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 CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional)  
- MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional)  
- DOCTORAL DEGREE IN EARTHQUAKE ENGINEERING AND STRUCTURAL DYNAMICS (Syllabus 2012). (Teaching unit Optional)  
- MASTER'S DEGREE IN GEOTECHNICAL AND EARTHQUAKE ENGINEERING (Syllabus 2009). (Teaching unit Optional)  
- MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2009). (Teaching unit Optional)  
- MASTER'S DEGREE IN GEOTECHNICAL ENGINEERING (Syllabus 2015). (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.
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

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Theory classes: 19h 30m 15.60%</th>
<th>Practical classes: 9h 45m 7.80%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 9h 45m 7.80%</td>
<td>Guided activities: 6h 4.80%</td>
</tr>
<tr>
<td></td>
<td>Self study: 80h 64.00%</td>
<td></td>
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</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction to the course. Seismic actions and their effect on structures. The seismic risk</strong></td>
<td><strong>7h 11m</strong></td>
<td><strong>Description:</strong> Introduction to the course. Introduction to seismic risk, earthquake damage</td>
</tr>
<tr>
<td><strong>Seismological engineering</strong></td>
<td><strong>7h 11m</strong></td>
<td><strong>Description:</strong> Seismological engineering. Tectònica i origen dels terratrèmols. Tipus of falles, mesures d'intensitat of fort fort.</td>
</tr>
<tr>
<td><strong>Basics of Structural Dynamics</strong></td>
<td><strong>7h 11m</strong></td>
<td><strong>Description:</strong> Review of basic concepts of structural dynamics. Oscillators of one and several freedom degrees. Response spectra.</td>
</tr>
<tr>
<td><strong>Seismic hazard assessment</strong></td>
<td><strong>7h 11m</strong></td>
<td><strong>Description:</strong> Probabilistic and deterministic evaluation of seismic hazard</td>
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<tr>
<td><strong>Practical session: Probabilistic evaluation of the seismic threat</strong></td>
<td><strong>7h 11m</strong></td>
<td><strong>Description:</strong> Practical example of probabilistic assessment of the seismic hazard (CRISIS2015).</td>
</tr>
</tbody>
</table>
## Earthquake resistant design

**Description:** Standards of earthquake resistant design. Principles of conceptual design, structural configuration, design details.

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

## Vulnerability and seismic risk

**Description:** Vulnerability and seismic risk assessment in urban areas (MIV, MEC). Holistic risk assessment.

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

## Probabilistic assessment of seismic risk

**Description:** Probabilistic assessment of seismic risk.

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

## Practical probabilistic assessment of seismic risk

**Description:** Practical example of probabilistic assessment of seismic risk (CAPRA Team RC+).

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

## Ex-post evaluation of damage in buildings

**Description:** Assessment of habitability and damage in buildings affected by an earthquake.

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

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

<table>
<thead>
<tr>
<th>Oral presentations of the students about a topic related to the course</th>
<th><strong>Learning time:</strong> 14h 23m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
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<tr>
<td></td>
<td>Self study: 8h 23m</td>
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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:**


