240372 - Mechanical Properties of Materials

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2019
Degree: BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Spanish

Teaching staff
Coordinator: Llanes Pitarch, Luis Miguel
Others: Santana Perez, Orlando Onofre
Maspoch Ruldua, Maria Lluïsa

Degree competences to which the subject contributes

Specific:
CE9. Knowledge of science, technology and materials' chemistry fundamentals. Understanding the relation between microstructure, synthesis or processing and materials' properties.
CEM1. Knowledge on several types of materials' structure, as well as analysis characterisation and techniques of materials.
CEM2. Knowledge on mechanical, electronic, chemical and biologic behaviour of materials, and capacity to apply this behaviour into design, calculation and modelling of aspects of elements, components and equipment.

Teaching methodology

Lectures on theoretical and problem-solving issues are given throughout the course. Evaluation is done on the basis of written exams and oral presentations of proposed activities.

Learning objectives of the subject

The main objective of the course is that student understands the importance of structure - mechanical property correlation in the material selection process regarding structural applications, according to service conditions requirements. In doing so, basic concepts are given on mechanical response of materials, elastic deformation and plasticity, strengthening mechanisms, fracture, fatigue, and enviromental effects. In all the cases special emphasis is done on critical design parameters and selection of specific materials for each service condition.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 60h</th>
<th>Hours large group: 40h</th>
<th>66.67%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>33.33%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>0.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
<th>Learning time</th>
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</thead>
<tbody>
<tr>
<td><strong>1. Introduction</strong></td>
<td>Introduction: mechanical integrity, durability and reliability issues in structural applications. Mechanical response of structural materials: basic concepts of elasticity and plasticity.</td>
<td><strong>8h</strong></td>
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<tr>
<td><strong>4. Fatigue of materials</strong></td>
<td>Fatigue. Cyclic deformation and crack nucleation. Fatigue crack propagation. Design criteria against fatigue</td>
<td><strong>28h</strong></td>
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</tbody>
</table>
## 5. Environmental effects on the mechanical response of materials

**Learning time:** 12h
- Theory classes: 2h
- Practical classes: 2h
- Guided activities: 2h
- Self study: 6h

**Description:**
Environmental assisted cracking. Corrosión fatigue. Case studies.

## 6. Mechanical properties and fracture behavior of polymers and composites

**Learning time:** 20h
- Theory classes: 6h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 10h

**Description:**

### Qualification system

50% Final Exam + 30% Short (midterm) Tests + 10% Lab Reports + 10% Guided Activities.
In case the student fails the course, it is possible to do a re-assessment test, in a date fixed by the School (July). The re-assessment grade will be calculated as follows:

NF = 80% Re-assessment test + 10% Lab Reports + 10% Guided Activities.
Qualifications for Lab Reports and Guided Activities will be those obtained during the regular course.
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Bibliography

Basic:


Complementary:


Others resources:

Material docente disponible en ATENEA