



Course guide

250404 - INFRAHID - Hydraulic Infrastructure

Last modified: 03/10/2023

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: 2023	ECTS Credits: 4.5	Languages: Catalan

LECTURER

Coordinating lecturer:	FRANCESC XAVIER GIRONELLA I COBOS
Others:	JOSE MIGUEL DIEGUEZ GARCIA, CARLES FERRER BOIX, FRANCESC XAVIER GIRONELLA I COBOS, VICENTE GRACIA GARCIA, JUAN PEDRO MARTÍN VIDE, FRANCISCO NUÑEZ GONZÁLEZ, ARNAU PRATS PUNTÍ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

- 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:

- 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 consists of 3 hours per week that are dedicated to lectures where the professor explains the concepts and basic materials of the matter, practical lessons with examples and exercises, and laboratory sessions where groups of three students develop a guided work. The lectures will be teach mostly 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 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. Basic knowledge of the maritime way, environmental conditions, coastal hydraulics. Surge. Transport and dispersion. Project of ports and coasts. Engineering port. Engineering coast. Works of coastal protection. Longitudinal and transverse dynamics. Interaction port - coast. Response of the coast.

STUDY LOAD

Type	Hours	Percentage
Self study	72,0	63.94
Hours medium group	9,8	8.70
Hours small group	9,8	8.70
Hours large group	21,0	18.65

Total learning time: 112.6 h

CONTENTS

HYDRAULIC ENGINEERING

Description:

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. Description 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.

Full-or-part-time: 57h 35m

Theory classes: 17h
Practical classes: 7h
Self study : 33h 35m



Maritime Engineering

Description:

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:

Coneixaments intensify the students in the design of seawalls port.

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

Teamwork and forme guided to apply the concepts that the student has learned in a practical way.

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

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

Teamwork and forme guided to apply the concepts that the student has learned in a practical way.

Full-or-part-time: 34h 48m

Theory classes: 4h

Practical classes: 3h 30m

Laboratory classes: 7h

Self study : 20h 18m

EXAM

Full-or-part-time: 4h 48m

Laboratory classes: 2h

Self study : 2h 48m

GRADING SYSTEM

The mark of the course is obtained from 4 required practical works (3 from hydraulics and 1 from maritime) distributed along the course. The final mark is obtained by the arithmetic mean of the 4 practical works. Failure to reach an approved mark, exists the option to attend an evaluation of all the matter.

The course is structured in four subjects and it will be evaluated with four exercices and one test.

Each exercice could be individual or in group. In this case, it will be accepted a maximum of three students. There will be four exercices (one per subject), three of which are hydraulic subject and one are maritime subject.

The course score is divided into 60% of the exercices and 40% of the test exam. Exercices and test have an score of 0 to 10. Each exercice has a weighted factor (subject hours/course hours) to obtain the overall score of exercices.

The test exam will be held in January, during school hours. It will have questions divided according to the course.

EXAMINATION RULES.

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



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 [on line]. Salamanca: Puertos del Estado, 2001 [Consultation: 30/05/2012]. Available on: http://www.puertos.es/programa_rom/ROM_00_espa.html. ISBN 8488975309.
- Morang, A. [et al.]. Coastal engineering manual [on line]. Washington: US Army Corps of Engineers, 2003 [Consultation: 02/02/2021]. Available on: <http://www.a-jacks.com/Coastal/GeneralInfo/CEM/CEM.aspx>.