Course guide
2500052 - GECEDIANEH - Design and Analysis Tools in Hydraulic Engineering

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: 2022  ECTS Credits: 4.5  Languages: Spanish

LECTURER

Coordinating lecturer: MARTI SANCHEZ JUNY
Others: GONZALO JAVIER OLIVARES CERPA, MARTI SANCHEZ JUNY, JACKSON DAVID TELLEZ ALVAREZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14417. Knowledge and understanding of the supply and sanitation systems, as well as their sizing, construction and conservation. (Specific technology module: Civil Construction)
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.
14391. Conceive, project, manage and maintain systems in the field of construction engineering. Cover the entire life cycle of an infrastructure or system or service in the field of construction engineering. (Additional school competition).

TEACHING METHODOLOGY

The course consists of 1.5 hours per week of classroom activity (large size group) and 1.5 hours weekly with half the students (medium size group).

The 1.5 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 1.5 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.

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

Knowledge of the main tools used both for the design of hydraulic structures and hydrodynamic analysis. Study of the theoretical models and laws of similarity. Knowledge of the measuring instrumentation usually used in field and laboratory. Main design and experimental analysis techniques. Knowledge and application of the main commercial models of hydraulic simulation in openflow (IBER, HECRAS) and water pressure (EPANET) and hydrological (HMS).

1 Ability to design a simple experimental campaign in hydraulic infrastructures, either in the field or in the laboratory.
2 Ability to properly select the objectives and calculation tools to carry out a hydraulic / hydrological analysis.

Knowledge of the main tools used both for the design of hydraulic structures and hydrodynamic analysis. Study of the theory of models and laws of similarity. Knowledge of the measurement instrumentation commonly used in the field and laboratory. Main design techniques and experimental analysis. Knowledge and application of the main commercial models of hydraulic simulation both in free sheet (IBER, HECRAS) and pressure (EPANET) and hydrological (HMS). Study of practical cases.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Guided activities</td>
<td>4,5</td>
<td>4.00</td>
</tr>
<tr>
<td>Self study</td>
<td>63,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>22,5</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>22,5</td>
<td>20.00</td>
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Total learning time: 112.5 h

CONTENTS

I. Introduction to experimental hydraulics

Description:
Introduction to dimensional analysis and reduced models
Measurement techniques in the laboratory
Risk prevention in the laboratory and field

Full-or-part-time: 12h
Theory classes: 4h
Practical classes: 1h
Self study: 7h

II. Lab work on gradually and rapidly varied flow

Description:
Objectives of the Lab work
Lab work
Data processing and analysis

Full-or-part-time: 24h
Theory classes: 1h
Practical classes: 5h
Laboratory classes: 4h
Self study: 14h
### III. Lab work on velocity and flow rate measurement

**Description:**
Objectives of the Lab work  
Lab work  
Data processing and analysis

**Full-or-part-time:** 24h  
Theory classes: 1h  
Practical classes: 5h  
Laboratory classes: 4h  
Self study: 14h

### IV. Numerical modeling with HECRAS

**Description:**
Introduction to HECRAS  
Modeling of Lab work

**Full-or-part-time:** 19h 12m  
Theory classes: 2h  
Practical classes: 6h  
Self study: 11h 12m

### V. Numerical modeling with IBER

**Description:**
Introduction to IBER  
Modeling of Lab work

**Full-or-part-time:** 28h 47m  
Theory classes: 4h  
Practical classes: 6h  
Laboratory classes: 2h  
Self study: 16h 47m

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**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: