250222 - RESISMAT - Strength of Materials

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2017
Degree: BACHELOR'S DEGREE IN PUBLIC WORKS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6

Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: LUIS MIGUEL CERVERA RUIZ
Others: LUIS MIGUEL CERVERA RUIZ, JOSE MANUEL GONZALEZ LOPEZ, ANTONIA LARESE DE TETTO

Opening hours
Timetable: Tuesday 12:00 am to 14:00 pm Module C1
Thursday 12:00 am to 14:00 pm Module C1
and hours to be agreed with professors.

Degree competences to which the subject contributes

Specific:
3073. Ability to analyse and understand how the characteristics of structures influence their behaviour. Ability to apply knowledge of the resistance dynamics of structures in order to dimension them in accordance with existing regulations using analytical and numerical calculation methods

Transversal:
592. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
596. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
599. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
602. 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.
584. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Teaching methodology
The course consists of 4 hours a week of classes during the 15 weeks of the semester.
The approximate distribution of the 60 contact hours is:
15 hours of lectures devoted to the exposition of the concepts and basic materials for the course.
15 hours of practical sessions devoted to the presentation of examples and exercises and problems.
24 hours laboratory and directed activities devoted to practical exercises to consolidate the objectives of general and specific learning of the subject.
6 hours devoted to the evaluation tests.
Learning objectives of the subject

Students will learn to analyse how the characteristics of structures influence structural behaviour. They will also develop the skills to solve structural behaviour problems in the structural design process.

Upon completion of the course, students will have acquired the ability to: 1. Apply basic concepts of solid mechanics and theory of elasticity to basic structural problems. 2. Find laws of stress and deformation in structures by means of analytical calculation methods. 3. Find the stress distributions that generate the forces in sections of different types.

Basic concepts of strength of materials and structural engineering; Introduction to solid mechanics; Introduction to the theory of elasticity; Calculation of stresses and displacements derived from external forces; Laws of stress and deformation in isostatic structures; Sectional behaviour and stresses derived from the forces acting on a section (axial force, bending moment, shear force and torsion)

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Theory classes: 15h</th>
<th>10.00%</th>
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<tbody>
<tr>
<td></td>
<td>Practical classes: 15h</td>
<td>10.00%</td>
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<tr>
<td></td>
<td>Laboratory classes: 30h</td>
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<td></td>
<td>Guided activities: 6h</td>
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<td>Self study: 84h</td>
<td>56.00%</td>
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# Content

## Solid mechanics and elasticity theory

### Learning time: 38h 24m
- Theory classes: 4h
- Practical classes: 4h
- Laboratory classes: 8h
- Self study: 22h 24m

### Description:

Solid mechanics and elasticity theory. Problems
Solid mechanics and elasticity theory. Laboratory

## Fundamentals of Strength of Materials

### Learning time: 14h 23m
- Theory classes: 1h
- Practical classes: 1h
- Laboratory classes: 4h
- Self study: 8h 23m

### Description:

Fundamentals of Strength of Materials. Problems
Foundations of Strength of Materials. Laboratory

## Axial force

### Learning time: 9h 36m
- Theory classes: 1h
- Practical classes: 1h
- Laboratory classes: 2h
- Self study: 5h 36m

### Description:
Axial force in straight beams. Sections of several materials. Articulated structures: Isostatic and hyperstatic.

Axial force. Problems
Axial force. Laboratory
## Bending moment

<table>
<thead>
<tr>
<th><strong>Description:</strong></th>
<th><strong>Learning time:</strong> 48h</th>
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<tbody>
<tr>
<td>Bending moment. Laboratory</td>
<td>Practical classes: 6h</td>
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<tr>
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<td>Laboratory classes: 8h</td>
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<td>Self study: 28h</td>
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## Shear

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<tr>
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<th><strong>Learning time:</strong> 19h 12m</th>
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<tbody>
<tr>
<td>Shear. problems</td>
<td></td>
</tr>
<tr>
<td>Shear. Laboratory</td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
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<td></td>
<td>Self study: 11h 12m</td>
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## Torque

<table>
<thead>
<tr>
<th><strong>Description:</strong></th>
<th><strong>Learning time:</strong> 14h 23m</th>
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<tbody>
<tr>
<td>Torque. Problems</td>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td>Torque. Laboratory</td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study: 8h 23m</td>
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</table>
The final grade is the weighted average of the obtained periodic evaluation exercises (A), in the practical exercises in the practical classes and laboratories and guided activities (AD). Periodic evaluation (A) is obtained as: $A = 0.2 \times A1 + 0.4 \times A2 + 0.4 \times A3$, with A1, A2 and A3 the three periodic evaluations. If a grade equal to or greater than 5.0 in the periodic evaluation obvtiene, the final grade for the course is obtained as: $NF = 1.0 \times 0.2 \times AD$.

Criteria for re-evaluation qualification and eligibility: Students that failed the ordinary evaluation and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment tests due to certifiable force majeure will be ensured extraordinary evaluation periods.

These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

If you perform any of the ongoing evaluation activities and laboratory in the scheduled period will be considered as zero score.

**Bibliography**

**Basic:**


**Complementary:**


