Course guide
2500236 - GEA0236 - River and Coastal Space Management

Last modified: 19/06/2024

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

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

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: VICENTE GRACIA GARCIA

Others: CARLES FERRER BOIX, VICENTE GRACIA GARCIA, JUAN PEDRO MARTÍN VIDE, ARNAU PRATS PUNTÍ
Mestres Ridge, Marc

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14458. Apply the methodologies of studies and evaluations of environmental impact and, in general, of environmental technologies, sustainability and waste treatment and of the management of international standards of environmental quality. Life cycle analysis, carbon footprint and water footprint and assess natural hazards (river, coastal floods, droughts, fires, soil erosion and landslides).
14465. Identify renewable energy generation techniques and energy transition concept.

Generical:
14440. Identify, formulate and solve problems related to environmental engineering.
14441. Apply the functions of consulting, analysis, design, calculation, project, construction, maintenance, conservation and exploitation of any action in the territory in the field of environmental engineering.
14442. To use in any action in the territory proven methods and accredited technologies, in order to achieve the greatest efficiency respect for the environment and the protection of the safety and health of workers and users.
14443. Apply the necessary legislation during the professional practice of environmental engineering.
14444. Apply business management techniques and labor legislation.

TEACHING METHODOLOGY

The course consists of 4 hours per week of theoretical-practical face-to-face classes in the classroom. In these classes, the instructors present the basic concepts and materials of the subject, provide examples, and conduct exercises.
Supporting material in the form of a detailed teaching plan is used via the virtual campus ATENEA: contents, scheduling of assessment activities and guided learning, and bibliography.

Although most sessions will be conducted in the language indicated in the guide, sessions that feature guest experts may occasionally be conducted in another language.

LEARNING OBJECTIVES OF THE SUBJECT

This course will provide general knowledge of river morphology and the formation of the channels. The relevant processes for the management of beaches and the marine environment will also be shown, as well as management strategies at different time scales with a comprehensive perspective. Thus, a description will be made of the rivers, their composition and morphology from high mountains to deltaic bodies. Emphasis will be placed on regime theory, sediment stability, Shields theory, flow resistance, etc. On the other hand, the coastal landscape will be shown showing the typology of coasts, urban planning of the coast in Spain, climate change and the coast. The main drivers of marine dynamics will be shown: wind, waves, tides and marine currents, as well as the dispersion of pollutants in coastal areas and estuaries and coastal sedimentary dynamics.

1. Understand the various aspects that make up River Dynamics in its ecological aspects, application of numerical methods.
2. Analyze the latest trends in environmental recovery strategies for degraded river areas established in the Directive Water framework in force in Europe, as well as coastal and estuary spaces.

Management of the Fluvial and Coastal Area. Overview of the various aspects that make up Fluvial and Coastal Dynamics. Vision that includes aspects ecological, numerical, descriptive and theoretical methods. The subject responds to the criteria for the recovery of degraded river areas established by the Water Framework Directive in Europe, as well as coastal and estuarine areas.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	15,0	10.00
Hours large group	30,0	20.00
Hours medium group	15,0	10.00

Total learning time: 150 h

CONTENTS

Introduction

Description:
Description of the syllabus, evaluation system. Fluvial and coastal conflicts. The fluvial and coastal landscape: sandy shores and rocky shores. The administrative management system in Spain. Hazards and Risks: erosion and flooding. Holistic approaches: research and management projects in Europe DANUBIUS, DOORS

Specific objectives:
Show the objectives of the subject Show the current fluvial and coastal landscape with emphasis on the Mediterranean region

Full-or-part-time: 4h 48m
Theory classes: 2h
Self study : 2h 48m

The river environment

Description:
Differences between rivers and canals. Introduction to river morphology
Morphologies in plan and cross section. Morphological similarity
Dominant flow, hydrological and hydraulic concept. Longitudinal profile: incision (erosion) and growth. Scale analogy
River flow curves, uplift, secondary current. Laws of Fargue. Edge erosion. Dynamics of mouths
Alluvial aggregates. Classification of solid transport according to origin and mode. measures Evaluation of total transport and fund transport formulas

Full-or-part-time: 24h
Theory classes: 4h
Practical classes: 6h
Self study : 14h

The river flooding

Description:
Water framework directive and flood directive. Water discharges, objectives and effects. Criteria for environmentally acceptable discharges
Zoning regarding floods. Motes: economical sizing, effects, lamination and dening. Flood risk management.
Level-flow relationships in rivers. Resistance to the flow of vegetation. Hec-Ras calculation methods and options. Way of intense drainage. Interpretation of mathematical models

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

River erosion

Description:
Sediment production in a basin. Sedimentation in reservoirs: morphologies and sediment passage systems
Erosion calculations, general and by contraction

Full-or-part-time: 9h 36m
Theory classes: 2h
Practical classes: 2h
Self study : 5h 36m

River management

Description:
Construction materials in river engineering. Eco hydraulics River bridges: elevations and excavations. Construction materials in river engineering. Eco hydraulics River bridges: elevations and excavations.
Ephemeral rivers and torrential rivers. Dynamics of hyperconcentrated flows. Rambles Edge defense works.

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

Coastal boundaries and time scales

Description:
Based on nearby examples from the Catalan coast, the sandy coast is characterized from a physical point of view and the concepts of coastal cell and sediment balance are introduced as basic tools for impact assessment of any action on the coast
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Specific objectives:
Definition of the concept of littoral cell Calculation of the sediment budget of a littotral cell
Characterize the movements of the coast in time and space

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

Hydrodynamics and coastal flood hazard

Description:
Wave and mean sea leavel description as the main forces acting n the coast
Description of the main processes that modify the characteristics of the wave when it approaches the coast. Description of the main processes driving coastal flooding,

Specific objectives:
Understanding a swell climate. Construct a time series of tides.
Define the characteristics of the waves at any point on the coast.
Assessment of the wave runup and overtopping

Full-or-part-time: 9h 36m
Theory classes: 2h
Practical classes: 2h
Self study : 5h 36m

Coastal sediment dynamics and the erosion hazard

Description:
Description of the methods to determine the longshore sedoimemt tranpsort, one of the main processes responsible erosion.
Description of the methods to determine the cross-shore sedoimemt tranpsort, one of the main processes responsible erosion.

Specific objectives:
Use of the CERC and Kamphuis formulas to calculate the longshore sediment transport
Understand the changes induced by the cross-shore sediment transport at diferent time scales.

Full-or-part-time: 9h 36m
Theory classes: 2h
Practical classes: 2h
Self study : 5h 36m

Strategies for managing erosion and flooding

Description:
With examples from the Catalan coast, breakwater linings, their impacts on the coast and aspects related to design and construction are shown,
The impacts of groines and detached breakwaters are shown with examples of the Catalan coast,
Descrition of beach nourishment, the necessary parameters for its design and construction aspects. Examples of such type of work in the Catalan coast are shown.

Specific objectives:
Knowing how to recognize the main impacts of this type of work on neighboring beaches.
To recognize the main impacts of these works and the hydrodynamic parameters necessary for their design
Identify the necessary parameters for the design and construction of this type of work, its impacts and maintenance.

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

New tools for coastal management

Description:
To describe the main achievements obtained by IPCC and the scenarios considered
Introduce the concept of adaptation pathways and describe the existing nature based solutions to increase the resilience of the coast. Examples done along the Catalan coast are given.

Specific objectives:
Know how to determine the sea level rise for the different climate change scenarios at any point on the coast.
Design and apply an adaptation pathway to a coastal archetype.

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

Coastal and marine pollution

Description:
Types of solid (plastic) and liquid (oil) waste. Evolution and monitoring. Waste removal.
Introduction to the design of outfalls.

Specific objectives:
Identify the most relevant aspects in the design of outfalls

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

Evaluation

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

GRADING SYSTEM

The regular assessment of the course consists of: two theoretical-practical exams that each contribute 45% to the final grade and the submission of two individual practical assignments, each contributing 5% to the final grade. All activities are mandatory. If not completed, they will be assigned a value of zero.

Students who fail the regular assessment, but have submitted the practical assignments and report, and have taken the theoretical exam, have the option to take a re-assessment test. The maximum grade for the re-assessment exam is five.

The assessment tests consist of a part with questions on concepts related to the learning objectives of the course in terms of knowledge or understanding, and a set of application exercises.

BIBLIOGRAPHY

Basic:

- Martín Vide, Juan Pedro. Apuntes de Dinàmica Fluvial. Fundación Nueva Culutra del Agua,
- Martín Vide, J.P. Ingeniería de ríos. 2a ed. Barcelona: Edicions UPC, 2006. ISBN 9788483019009.
- Kay, R.; Alder, J. Coastal planning and management. 2nd ed. Oxon: Taylor & Francis, 2005. ISBN 0415317738.
- Herbich, J.B. (ed.). Handbook of coastal engineering. New York: McGraw Hill, 2000. ISBN 0071344020.
- Dean, R.G; Dalrymple, R.A. Coastal processes: with engineering applications. Cambridge: Cambridge University Press, 2002. ISBN 0521495350.