Course guide
250408 - ENGAIGUA - Water Engineering

Last modified: 22/05/2024

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). (Compulsory subject).

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

LECTURER

Coordinating lecturer: MANUEL ESPINO INFANTES

Others: MANUEL ESPINO INFANTES, CARLES FERRER BOIX, IVET FERRER MARTI

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
8205. The ability to plan and dimension water and wastewater processing and treatment systems.
8230. The ability to plan, dimension, construct and maintain hydraulic works.
8231. The ability to plan, evaluate and regulate the use of surface water and groundwater resources.
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.
8562. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

8563. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

The course is based on four hours per week. Th structure of the sessions (2 hours per class) is as follows: 1.- Theoretical concepts (mostly taking about 1.5 hours) and, 2.- numerical exercises (mostly taking about 0.5 hours). This structure will be repeated along the course as long as the addressed concepts allow to combine theoretical concepts and numerical exercises.
Material used for the course will be placed in the ATENEA intranet: contents, evaluation exercises and directed learning as well as literatura.
As for the language in which the subject is taught, the first part of it, corresponding to Coastal Water Engineering, will be taught in Spanish and the rest of it 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

Students will learn to apply their knowledge of hydraulic, maritime and environmental engineering.

Upon completion of the course, students will be able to:

Analyse and establish the requirements of hydraulic infrastructure and understand its environmental impact;
Plan, dimension, construct and maintain hydraulic infrastructure;
Plan, evaluate and regulate the use of surface and underground water resources;
Analyse and establish the requirements of environmental engineering processes, including regeneration of water for reuse in environmental protection applications;
Plan and dimension water and wastewater processing and treatment systems;
Analyse maritime engineering problems;
Understand dynamic phenomena of the coastal ocean and atmosphere and solve problems encountered in port and coastal areas, including the environmental impact of coastal interventions;
Analyse and plan maritime works.

Planning, dimensioning, construction and maintenance of hydraulic infrastructure; Planning, evaluation and regulation of the use of surface and underground water resources; Planning and dimensioning of water and wastewater processing and treatment systems; Dynamic phenomena of the coastal ocean and atmosphere: Problems encountered in port and coastal areas, including the environmental impact of coastal interventions; Analysis and planning of maritime works.

STUDY LOAD

Type	Hours	Percentage
Hours small group	13,0	8.67
Self study	96,0	64.00
Hours medium group	13,0	8.67
Hours large group	28,0	18.67

Total learning time: 150 h

CONTENTS

coastal and estuarine hidrodynamics

Description:
Description of the physical processes of coastal ocean dynamics relevant from the point of view of civil engineering.
Mathematical description of relevant ocean currents from the point of view of civil engineering.
Mathematical description of tides and tidal currents relevant from the point of view of civil engineering
problems

Specific objectives:
Familiarize the student with the description of the physical processes of coastal ocean dynamics relevant from the point of view of civil engineering.
Familiarize the student with the mathematical description of relevant ocean currents from the point of view of civil engineering
Familiarize the student with the mathematical description of tides and tidal currents relevant from the point of view of civil engineering
practice the numerical basis of hydrodynamics

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

The water quality in coastal

Description:
Introduction to marine engineering
Concepts of marine pollution
Concepts of dispersion and difussion in marine environment
Describe the monitoring and management tools applied to marine engineering in a coastal town
Describe the submarine emissaries

Specific objectives:
To provide students with the basics to follow the course
To provide students with the concepts of pollution at sea
To provide students with the knowledge to understand the dispersion and difussion processes
To provide students with the knowledge to manage and control processes
To provide the knowledge to measure alunme an outfall

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

Case Study I - quality in coastal

Description:
Case study on water quality in coastal

Specific objectives:
Put into practice the knowledge acquired and integrated

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

Case Study II - underwater outfall

Description:
Case Study II - underwater outfall

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

evaluation

Full-or-part-time: 12h
Laboratory classes: 5h
Self study : 7h

Review of concepts of hydraulics in free plate

Description:
Review of concepts of hydraulics in free plate

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

Deduction of the Saint Venant equations, equations of the movement of water in a free sheet, in a variable regime and in one dimension. Application examples.

Description:
Deduction of the Saint Venant equations, equations of the movement of water in a free sheet, in a variable regime and in one dimension. Application examples.

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

Study of boundary conditions in a variable regime. Method of characteristics.

Description:
Study of boundary conditions in a variable regime. Method of characteristics.

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

Spread of avenues to rivers. Kinematic wave, diffusive wave and full wave methods.

Description:
Spread of avenues to rivers. Kinematic wave, diffusive wave and full wave methods.

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

Zoning criteria. Water Framework Directive and Floods Directive. Flood management.

Description:

Zoning criteria. Water Framework Directive and Floods Directive. Flood management.

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

Review of fluvial dynamics concepts.

Description:
Review of fluvial dynamics concepts.

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

Deduction of the sediment mass conservation equation or Exner equation.

Description:
Deduction of the sediment mass conservation equation or Exner equation.

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

Introduction to morphodynamic models. Analytical models. Boundary conditions.

Description:
Introduction to morphodynamic models. Analytical models. Boundary conditions.

Full-or-part-time: 4h 48m
Theory classes: 1h
Laboratory classes: 1h
Self study : 2h 48m

Hydraulics of Bridges.

Description:
Hydraulics of Bridges.

Full-or-part-time: 2h 24m
Theory classes: 1h
Self study : 1h 24m

Wetlands for water treatment

Description:
Wetlands for water treatment

Full-or-part-time: 2h 24m
Theory classes: 1h
Self study : 1h 24m

Wetlands for sludge treatment

Description:

Wetlands for sludge treatment

Full-or-part-time: 4h 48m
Theory classes: 1h
Practical classes: 1h
Self study : 2h 48m

Microalgae systems

Description:
Microalgae systems

Full-or-part-time: 2h 24m
Theory classes: 1h
Self study : 1h 24m

Water regeneration and reuse

Description:
Water regeneration and reuse

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

Technical visit

Description:
Technical visit

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

Presentation of work and Exam

Description:
Presentation of work and Exam

Full-or-part-time: 12h
Theory classes: 2h
Practical classes: 3h
Self study : 7h

GRADING SYSTEM

The evaluation of the course is carried out by means of the continuous evaluation method.
Continous evaluation consists of carrying out different activities, either individually or in group, of additive caracter, carried out along the course. More precisely, activities that will be subjected to evaluation will be: a) one examen for each part of the cours (three in total, one for the part of environmental engineering, one for the maritime engineering and one for the hydraulic engineering) and b) the evaluation of different case studies

EXAMINATION RULES.

Failure to perform acontinuous assessment activity in the scheduled period will result in a mark of zero in that activity.

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Complementary:
- Metcalf & Eddy. Wastewater engineering: treatment and reuse. 4th ed. Boston, EEUU: Mc Graw-Hill Higher Education, 2003. ISBN 0070418780.
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