250472 - ANPROESTAC - Analysis and Design of Steel Structures

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: ENRIQUE MIRAMBELL ARRIZABALAGA
Others: ROLANDO ANTONIO CHACÓN FLORES, ENRIQUE MIRAMBELL ARRIZABALAGA, ESTHER REAL SALADRIGAS

Opening hours
Timetable: To agree

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 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.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Theory classes: 19h 30m</th>
<th>15.60%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practical classes: 9h 45m</td>
<td>7.80%</td>
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<tr>
<td></td>
<td>Laboratory classes: 9h 45m</td>
<td>7.80%</td>
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<tr>
<td></td>
<td>Guided activities: 6h</td>
<td>4.80%</td>
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<tr>
<td></td>
<td>Self study: 80h</td>
<td>64.00%</td>
</tr>
</tbody>
</table>
# 250472 - ANPROESTAC - Analysis and Design of Steel Structures

## Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Learning time</th>
<th>Theory classes:</th>
<th>Practical classes:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. The steel material.</strong></td>
<td>Steel properties. Stress-strain relationship. Temperature effects. Strain rate. Plasticity. Ductility. Toughness. Fatigue.</td>
<td>7h 11m</td>
<td>3h</td>
<td></td>
<td>4h 11m</td>
</tr>
<tr>
<td><strong>2. Design of structural elements in front of brittle fracture and fatigue.</strong></td>
<td>Treatment in Instrucción EAE and Eurocode. Exercises and problems. Exercises</td>
<td>14h 23m</td>
<td>3h</td>
<td>3h</td>
<td>8h 23m</td>
</tr>
<tr>
<td><strong>Assessment 2</strong></td>
<td></td>
<td>7h 11m</td>
<td></td>
<td>3h</td>
<td>4h 11m</td>
</tr>
</tbody>
</table>
**Joints**

**Description:**
Joints.  
Welding properties. Calculation of welded joints.  
Bolted joints. Base plates. 
Joint exercises

**Learning time:** 14h 23m  
Theory classes: 3h  
Practical classes: 3h  
Self study: 8h 23m

<table>
<thead>
<tr>
<th>Built-up elements</th>
<th>Learning time</th>
<th>7h 11m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Built-up columns, lattice girders and trusses.</td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Structural types</th>
<th>Learning time</th>
<th>7h 11m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
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<tr>
<td>Design of multy-storey buildings and industrial buildings.</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Accidental actions</th>
<th>Learning time</th>
<th>7h 11m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
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</tbody>
</table>
| Fire resistance. Simplified Method.  
Seismic design based on ductility.  
Blast and impact. |               |        |

<table>
<thead>
<tr>
<th>Assessment 3</th>
<th>Learning time</th>
<th>7h 11m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
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</tbody>
</table>
| Laboratory classes: 3h  
Self study: 4h 11m |               |        |
Qualification system

The mark of the course is obtained from the ratings of continuous assessment.

The first assessment is 40% and the second 60% of the total.

Regulations for carrying out activities

Any exercise with conceptual errors in determining the internal forces will be assessed with 0.

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: