:
Show students the content, organization of the course and evaluation method.
Identify the time and space scales on sandy beaches from real beach profile data obtained on the Catalan coast.

Full-or-part-time: 12h
Theory classes: 1h
Practical classes: 4h
Self study : 7h

Driving terms. Waves and medium level

Description:
The waves and mean water level oscillations will be characterized based on real data recorded at different locations along the Spanish coast. It is intended to provide the necessary tools to be able to characterize the driving agents that govern the changes of the coast as a preliminary step to be able to define management policies

Specific objectives:
To determine at any location the conditions of swell and mean sea level.

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

Sediment transport

Description:
Show the different methods of calculating cross-shore and longshore sediment transport in order to evaluate the impacts of the works that can be proposed to manage the coast

Specific objectives:
Be able to evaluate sediment transport in a castal stretch.
The use of simple formulas to determine the longshore sediment transport
The use of complex numerical model to determine the evolution of a beach.

Full-or-part-time: 14h 23m
Theory classes: 6h
Self study : 8h 23m

Measures to fix the coast

Description:
Show the parts of a revetment, the examples on the Mediterranean coast, evaluate its impacts on the neighboring beaches.

Specific objectives:
Evaluate the functional design of a revetment

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

Measures to modulate the beach response

Description:
Description of this type of work and the variables involved in its functional design. Determine the impacts they cause on the coast. Show real examples of the Catalan coast.

Specific objectives:
Design detached breakwaters and grynes. Assess their impacts on the coast

Full-or-part-time: 21h 36m
Theory classes: 9h
Self study : 12h 36m

Measures with sediments

Description:
Description of this type of work and the variables involved in its functional design. Determine the impacts they cause on the coast. Show real examples along the Catalan coast mainly.

Specific objectives:
Carry out the functional design of this type of works. Assess their impacts on the coast

Full-or-part-time: 26h 24m
Practical classes: 11h
Self study : 15h 24m

New approaches to cope climate change

Description:
Apply the concept of solutions based on nature on the coast. Different examples of this type of solution will be shown, such as rapid action measures or the combination of coastal space and dune systems

Specific objectives:
Apply the concept of nature-based solutions to the coast.

Full-or-part-time: 14h 23m
Theory classes: 6h
Self study : 8h 23m

GRADING SYSTEM

The continuous assessment consists of doing different activities, both individual and group, of an additive and formative nature, carried out during the course (inside and outside the classroom). The grade of the course results from the average of the activities of this type. A non delivered activity has a grade of zero.

In case of not obtaining a grade higher than five, the student may present himself for an extraordinary evaluation consisting of an exam. The maximum mark in this case will be five..

BIBLIOGRAPHY

Basic:
- Morang, A. [et al.]. Coastal engineering manual. Washington: U.S. Army Corps of Engineers, 2003.
- Herbich, J.B. (ed.). Handbook of coastal engineering. New York: McGraw Hill, 2000. ISBN 0071344020.
- Kay, R.; Alder, J. Coastal planning and management. 2nd ed. Oxon: Taylor & Francis, 2005. ISBN 0415317738.