250476 - AVAREDRSIS - Seismic Risk Assessment and Reduction

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 GEOTECHNICAL ENGINEERING (Syllabus 2015). (Teaching unit Optional)
- MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2009). (Teaching unit Optional)
- MASTER'S DEGREE IN GEOTECHNICAL AND EARTHQUAKE ENGINEERING (Syllabus 2009). (Teaching unit Optional)
- DOCTORAL DEGREE IN EARTHQUAKE ENGINEERING AND STRUCTURAL DYNAMICS (Syllabus 2012). (Teaching unit Optional)
- 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)
ECTS credits: 5

Teaching languages: Spanish

Teaching staff
Coordinator: MARTHA LILIANA CARREÑO TIBADUIZA
Others: MARTHA LILIANA CARREÑO TIBADUIZA

Opening hours
Timetable: After each session

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.
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Teaching methodology
The course consists of 3 hours per week of classroom activity.

The 3 hours are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

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.


Study load

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<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 125h</th>
</tr>
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<tbody>
<tr>
<td>Hours large group:</td>
<td>19h 30m</td>
</tr>
<tr>
<td>Hours medium group:</td>
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### Content

| **Introduction to the course. Seismic actions and their effect on structures. The seismic risk** | **Learning time:** 7h 11m  
**Theory classes:** 3h  
**Self study:** 4h 11m |
| Description: | Introduction to the course. Introduction to seismic risk, earthquake damage |

| **Seismological engineering** | **Learning time:** 7h 11m  
**Theory classes:** 3h  
**Self study:** 4h 11m |
| Description: | Seismological engineering. Tectònica i origen dels terratrèmols. Tipus of falles, mesures d'intensitat of fort fort |

| **Basics of Structural Dynamics** | **Learning time:** 7h 11m  
**Theory classes:** 3h  
**Self study:** 4h 11m |
| Description: | Review of basic concepts of structural dynamics. Oscillators of one and several freedom degrees. Response spectra |

| **Seismic hazard assessment** | **Learning time:** 7h 11m  
**Theory classes:** 3h  
**Self study:** 4h 11m |
| Description: | Probabilistic and deterministic evaluation of seismic hazard |

| **Practical session: Probabilistic evaluation of the seismic threat** | **Learning time:** 7h 11m  
**Practical classes:** 3h  
**Self study:** 4h 11m |
<p>| Description: | Practical example of probabilistic assessment of the seismic hazard (CRISIS2015). |</p>
<table>
<thead>
<tr>
<th>Topic</th>
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<tr>
<td><strong>Earthquake resistant design</strong></td>
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<tr>
<td><strong>Description:</strong></td>
<td>Standards of earthquake resistant design. Principles of conceptual design, structural configuration, design details earthquake resistant.</td>
</tr>
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<td><strong>Vulnerability and seismic risk</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Vulnerability and seismic risk assessment in urban areas (MIV, MEC). Holistic risk assessment.</td>
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<td><strong>Probabilistic assessment of seismic risk.</strong></td>
<td></td>
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<td><strong>Description:</strong></td>
<td>Probabilistic assessment of seismic risk.</td>
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<tr>
<td><strong>Practical probabilistic assessment of seismic risk</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Practical example of probabilistic assessment of seismic risk (CAPRA Team RC +).</td>
</tr>
<tr>
<td><strong>Ex-post evaluation of damage in buildings</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Assessment of habitability and damage in buildings affected by an earthquake.</td>
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Disaster risk management

**Learning time:** 7h 11m
- Theory classes: 3h
- Self study: 4h 11m

**Description:**
Ex-post evaluation. Indicators of disaster risk management.

Oral presentations of the students about a topic related to the course

**Learning time:** 14h 23m
- Laboratory classes: 6h
- Self study: 8h 23m

**Qualification system**

Presentación oral: Cada alumno hará una presentación oral en la que trate un tema relacionado con la temática de la asignatura. (30%)

Trabajo final: Consiste en realizar el análisis sísmico de una estructura a elegir por el estudiante aplicando una norma de diseño de su elección. (40%)

Evaluaciones: Los alumnos realizarán en clase ejercicios prácticos puntuables sobre los temas explicados. (30%)

**Regulations for carrying out activities**

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:**