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 MARTIN 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 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
## Study load

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Theory classes:</td>
<td>19h 29,4m</td>
<td>17.32%</td>
</tr>
<tr>
<td>Practical classes:</td>
<td>9h 46,2m</td>
<td>8.68%</td>
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<tr>
<td>Laboratory classes:</td>
<td>9h 46,2m</td>
<td>8.68%</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>1h 29,4m</td>
<td>1.32%</td>
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<tr>
<td>Self study:</td>
<td>72h</td>
<td>63.99%</td>
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**Total learning time:** 112h
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<tr>
<th>31.2m</th>
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**Content**

<table>
<thead>
<tr>
<th>HYDRAULIC ENGINEERING</th>
<th>Learning time: 57h 35m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 17h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 7h</td>
</tr>
<tr>
<td></td>
<td>Self study : 33h 35m</td>
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**Description:**
Exercises
Locks. Exercises
Type uses. Decrpicció 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.

<table>
<thead>
<tr>
<th>Maritime Engineering</th>
<th>Learning time: 31h 12m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
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<tr>
<td></td>
<td>Practical classes: 2h</td>
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<tr>
<td></td>
<td>Laboratory classes: 7h</td>
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<td></td>
<td>Self study : 18h 12m</td>
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**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.
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 practical 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 exercises and one test.

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

The course score is divided into 70% of the exercises and 30% of the test exam. Exercises and test have an score of 0 to 10. Each exercise has a weighted factor (subject hours/course hours) to obtain the overall score of exercises.

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.
Bibliography

Basic:


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).