Course guides

250713 - 250713 - Experimental Techniques for the Characterization of Structural Materials

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015). (Optional subject).
Academic year: 2019  ECTS Credits: 5.0  Languages: Spanish

LECTURER

Coordinating lecturer: ROLANDO ANTONIO CHACÓN FLORES
Others: ANTONIO AGUADO DE CEA, DIEGO FERNANDO APONTE HERNÁNDEZ, JESÚS MIGUEL BAIRÁN GARCÍA, JUAN RAMON CASAS RIUS, ROLANDO ANTONIO CHACÓN FLORES, LUCA PELA, ESTHER REAL SALADRIGAS, IGNACIO SEGURA PEREZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
13364. To conceive and design civil and building structures that are safe, durable, functional and integrated into its surroundings.
13365. Designing and building using traditional materials (reinforced concrete, prestressed concrete, structural steel, masonry, wood) and new materials (composites, stainless steel, aluminum, shape memory alloys?).
13366. To evaluate, maintain, repair and strengthen existing structures, including the historic and artistic heritage.
13368. Mathematically modelling structural engineering problems.
13369. To apply methods and advanced design software and structural calculations, based on knowledge and understanding of forces and their application to the structural types of civil engineering.

General:
13360. To conceive, design, analyze and manage structures or structural elements of civil engineering or building, encouraging innovation and the advance of knowledge.
13361. To develop, improve and use conventional materials and new construction techniques to ensure the safety requirements, functionality, durability and sustainability.

TEACHING METHODOLOGY

Different activities are developed throughout the course for the sake of providing an interesting learning environment. The activities are somehow separated in two blocks.

- Let's measure. Attendees learn in a hands-on fashion how to use measurement equipment. Low-cost sensors and open-source microcontrollers are used for this purpose. Engineering problems related to forces, displacements, accelerations, temperature, humidity, etc are set as case studies.

- Lectures and laboratory sessions. A journey for state-of-the-art techniques related to the analysis of steel structures, concrete structures, building and bridges and other cementitious materials are given.

All educational resources are given in ATENEA, the Learning Management System.
LEARNING OBJECTIVES OF THE SUBJECT

Subject to act in front of practical engineering problems related to the characterization of building materials.

Capability to define the tests to be applied to a structure with damage in their structural evaluation, and define the criteria for monitoring the construction process of a singular structure.


The main objectives of the course are:

- To provide a framework for the experimental analysis of engineering problems infused with critical thinking and scientific method. The communication of the results is performed by the production of papers, posters, videos and oral presentations

- To provide knowledge related to experimental techniques, monitoring, material characterization and other methodologies useful in civil engineering problems.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>9,8</td>
<td>7.83</td>
</tr>
<tr>
<td>Hours small group</td>
<td>9,8</td>
<td>7.83</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.80</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>63.95</td>
</tr>
<tr>
<td>Hours large group</td>
<td>19,5</td>
<td>15.59</td>
</tr>
</tbody>
</table>

Total learning time: 125.1 h

CONTENTS

Block 1

Description:
Scientific method
Preparation of scientific and technical documents

Full-or-part-time: 7 h
Theory classes: 3h
Self study : 4h 11m
Block 2

**Description:**
Sensors  
Data acquisition systems  
Graphical User Interface  
These sessions include two development practices with the scholarship holders of the subject

**Full-or-part-time:** 36 h  
Theory classes: 9h  
Practical classes: 3h  
Laboratory classes: 3h  
Self study: 21h

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Block 3

**Description:**
Experimental techniques in steel structures  
Experimental techniques for structural concrete  
Experimental techniques for cementitous materials  
Experimental techniques in masonry structures  
Experimental techniques for bridges

**Full-or-part-time:** 50 h  
Laboratory classes: 21h  
Self study: 29h 24m

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**GRADING SYSTEM**

The marks are obtained by the following activities:

***Critical analysis of a scientific research from reputed journals.***

*** Development of a measurement artifact

*** Writing of a scientific report with results from the measurement experience.

**Research related to cutting-edge experimental techniques

***Development of a communication poster

***Short test

**EXAMINATION RULES.**

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

Basic: