220113 - Structural Theory and Industrial Construction

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 737 - RMEE - Department of Strength of Materials and Structural Engineering
758 - EPC - Department of Project and Construction Engineering
Academic year: 2018
Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 4,5
Teaching languages: Catalan

Teaching staff
Coordinator: XAVIER ROCA RAMON
CARLOS ROMEA
Others: CARLES ROMEA
JOSE MANUEL DÍAZ

Prior skills
The "Theory of Structures" module presumes prior knowledge of the subject "Continuum mechanics and Strength and Materials", as well as elementary notions of matrix algebra.

Degree competences to which the subject contributes
Specific:
1. An understanding of, and skills for, the calculation and design of industrial structures

Transversal:
2. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

Teaching methodology
The course is organized as follows:

1. Classes with large groups. In these classes, the theoretical contents of the subject, as well as part of the practical contents, are developed. The expository strategy to be used in each lecture will be at the teacher's discretion, and will depend upon the goals set out in the corresponding module. The first and second partial exams will also take place in these classes.
2. Classes with medium-sized/small groups. These classes will focus on the practical application of the concepts developed in the theoretical lectures. Practical problems will be solved by either the teacher or the students themselves as part of their self-learning process. If appropriate, supervised activities may also be carried out.

Learning objectives of the subject
Provide students with the basic notions of both structural design and industrial construction.
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group:</th>
<th>31h</th>
<th>27.56%</th>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>14h</td>
<td>12.44%</td>
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<tr>
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<td>Self study:</td>
<td>67h 30m</td>
<td>60.00%</td>
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<tr>
<td>Module</td>
<td>Description</td>
<td>Learning time</td>
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| **Module 1. Introduction to structures** | 1.1. Concept of structure  
1.2. Steps for structural analysis  
1.3. Classification of structures  
1.4. Solution methods in structural analysis  
1.4.1. Force method  
1.4.2. Displacement method  
1.4.3. Comparison of force and displacement methods | **Learning time:** 7h  
Theory classes: 2h  
Laboratory classes: 1h  
Self study: 4h |
| **Module 2. Basic notions of the displacement method** | 2.1. Slope-deflection equations  
2.2. Particularization to non-sway structures  
2.3. Simplifications derived from symmetry conditions.  
2.4. Sway structures | **Learning time:** 27h 30m  
Theory classes: 6h 45m  
Laboratory classes: 3h  
Self study: 17h 45m |
3.2. Matrix form of the slope-deflection equations: the stiffness matrix.  
3.3. Transformation of coordinates  
3.4. Structural equilibrium in matrix form.  
3.5. Imposition of boundary conditions.  
3.6. Pin-ended beams  
3.7. Thermal effects. | **Learning time:** 21h 45m  
Theory classes: 6h 45m  
Laboratory classes: 3h  
Self study: 12h |
### Module 4. Introduction to industrial construction

**Learning time:** 23h 30m  
- Theory classes: 6h 45m  
- Laboratory classes: 3h  
- Self study: 13h 45m  

**Description:**  
4.1 Construction Processes  
4.2 Legal framework of construction processes

### Module 5. Basics on building systems: functions and characteristics

**Learning time:** 32h 45m  
- Theory classes: 8h 45m  
- Laboratory classes: 4h  
- Self study: 20h

**Description:**  
5.1 Foundations and Structures  
5.2 External closures: façades and roofs  
5.3 Interior elements  
5.4 Finishings

### Qualification system

1st exam "Structural theory", weight 40%  
Proposed activity "Structural theory", weight: 10%  
2nd exam "Industrial construction", weight: 40%  
Proposed activity "Industrial construction", weight: 10%  

The bad results of the partial examination will be able to recover with another test to realise the day fixed by the final examination. This test can access all the students enrolled that they have asked it with a minimum of 72 hours before.  
The qualification of the test will be between 0 and 10, and will substitute to the initial qualification always it will be upper.

### Bibliography

**Basic:**  