

Water Engineering (250408)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	6.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) PARS: ENGINYER/A DE CAMINS, CANALS I PORTS (pla 2022)
Course	2024/25

Main teaching language at each group

- Group 10CA1 Catalan (Q1)
- Group 10ES2 Spanish (Q2)

Faculty

Responsible Faculty: Manuel Espino Infantes

Faculty: Manuel Espino Infantes, Carles Ferrer Boix, Ivet Ferrer Marti

Objectives of Education

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.

Competencies

Especific

The ability to plan and dimension water and wastewater processing and treatment systems.

The ability to plan, dimension, construct and maintain hydraulic works.

The ability to plan, evaluate and regulate the use of surface water and groundwater resources.

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

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.

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.

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.

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	27.96 h	51.78 %
	Medium group	13.02 h	24.11 %
	Laboratory classes	13.02 h	24.11 %
	Guided Activities	0.0 h	0.00 %
Self Study		96.0 h	

Contents

coastal and estuarine hidroynamics

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

The water quality in coastal

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

Case Study I - quality in coastal

Case study on water quality in coastal

Specific Objectives

Put into practice the knowledge acquired and integrated

Case Study II - underwater outfall

Case Study II - underwater outfall

evaluation

Review of concepts of hydraulics in free plate

Review of concepts of hydraulics in free plate

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.

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.

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

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

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

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

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

Review of fluvial dynamics concepts.

Review of fluvial dynamics concepts.

Deduction of the sediment mass conservation equation or Exner equation.

Deduction of the sediment mass conservation equation or Exner equation.

Introduction to morphodynamic models. Analytical models. Boundary conditions.

Introduction to morphodynamic models. Analytical models. Boundary conditions.

Hydraulics of Bridges.

Hydraulics of Bridges.

Wetlands for water treatment

Wetlands for water treatment

Wetlands for sludge treatment

Wetlands for sludge treatment

Microalgae systems

Microalgae systems

Water regeneration and reuse

Water regeneration and reuse

Technical visit

Technical visit

Presentation of work and Exam

Presentation of work and Exam

Teaching Methodology

The course is based on four hours per week. The 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.

Grading Rules

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

The evaluation of the course is carried out by means of the continuous evaluation method.

Continuous evaluation consists of carrying out different activities, either individually or in group, of additive character, carried out along the course. More precisely, activities that will be subjected to evaluation will be: a) one examen for each part of the course (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

Test Rules

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

Office Hours

Friday from 15h00 to 17h00

Bibliography

Basic

- Mihelcic, J.R. [Fundamentos de ingeniería ambiental](#). México, D.F.: Limusa, 2001. ISBN 9681859162.
- Kiely, G. [Ingeniería ambiental: fundamentos, entornos, tecnologías y sistemas de gestión](#). Madrid: McGraw-Hill, 1999. ISBN 8448120396.
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- Pugh, D. [Sea-level science: understanding tides, surges, tsunamis and mean sea-level changes](#). 2nd ed. Cambridge: Cambridge University Press, 2014. ISBN 9781107028197.
- Lewis, R. [Dispersion in estuaries and coastal waters](#). Chochester [etc.]: John Wiley and Sons, 1997. ISBN 0471961620.
- Wood, I.R.; Bell, R.G.; Wilkinson, D.L. [Ocean disposal of wastewater](#). Singapore: World Scientific, 1993. ISBN 9810210442.
- Henderson, F.M. [Open channel flow](#). New York: Macmillan Publishing CO., Inc., 1966. ISBN 9780023535109.
- Cardoso, A.H. [Hidráulica: fundamentos e aplicações. Volume 1](#). Lisboa: IST Press, 2021. ISBN 9789898481818.
- García, Marcelo H. Sedimentation Engineering Processes, Measurements, Modeling, and Practice. New York: American Society of Civil Engineers, 2008. ISBN 9780784471289.
- Chaudhry, M.F. Open-channel flow. 3rd ed. Cham, Switzerland: Springer, 2022. ISBN 9783030964474.

Complementary

- Metcalf & Eddy. Wastewater engineering: treatment and reuse. 4th ed. Boston, EEUU: Mc Graw-Hill Higher Education, 2003. ISBN 0070418780.
- Tolmazin, D. [Elements of dynamic oceanography](#). London: Chapman & Hall, 1985. ISBN 0412532301.
- Knauss, J.A.; Garfield, N. [Introduction to physical oceanography](#). 3rd ed. Long Grove, Illinois: Waveland Press, Inc., 2017. ISBN 9781478632504.
- Martin, J.L.; McCutcheon, S.C. [Hydrodynamics and transport for water quality modeling](#). Boca Raton (Calif.): Lewis Publishers, 1999. ISBN 0873716124.
- Kennish, M.J. [Practical handbook of estuarine and marine pollution](#). Boca Raton: CRC Press, 1997. ISBN 0849384249.