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:

Flow Resistance Exercises. Exercises In The beginning of the movement.
Assessment of bed erosion: Long-term erosion, erosion by bottom forms. The power of the flow. Examples of bed stability.
Transport formulas. The balance of Lane. Exner equation (Morphodynamic equation)
Simple exercise in fluvial morphology, explanation of Exner’s equation in a practical example.

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:

Development of a didactic exercise on dam stability

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:**