

Hydraulic Infrastructure (250404)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	4.5 ECTS
Programs	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 10CA2 Catalan (Q2)

Faculty

Responsible Faculty: Francesc Xavier Gironella I Cobos

Faculty: Carles Ferrer Boix, Francesc Xavier Gironella I Cobos, Vicente Gracia Garcia, Juan Pedro Martín Vide, Francisco Nuñez González

Objectives of Education

Students will learn to design and dimension hydraulic works and installations and hydroelectric installations and to plan and manage surface and underground hydraulic resources. Basic knowledge of maritime engineering as well as capacity for the construction and conservation of maritime works.

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

Analyse fluvial sediment transport, flooding and different concepts of restoration;

Conduct a hydraulic power analysis of a hydroelectric installation;

Plan hydraulic works. Realize a project of a hydraulic work. Realize a study of surge from royal measures proceeding from a buoy. To realize the project of a port including basic elements. To do a study of dynamics of coasts, including the interaction between port - coast.

Open channel flow and pressurised flow; Aspects of river engineering, including morphology, sediment transport and flooding; Environmental aspects of floodplains and river restoration; Hydroelectric installations; Dams, canals, pressurised pipes and pump systems; Hydraulic studies of water treatment infrastructure; Water hammer and mass oscillation. Wave motion. Sediment transport and dispersion. Crown wall. Overtopping. Introduction to probabilistic design.

Competencies

Specific

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

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	20.97 h	51.76 %
	Medium group	9.77 h	24.12 %
	Laboratory classes	9.77 h	24.12 %
	Guided Activities	0.0 h	0.00 %
Self Study		72.0 h	

Contents

HYDRAULIC ENGINEERING

Comparison between rivers and canals. River morphology: plan and section. Analogy of the dominant flow and balance.

Exercises

Types of locks. Requests. Stability and strength. Technical aspects of earth and concrete dams.

Locks. Exercises

Type uses. Descripció element of exploitation.

Hydroelectric exploitation. Exercises.

Specific Objectives

Establish the differences with the channels. Understanding the nature of rivers in plan and section.

Understanding what determines the river forms and why.

Knowledge to design and introduce the study of locks

Show students the knowledge and criteria for designing and calculating hydraulic infrastructure for energy generation.

Maritime Engineering

Extension for the design of seawalls with the presentation of more formulations and their applicability to the calculation of sections of seawalls. New types of dikes.

Practical application to real cases of seawalls in port works.

Working with students to apply a spreadsheet (excel) formulations for the design of seawalls.

Description of Levels I, II and III. Comparison with deterministic design. Concepts of modes of breakdown and breakdown of equations.

Practical application to real cases of seawalls in port works.

Working with students to apply a spreadsheet (excel) Levels I, II and III of probabilistic design in a seawall.

Specific Objectives

To intensify the acknowledgement of students in the design of seawalls port.

Helping students to understand the issue and applicability of the theory.

Understand the foundations of probabilistic design concepts applied to maritime engineering.

Helping students to understand the issue and applicability of the theory.

EXAM

Teaching Methodology

The course consists of 3 hours per week that are dedicated to lectures where the professor explains the concepts and basic materials of the matter and practical and laboratory lessons with examples and

exercises. The first fourth month period, the lectures will be teaching in Catalan. The second fourth month period, the lectures will be teaching in Spanish and English.

Grading Rules

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

The subject will be evaluated with two exams throughout the course. The exam consists of a theoretical part and a problem-solving part. The final grade for the course is the average of the exams.

Office Hours

Consult with the professor by e-mail.

Bibliography

Basic

- Martín Vide, J.P. [Ingeniería de ríos](#). 2a ed. Barcelona: Edicions UPC, 2006. ISBN 9788483019009.
- Vallarino, E. [Tratado básico de presas](#). 6a ed. corr. i ampl. Madrid: Colegio de Ingenieros de Caminos, Canales y Puertos, 2006. ISBN 8438003141.
- Vallarino, E. [Obras hidráulicas](#). Madrid: Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos, 1980. ISBN 8460064611.
- Negro, V [et al.]. [Diseño de diques verticales](#). 2a ed. Madrid: Colegio de Ingenieros de Caminos, Canales y Puertos., 2008. ISBN 9788438003749.
- Negro, V.; Varela O. [Diseño de diques rompeolas](#). 2a ed. Madrid: Colegio de Ingenieros de Caminos, Canales y Puertos., 2008. ISBN 9788438004029.

Complementary

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