250475 - ESTMIXCOMP - Mixed and Composite 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: ANTONIO RICARDO MARI BERNAT, ENRIQUE MIRAMBELL ARRIZABALAGA

Opening hours
Timetable: The consultations will take place on appointment.

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 during 13 weeks.

In the theoretical lectures, 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>
<th>Laboratory classes: 9h 45m 7.80%</th>
<th>Guided activities: 6h 4.80%</th>
<th>Self study: 80h 64.00%</th>
</tr>
</thead>
</table>

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# Overview

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

**Description:**

Materials: Structural steel, steel reinforcement, concrete

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## Structural behavior. Time dependent effects

**Learning time:** 7h 11m  
Theory classes: 2h  
Practical classes: 1h  
Self study: 4h 11m

**Description:**

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## The prestressed composite structures. Ultimate limit states

**Learning time:** 7h 11m  
Theory classes: 2h  
Practical classes: 1h  
Self study: 4h 11m

**Description:**

Resolution of exercise for determining the ultimate moment of a section subjected to bending mixed positive and negative, considering linear elastic and plastic theory.
### Serviceability limit states

**Description:**

**Learning time:** 7h 11m
- Theory classes: 2h
- Practical classes: 1h
- Self study: 4h 11m

### Shear connection

**Description:**

**Learning time:** 7h 11m
- Theory classes: 2h
- Practical classes: 1h
- Self study: 4h 11m

### Construction process

**Description:**

**Learning time:** 7h 11m
- Theory classes: 2h
- Practical classes: 1h
- Self study: 4h 11m
# Composite columns

<table>
<thead>
<tr>
<th><strong>Description:</strong></th>
<th><strong>Learning time:</strong> 7h 11m</th>
</tr>
</thead>
</table>
Practical classes: 1h  
Self study: 4h 11m |

# Composite slabs with profiled sheet

<table>
<thead>
<tr>
<th><strong>Description:</strong></th>
<th><strong>Learning time:</strong> 7h 11m</th>
</tr>
</thead>
</table>
Practical classes: 1h  
Self study: 4h 11m |

# Composite bridges

<table>
<thead>
<tr>
<th><strong>Description:</strong></th>
<th><strong>Learning time:</strong> 7h 11m</th>
</tr>
</thead>
</table>
Self study: 4h 11m |
## Composite structures with different types of concrete

**Description:**
Evolutive construction procedures. Phases of concrete cast at transversal and longitudinal level. Structural continuity. Redistribution of stresses and forces along time. Interaction with the cracking of concrete.

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Learning time: 7h 11m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study : 4h 11m</td>
</tr>
</tbody>
</table>

**Learning time:**
- Theory classes: 9h
- Self study : 12h 36m

## Qualification system

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

It consists of five activities and a final exam.

The final mark (F) is obtained from the exam mark (E) and the activities directed (AD)

\[ F = 0.7E + 0.3AD \]

The maximum score assigned to each activity will be the same.

## 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:


