240635 - Extension in Strength of Materials

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 737 - RMEE - Department of Strength of Materials and Structural Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 4,5
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: Francesc Roure Fernández

Degree competences to which the subject contributes

Specific:
3. Knowledge and capacities to apply fundamentals of materials' elasticity and resistance to the behaviour of real solids.
2. Knowledge and capacities to calculate, design and test machines.
1. Knowledge and capacity to calculate and design industrial structures and buildings.

Teaching methodology
Theory and problems are combined in the classes: after presenting and developing a theme, problems related to it are presented and resolved.
Each student will have to realize 3 practical sessions in the laboratory (2 h each session).
Each student will have to do a work, with a team, that will be written and orally presented.

Learning objectives of the subject
Extending the knowledge in Strength of Materials to new type of parts and new material behaviours. After finishing the course the student has to be able to:
- Apply the general theory of bending to special sections, parts and cases.
- Use the Linear Elasticity Theory in polar and cylindrical coordinates to analyze axisymmetric components.
- Verify, calculate and optimize parts and components subjected to fatigue.
- Analyse and verify components made with composites (fibre reinforced resins).
- Establish the plastic behaviour of beams and bars.
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group:</th>
<th>0h</th>
<th>0.00%</th>
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<tr>
<td></td>
<td>Hours medium group:</td>
<td>45h</td>
<td>40.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
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<td></td>
<td>Guided activities:</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>67h 30m</td>
<td>60.00%</td>
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# 240635 - Extension in Strength of Materials

## Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time</th>
<th>Description</th>
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</table>
| **1.- Bending: Special cases** | **12h** | *Theory classes: 6h*  
*Self study : 6h*  

**Description:** Sections made of different materials. Reinforced concrete sections. Pieces with small radius of curvature. |
| **2.- Axisymmetric components** | **18h** | *Theory classes: 9h*  
*Self study : 9h*  

**Description:** Linear Elasticity in polar and cylindrical coordinates. Analysis of discs. Analysis of pipes. Analysis of tanks subjected to internal pressure. |
| **3.- Fatigue** | **18h** | *Theory classes: 9h*  
*Self study : 9h*  

**Description:** Fatigue failure process. Analysis of parts subjected to fatigue. S - N curves. The Influence of different factors. E - N curves. Linear fracture mechanics. |
| **4.- Anisotropic materials: Composites** | **18h** | *Theory classes: 9h*  
*Self study : 9h*  

| **5.- Plasticity** | **12h** | *Theory classes: 6h*  
*Self study : 6h*  

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**Laboratory**

<table>
<thead>
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<th>Learning time: 8h</th>
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<tr>
<td>Laboratory classes: 6h</td>
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<td>Self study: 2h</td>
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**Description:**
There will be 3 sessions in the Laboratory (2 h each):
- Analysis and measurement of stresses and displacements in a sandwich panel subjected to bending.
- Analysis and measurement of stresses in a tank subjected to internal pressure.
- Plastic bending of a metallic beam.

**Qualification system**

Final Mark = 0.6 NE + 0.1 NL + 0.3 NTR

NE: Final Exam Mark
NL: Laboratory Mark (3 points attendance, 7 points written reports)
NTR: Work Mark

**Regulations for carrying out activities**

Will be published before each test

**Bibliography**

**Basic:**


