Course guides
2500040 - GECOBHIDRA - Hydraulic Constructions

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: BACHELOR'S DEGREE IN CIVIL ENGINEERING (Syllabus 2020). (Optional subject).
Academic year: 2021 ECTS Credits: 6.0 Languages: Spanish

LECTURER
Coordinating lecturer: ALLEN BATEMAN PINZON
Others: ALLEN BATEMAN PINZON, JOSE MIGUEL DIEWEGUE GARCIA, JUAN PEDRO MARTÍN VIDE, BENIAMINO RUSSO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14418. Knowledge and ability to project and size hydraulic works and installations, energy systems, hydroelectric uses and planning and management of surface and underground hydraulic resources. (Specific technology module: Hydrology)

General:
14380. Scientific-technical training for the exercise of the profession of Technical Engineer of Public Works and knowledge of the functions of advice, analysis, design, calculation, project, construction, maintenance, conservation and exploitation.
14383. Ability to project, inspect and direct works, in their field.
14384. Capacity for the maintenance and conservation of hydraulic and energy resources, in its field.
14386. Capacity for maintenance, conservation and exploitation of infrastructure, in its field.
14389. Knowledge of the history of civil engineering and training to analyze and assess public works in particular and construction in general.

TEACHING METHODOLOGY

The course consists of 2 hours per week of classroom activity (large size group) and 1.6 hours weekly with half the students (medium size group).

The 2 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1.6 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.
LEARNING OBJECTIVES OF THE SUBJECT

Students will acquire the knowledge and skills to plan and design hydraulic works and facilities, energy systems and hydroelectric power plants, and to plan and manage surface and groundwater resources.

1 Ability to project and dimension hydraulic works and installations, energy systems, hydroelectric uses and planning and management of surface and underground hydraulic resources.


STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>24,0</td>
<td>16.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>6,0</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

Hidroelectric and irrigation Channels

Description:

Full-or-part-time: 15h 36m
Theory classes: 2h
Practical classes: 2h
Laboratory classes: 2h 30m
Self study : 9h 06m
Hydroelectric Power Plants

Description:

Perform a calculation of power, losses in pipes and other details of the flow in hydroelectric systems

Full-or-part-time: 12h
Theory classes: 3h
Practical classes: 2h
Self study: 7h

Fluvial morphodynamics and riverbed works

Description:
Simple exercise in fluvial morphology, explanation of Exner's equation in a practical example. General characteristics of local erosion: Bridge piles, stirrups, sleepers, prominent elements in beds, falls, walls. Maximum erosion and the temporal evolution of erosion. The mechanics of local erosion in piles and bridge stirrups, formulas of maxima, equations of temporal evolution. Almost permanent calculations of the evolution of erosion in piles and stirrups. On elevation in bridges. Characteristics, formulations. The local erosion calculation will be carried out in a bridge pile and in a abutment. Additionally, they will go to the laboratory to see in an experiment the local erosion process. Piping, protection materials, design of a longitudinal protection. Protection for bridge batteries and bridge stirrups. Sedimentation in reservoirs, calculation of production and progress of the delta. Sediment management. Several examples of bed protection design in beds.

Full-or-part-time: 36h
Theory classes: 9h
Practical classes: 4h
Laboratory classes: 2h
Self study: 21h

Dams

Description:

Full-or-part-time: 19h 12m
Theory classes: 8h
Self study: 11h 12m
### Dispersion and mixing in river systems

**Description:**
Saline wedge in mouths, description of the phenomenon, its impact on sedimentation in rivers, wedge dynamics. Dispersion of pollutants and suspended sediment in channels. Longitudinal, vertical and transversal dispersion. Examples of dredging, mining, and others.

**Full-or-part-time:** 9h 36m
Theory classes: 3h  
Practical classes: 1h  
Self study: 5h 36m

### DebrisFlows

**Description:**
In this session we will visit the river morphodynamics laboratory to carry out a detrital flow experiment, previously we will show examples in videos of experiments with detrital flows.

**Full-or-part-time:** 14h 23m
Theory classes: 4h  
Laboratory classes: 2h  
Self study: 8h 23m

### Flood and Risk Assessment

**Description:**
Practical flooding exercise with simple 2D models.

**Full-or-part-time:** 16h 48m
Theory classes: 5h  
Practical classes: 2h  
Self study: 9h 48m

### Visit to a hydroelectric system

**Description:**
The visit to Susqueda waterfall is interesting since its water supplies the city of Barcelona. Furthermore, the dam is of great architectural value for the beauty of its design. This trip will only be scheduled if conditions are right.

**Full-or-part-time:** 14h 23m
Laboratory classes: 6h  
Self study: 8h 23m
evaluation

Full-or-part-time: 6h
Laboratory classes: 2h 30m
Self study : 3h 30m

GRADING SYSTEM

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

BIBLIOGRAPHY

Basic:

Complementary: