250408 - ENGAIGUA - Water Engineering

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Compulsory)
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Compulsory)
ECTS credits: 6  Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: MANEL ESPINO INFANTES
Others: ENRIQUE BONET GIL, MANEL ESPINO INFANTES, IVET FERRER MARTI, MARIA JESUS GARCIA GALAN, MARTI SANCHEZ JUNY

Opening hours
Timetable: Friday form 15h00 to 17h00

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.
250408 - ENGAIGUA - Water Engineering

Teaching methodology

The course is based on four hours per week. The 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 literature.

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>Total learning time: 150h</th>
<th>Hours large group: 25h 58,8m 17.32%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 13h 01,2m 8.68%</td>
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<tr>
<td></td>
<td>Hours small group: 13h 01,2m 8.68%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 1h 58,8m 1.32%</td>
</tr>
<tr>
<td></td>
<td>Self study: 96h 64.00%</td>
</tr>
</tbody>
</table>

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- 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;
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# Content

## coastal and estuarine hidrodynamics

<table>
<thead>
<tr>
<th>Learning time: 16h 48m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td>Self study: 9h 48m</td>
</tr>
</tbody>
</table>

**Description:**
treat estuarine and coastal hydrodynamics

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

## The water quality in coastal

<table>
<thead>
<tr>
<th>Learning time: 14h 23m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Self study: 8h 23m</td>
</tr>
</tbody>
</table>

**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 alunme an outfall

## Case Study I - Maritime

<table>
<thead>
<tr>
<th>Learning time: 2h 24m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td>Self study: 1h 24m</td>
</tr>
</tbody>
</table>

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

**Specific objectives:**
Put into practice the knowledge acquired and integrated
<table>
<thead>
<tr>
<th>Case Study II - Maritime</th>
<th>Learning time: 2h 24m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 1h 24m</td>
</tr>
</tbody>
</table>

**Description:**
Case Study II

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 5h</td>
</tr>
<tr>
<td></td>
<td>Self study: 7h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Introduction to variable flow regime in water. Equations.</th>
<th>Learning time: 4h 48m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 2h 48m</td>
</tr>
</tbody>
</table>

**Description:**
Variable interest regime
1D Saint Venant equations

<table>
<thead>
<tr>
<th>Resolution methods of equations of the system variable 1D. Numerical schemes</th>
<th>Learning time: 4h 48m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 2h 48m</td>
</tr>
</tbody>
</table>

**Description:**
Finite difference methods
The scheme Preissman

<table>
<thead>
<tr>
<th>Analysis of the flood hazard -Hec-GeoRas-I</th>
<th>Learning time: 4h 48m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 2h 48m</td>
</tr>
</tbody>
</table>

**Description:**
Getting geometries using GIS tools
### Analysis of flood-hazard Hec-GeoRas_II

**Description:**
- Simulations
- Analysis of results

**Learning 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

**Learning time:** 4h 48m
- Theory classes: 2h
- Self study: 2h 48m

### Dimensional modeling of flow in rivers

**Description:**
- Introduction to model Iber
- Applying the analysis of a flood in a river avenue

**Learning time:** 4h 48m
- Laboratory classes: 2h
- Self study: 2h 48m

### The physical modeling in hydraulic engineering and fluvial dynamics

**Description:**
- Similarity theory, types of scale models and scale effects

**Learning time:** 4h 48m
- Theory classes: 2h
- Self study: 2h 48m
# Modeling and analysis of the danger of flooding in urban areas

**Description:**
- Sources of information
- Special urban drainage modeling and its

**Learning time:** 4h 48m  
- Theory classes: 1h  
- Laboratory classes: 1h  
- Self study: 2h 48m

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# case study hydraulic

**Description:**
- Exercises in groups of 2

**Learning time:** 2h 24m  
- Theory classes: 1h  
- Self study: 1h 24m

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# Water quality parameters (microbiological and physical-chemical)

**Description:**
- Microbiological quality parameters

**Learning time:** 2h 24m  
- Theory classes: 1h  
- Self study: 1h 24m

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# characteristics of the wastewater

**Description:**
- Characteristics of wastewater exercises

**Learning time:** 4h 48m  
- Theory classes: 1h  
- Practical classes: 1h  
- Self study: 2h 48m

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# regulations

**Description:**
- Reuse Regulations

**Learning time:** 2h 24m  
- Theory classes: 1h  
- Self study: 1h 24m
## Treatment systems

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 9h 36m</th>
</tr>
</thead>
<tbody>
<tr>
<td>conventional treatment</td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>Treatments II exercises</td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study : 5h 36m</td>
</tr>
</tbody>
</table>

## Fate of water

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 4h 48m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management and Reuse</td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study : 2h 48m</td>
</tr>
</tbody>
</table>

## unconventional treatment systems

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of wastewater in the city of the future</td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>bioelectrochemistry systems</td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td>calculation of electricity production with bio-electrochemical systems</td>
<td>Self study : 7h</td>
</tr>
</tbody>
</table>

## Qualification 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 caracter, 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.

## Regulations for carrying out activities

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

**Basic:**


**Complementary:**


