Course guides  
**250408 - ENGAIGUA - Water Engineering**

**Unit in charge:** Barcelona School of Civil Engineering  
**Teaching unit:** 751 - DECA - Department of Civil and Environmental Engineering.

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

**Academic year:** 2020  
**ECTS Credits:** 6.0  
**Languages:** Catalan, Spanish, English

**LECTURER**

**Coordinating lecturer:** MANEL ESPINO INFANTES  
**Others:** ENRIQUE BONET GIL, MANEL ESPINO INFANTES, IVET FERRER MARTI, MARIA JESUS GARCIA GALAN, MARTI SANCHEZ JUNY

**DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES**

**Specific:**
8205. The ability to plan and dimension water and wastewater processing and treatment systems.  
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.

**Transversal:**
8559. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.  
8562. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.  
8563. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

**TEACHING METHODOLOGY**

The course is based on four hours per week. Th structure of the sessions (2 hours per class) is as follows: 1.- Theoretical concepts (mostly taking about 1.5 hours) and, 2.- numerical exercises (mostly taking about 0.5 hours). This structure will be repeated along the course as long as the addressed concepts allow to combine theoretical concepts and numerical exercises.  
Material used for the course will be placed in the ATENEA intranet: contents, evaluation exercises and directed learning as well as literatura.
LEARNING OBJECTIVES OF THE SUBJECT

Students will learn to apply their knowledge of hydraulic, maritime and environmental engineering.

Upon completion of the course, students will be able to:

Analyse and establish the requirements of hydraulic infrastructure and understand its environmental impact;
Plan, dimension, construct and maintain hydraulic infrastructure;
Plan, evaluate and regulate the use of surface and underground water resources;
Analyse and establish the requirements of environmental engineering processes, including regeneration of water for reuse in environmental protection applications;
Plan and dimension water and wastewater processing and treatment systems;
Analyse maritime engineering problems;
Understand dynamic phenomena of the coastal ocean and atmosphere and solve problems encountered in port and coastal areas, including the environmental impact of coastal interventions;
Analyse and plan maritime works.

Planning, dimensioning, construction and maintenance of hydraulic infrastructure; Planning, evaluation and regulation of the use of surface and underground water resources; Planning and dimensioning of water and wastewater processing and treatment systems; Dynamic phenomena of the coastal ocean and atmosphere: Problems encountered in port and coastal areas, including the environmental impact of coastal interventions; Analysis and planning of maritime works.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>2,0</td>
<td>1.33</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>13,0</td>
<td>8.67</td>
</tr>
<tr>
<td>Hours large group</td>
<td>26,0</td>
<td>17.33</td>
</tr>
<tr>
<td>Self study</td>
<td>96,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>13,0</td>
<td>8.67</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

coastal and estuarine hidrodynamics

Description:

Familiarize students with the description of physical processes relevant coastal ocean dynamics from the perspective of engineering civil.

Specific objectives:

Familiarize students with the description of physical processes relevant coastal ocean dynamics from the perspective of engineering civil.

Full-or-part-time: 16h 48m

Theory classes: 4h
Practical classes: 3h
Self study : 9h 48m
## The water quality in coastal

**Description:**
- Introduction to marine engineering
- Concepts of marine pollution
- Concepts of dispersion and diffusion in marine environment
- Describe the monitoring and management tools applied to marine engineering in a coastal town
- Describe the submarine emissaries

**Specific objectives:**
- To provide students with the basics to follow the course
- To provide students with the concepts of pollution at sea
- To provide students with the knowledge to understand the dispersion and diffusion processes
- To provide students with the knowledge to manage and control processes
- To provide the knowledge to measure alumme an outfall

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

## Case Study I - Maritime

**Description:**
Case study on water quality in coastal

**Specific objectives:**
Put into practice the knowledge acquired and integrated

**Full-or-part-time:** 2h 24m
- Practical classes: 1h
- Self study: 1h 24m

## Case Study II - Maritime

**Description:**
Case Study II

**Full-or-part-time:** 2h 24m
- Practical classes: 1h
- Self study: 1h 24m

## evaluation

**Full-or-part-time:** 12h
- Laboratory classes: 5h
- Self study: 7h
Introduction to variable flow regime in water. Equations.

Description:
Variable interest regime
1D Saint Venant equations

Full-or-part-time: 4h 48m
Theory classes: 2h
Self study : 2h 48m

Resolution methods of equations of the system variable 1D. Numerical schemes

Description:
Finite difference methods
The scheme Preissman

Full-or-part-time: 4h 48m
Theory classes: 2h
Self study : 2h 48m

Analysis of the flood hazard -Hec-GeoRas-I

Description:
Getting geometries using GIS tools

Full-or-part-time: 4h 48m
Laboratory classes: 2h
Self study : 2h 48m

Analysis of flood-hazard Hec-GeoRas_II

Description:
Simulations
Analysis of results

Full-or-part-time: 4h 48m
Laboratory classes: 2h
Self study : 2h 48m

The regime variable in torrential channels. Concepts, equations and numerical schemes

Description:
The finite volume method
Schemes descentrats

Full-or-part-time: 4h 48m
Theory classes: 2h
Self study : 2h 48m
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Full-or-part-time</th>
<th>Theory classes</th>
<th>Laboratory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensional modeling of flow in rivers</td>
<td>Introduction to model Iber Applying the analysis of a flood in a river avenue</td>
<td>4h 48m</td>
<td></td>
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<tr>
<td>The physical modeling in hydraulic engineering and fluvial dynamics</td>
<td>Similarity theory, types of scale models and scale effects</td>
<td>4h 48m</td>
<td>2h</td>
<td></td>
<td>2h 48m</td>
</tr>
<tr>
<td>Modeling and analysis of the danger of flooding in urban areas</td>
<td>Sources of information Special urban drainage modeling and its</td>
<td>4h 48m</td>
<td>1h</td>
<td>1h</td>
<td>2h 48m</td>
</tr>
<tr>
<td>case study hydraulic</td>
<td>Exercises in groups of 2</td>
<td>2h 24m</td>
<td>1h</td>
<td>1h</td>
<td>1h 24m</td>
</tr>
<tr>
<td>Water quality parameters (microbiological and physical-chemical)</td>
<td>Microbiological quality parameters</td>
<td>2h 24m</td>
<td>1h</td>
<td></td>
<td>1h 24m</td>
</tr>
</tbody>
</table>
characteristics of the wastewater

**Description:** Characteristics of wastewater exercises

**Full-or-part-time:** 4h 48m
Theory classes: 1h
Practical classes: 1h
Self study: 2h 48m

regulations

**Description:** Reuse Regulations

**Full-or-part-time:** 2h 24m
Theory classes: 1h
Self study: 1h 24m

Treatment systems

**Description:**
- conventional treatment
- Treatments II exercises

**Full-or-part-time:** 9h 36m
Theory classes: 2h
Practical classes: 2h
Self study: 5h 36m

Fate of water

**Description:**
- Management and Reuse

**Full-or-part-time:** 4h 48m
Theory classes: 2h
Self study: 2h 48m

unconventional treatment systems

**Description:**
- Management of wastewater in the city of the future
- bioelectrochemistry systems
- calculation of electricity production with bio-electrochemical systems

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

The evaluation of the course is carried out by means of the continuous evaluation method. Continuous evaluation consists of carrying out different activities, either individually or in group, of additive character, carried out along the course. More precisely, activities that will be subjected to evaluation will be: a) one examen for each part of the cours (three in total, one for the part of environmental engineering, one for the maritime engineering and one for the hydraulic engineering) and b) the evaluation of different case studies.

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic:

Complementary: