250471 - PONTS - Bridges

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 STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015).
(Master’s Degree in Geotechnical and Earthquake Engineering) (Teaching unit Optional)
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MASTER’S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012).
(Teaching unit Optional)
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ECTS credits: 5
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: JUAN RAMON CASAS RIUS
Others: ANGEL CARLOS APARICIO BENGOECHEA, JUAN RAMON CASAS RIUS, GONZALO RAMOS SCHNEIDER

Opening hours
Timetable: The tutorial hours will be published at the beginning of the course

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.
250471 - PONTS - Bridges

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.

- Learn to design and build bridges of small and medium spans constructed by any method
- Started in the design and construction of long span bridges

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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<td>Laboratory classes: 9h 45m</td>
<td>7.80%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 6h</td>
<td>4.80%</td>
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<tr>
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<td>Self study: 80h</td>
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## Content

<table>
<thead>
<tr>
<th>Generals Themes</th>
<th>Learning time: 24h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
</tr>
<tr>
<td></td>
<td>Self study : 14h</td>
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</table>

**Description:**
- Presentation of the Course. Specific language of Bridge Engineering. Historical approach
- Actions on the bridges. Equipment of the superstructure
- Structural Behavior of Beam Bridges, Portal Bridges and Arch Bridges
- Structural behavior of cable-stayed bridges

<table>
<thead>
<tr>
<th>Structural behaviour and Design criteria for deck cross sections</th>
<th>Learning time: 16h 48m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
</tr>
<tr>
<td></td>
<td>Self study : 9h 48m</td>
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</tbody>
</table>

**Description:**
- Design of precast prestressed beam decks
- Design of slabs decks
- Design of box beam girder decks

<table>
<thead>
<tr>
<th>Bridge Bearings, Piers and Abutments</th>
<th>Learning time: 12h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td></td>
<td>Self study : 7h</td>
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</tbody>
</table>

**Description:**
- Design of Piers and Abutments
- Bearing devices for bridges

<table>
<thead>
<tr>
<th>Bridge Deck Structural Analysis by the Grillage method</th>
<th>Learning time: 7h 11m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practical classes: 3h</td>
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<tr>
<td></td>
<td>Self study : 4h 11m</td>
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</tbody>
</table>

**Description:**
- Structural analysis by plane grillage method of beam bridge decks, slab decks and box beam decks

<table>
<thead>
<tr>
<th>Evaluations</th>
<th>Learning time: 14h 23m</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Laboratory classes: 6h</td>
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<tr>
<td></td>
<td>Self study : 8h 23m</td>
</tr>
</tbody>
</table>
Design and Construction of segmental prestressed concrete bridges

<table>
<thead>
<tr>
<th>Learning time: 19h 12m</th>
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<tbody>
<tr>
<td>Theory classes: 8h</td>
</tr>
<tr>
<td>Self study : 11h 12m</td>
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</tbody>
</table>

Description:
- Design and Construction of bridge decks "in situ" and with precast beams
- Design and construction of segmental bridges span by sapan
- Design and construction of bridge decks by incremental launching
- Design and Construction of Bridges by the Cantilever method

Qualification system
- Conducting a preliminary draft bridge it is graded according to a format of five Practical Works, P1 to P5, conducted in groups of two non Erasmus students or 2 students + 1 Erasmus student
- These Practical Works will be delivered to the dates indicated in ATENEA. (Continuous assessment). Failure to timely delivery of a practice qualify with 50% of the mark obtained at delivery.
  - The mark obtained in each delivery (3 deliveries) will be considered as a mark of continuous assessment
  - These three assessment are worth the following:
    - Groups of two students not Erasmus: 30% of the final grade
    - Groups of two students + 1 Erasmus student: 40% of the final grade
  - The last assessment will be at week number 13 of course, it will last three hours and will have a value of 70% or 60% of the final grade respectively
- According to academic guidelines, there will only be an extraordinary assessment for students who can support, in a documented way, their inability to attend, for cause, to one or more partial assessments. You can only recover the missing assessment.

Although in the Masters course is not foreseen in the UPC regulations the scheduling a re-evaluation of the subjects, the Chair will conduct a reevaluation to all students who have not passed the subject under the following conditions:
- Valuation of Practical Work: 0.00 points
- Maximum Note: 5.00

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:

Aparicio, Angel C.; Casas, Juan Ramon. Apuntes de la asignatura "Puentes".


Calgaro y Virlogeux. Projet et Construction des ponts" (2 tomos). Presses de L'Ecole Nationales des Ponts et Chaussées,


