Last update: 04-11-2015

250404 - INFRAHID - Hydraulic Infrastructure

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering

Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering

Academic year: 2015

Degree: MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Compulsory)

ECTS credits: 4,5 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: FRANCESC XAVIER GIRONELLA I COBOS

Others: JOSE MIGUEL DIEGUEZ GARCIA, FRANCESC XAVIER GIRONELLA I COBOS, VICENTE GRACIA GARCIA, JUAN PEDRO MARTÍN VIDE

Opening hours

Timetable: To consult with the teacher.

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.

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.

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 contrucción 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

250404 - INFRAHID - Hydraulic Infrastructure

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.

Last update: 04-11-2015

250404 - INFRAHID - Hydraulic Infrastructure

Study load

	Theory classes:	19h 29,4m	17.32%
	Practical classes:	9h 46,2m	8.68%
	Laboratory classes:	9h 46,2m	8.68%
	Guided activities:	1h 29,4m	1.32%
	Self study:	72h	63.99%

Last update: 04-11-2015

250404 - INFRAHID - Hydraulic Infrastructure

Total learning time: 112h	

Last update: 04-11-2015

250404 - INFRAHID - Hydraulic Infrastructure

31,2m	

Last update: 04-11-2015

250404 - INFRAHID - Hydraulic Infrastructure

Content

HYDRAULIC ENGINEERING

Learning time: 57h 35m

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

Description:

Comparison between rivers and canals. River morphology: plant 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. Decripció 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

Learning time: 31h 12m

Theory classes: 4h
Practical classes: 2h
Laboratory classes: 7h
Self study : 18h 12m

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.

Last update: 04-11-2015

250404 - INFRAHID - Hydraulic Infrastructure

EXAM	Learning time: 4h 48m Laboratory classes: 2h Self study : 2h 48m

Qualification system

The mark of the course is obtained from 5 required practical works (3 from hydraulics and 2 from maritime) distributed along the course. The final mark is obtained by the arithmetic mean of the 5 prectical works. Failure to reach an approved mark, exists the option to attend an evaluation of all the matter.

The course is structured in five subjects and it will be evaluated with five 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 five exercices (one per subject), three of which are hydraulic subject and two are maritime subject.

The course score is divided into 70% of the exercices and 30% 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 last two hours and will have 20 questions divided according to the subjects:
Theme I- 2 questions
Theme II- 6 questions
Theme III 4 questions
Theme IV - 4 questions
Theme V 4 questions

Regulations for carrying out activities

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

250404 - INFRAHID - Hydraulic Infrastructure

Bibliography

Basic:

J.P. Martin Vide. Ingenieria de Ríos. Barcelona: UPC, 2007.

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., Varela, O., García, J.Y., López J.S.. Diseño de diques verticales. Colegio Ingenieros CCP,

Negro V., Varela, O.. Diseño de diques rompeolas. Colegio Ingenieros CCP,

Complementary:

Ministerio de Fomento - Puertos del Estado. ROM 00. Procedimiento general y bases de cálculo en el proyecto de obras marítimas y portuarias (parte I).

U.S. Army Corps of Engineers. Coastal Engineering Manual.