250474 - GESTESTRU - Structural Management

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 Optional)
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional)
MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2009). (Teaching unit Optional)
MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: JUAN RAMON CASAS RIOS
Others: VICENTE ALEGRE HEITZMANN, JUAN RAMON CASAS RIOS

Opening hours
Timetable: Thursday from 16.00 to 18.00

Degree competences to which the subject contributes

Specific:
8162. Knowledge of all kinds of structures and materials and the ability to design, execute and maintain structures and buildings for civil works.
8228. Knowledge of and competence in the application of advanced structural design and calculations for structural analysis, based on knowledge and understanding of forces and their application to civil engineering structures. The ability to assess structural integrity.

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.
8560. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
8561. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
250474 - GESTESTRU - Structural Management

**Teaching methodology**

The course consists of 1.8 hours per week of classroom activity (large size group) and 0.8 hours weekly with half the students (medium size group).

The 1.8 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 0.8 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**

Specialization subject in which knowledge on specific competences is intensified.

Knowledge and skills at specialization level that permit the development and application of techniques and methodologies at advanced level.

Contents of specialization at master level related to research or innovation in the field of engineering.

Knowledge regarding the correct performance of the structure in the service life, ie, all those aspects that arise once the structure has been built and put into service. Define the concepts that allow a good durability and appropriate management of this structure given the progressive deterioration of materials and the variation of the imposed actions.

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 19h 30m 15.60%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group: 9h 45m 7.80%</td>
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<tr>
<td></td>
<td>Hours small group: 9h 45m 7.80%</td>
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<tr>
<td></td>
<td>Guided activities: 6h 4.80%</td>
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<tr>
<td></td>
<td>Self study: 80h 64.00%</td>
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### Content

<table>
<thead>
<tr>
<th>Inspection of structures</th>
<th>Learning time: 28h 47m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td><strong>Theory classes:</strong> 12h</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td><strong>Self study:</strong> 16h 47m</td>
</tr>
</tbody>
</table>
| To introduce students the concepts that are part of the subject relating to inspection, maintenance, evaluation and repair of existing structures. Students learn the major defects that appear on the structures and their causes, taking into account the material, type of structure and phases where the problem originated (design or execution). To learn how to assess the importance of a defect or damage in the serviceability and safety of the structure. Once considered the most frequent defects in the structures in the class above, the objective is to know which are the mechanisms that lead to these defects. Showing the most used theoretical models for the modeling of degradation of structural materials. Description of the methods of inspection of existing structures. Scope. Provide criteria for proper decision on the most appropriate method to apply.
## Qualification system

**Structural assessment**

<table>
<thead>
<tr>
<th>Learning time: 28h 47m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 11h</td>
</tr>
<tr>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td>Self study: 16h 47m</td>
</tr>
</tbody>
</table>

### Description:

Description of evaluation methods based on structural reliability. Concept of reliability index. Definition and concept of the limit state function. Methods for calculating the probability of failure or reliability index: simulation methods, approximate methods (FOSM, FORM, SORM).

Statistical models of structural steel strength: yield strength, modulus of elasticity. Statistical models of concrete: compressive strength, ultimate strain, ... Statistical models of reinforcing and prestressing steel: yield strength, modulus of elasticity, ultimate strain. Statistical models of structural response. Statistical models for loads: permanent and variable loads, live load, ...

Illustrate through real examples the application of advanced methods for structural assessment.

### Specific objectives:
Show students the concepts and methods of structural assessment, by comparing them with the concepts and methods used in the design of new structures.
Provide the necessary information for the student to carry out a probabilistic assessment.

## Repair and strengthening of structures

<table>
<thead>
<tr>
<th>Learning time: 36h</th>
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<tbody>
<tr>
<td>Theory classes: 13h</td>
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<tr>
<td>Laboratory classes: 2h</td>
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<tr>
<td>Self study: 21h</td>
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### Description:
Jacketing methods for strengthening elements in compression and bending as well as other methods of flexural reinforcement.

Formulation of the general principles of structural strengthening by adding forces (external prestressing) and composite materials (FRP).


Most common damages and defects in concrete bridges, steel or masonry. Examples of bridges with structural and durability problems and proposals for strengthening.
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:


