Degree competences to which the subject contributes

Specific:
- CEMT-21. Knowledge of and the ability to apply the fundamentals of elasticity and strength of materials to the behaviour of real solids.
- CEMT-20. Knowledge of the mechanical, electronic, chemical and biological behaviour of materials, and the ability to apply it in designing, calculating and modelling aspects of elements, components and equipment.
- CEMT-24. Knowledge of and the capacity for the evaluation of the safety, durability and structural integrity of materials and components that are manufactured with these materials.

Transversal:
- 04 COE N2. 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.

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 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.
## Content

<table>
<thead>
<tr>
<th>1. Introduction</th>
<th>Learning time: 7h 30m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 1h 30m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 1h 30m</td>
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<tr>
<td></td>
<td>Self study: 4h 30m</td>
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</tbody>
</table>

**Description:**
Introduction: mechanical integrity, durability and reliability issues in structural applications.

<table>
<thead>
<tr>
<th>3. Fracture of materials</th>
<th>Learning time: 40h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
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<tr>
<td></td>
<td>Practical classes: 6h</td>
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<td></td>
<td>Laboratory classes: 4h</td>
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<td>Self study: 24h</td>
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</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th>3. Fatigue of materials</th>
<th>Learning time: 47h 30m</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 7h 30m</td>
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<td></td>
<td>Practical classes: 7h 30m</td>
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<td></td>
<td>Laboratory classes: 4h</td>
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<td>Self study: 28h 30m</td>
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</table>

**Description:**
Fatigue. Cyclic deformation and crack nucleation. Fatigue crack propagation. Design criteria against fatigue.

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<tr>
<th>4. Environmental effects on the mechanical response of materials.</th>
<th>Learning time: 20h</th>
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<tr>
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<td>Theory classes: 3h</td>
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<td>Practical classes: 3h</td>
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<td></td>
<td>Laboratory classes: 2h</td>
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<td>Self study: 12h</td>
</tr>
</tbody>
</table>

**Description:**
Environmental assisted cracking. Corrosión fatigue. Case studies.
### 5. High temperature mechanical response of materials.

**Learning time:** 7h 30m  
Theory classes: 1h 30m  
Practical classes: 1h 30m  
Self study: 4h 30m

**Description:**  
Creep. Relationship among temperature, stress and strain rate.  
Deformation mechanisms at high temperature.  
Superplasticity. Deformation mechanisms maps.

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

**Learning time:** 27h 30m  
Theory classes: 6h  
Practical classes: 3h  
Laboratory classes: 2h  
Self study: 16h 30m

**Description:**  

### Qualification system

50% Final Exam + 30% Short (midterm) Tests + 10% Lab Reports + 10% Guided Activities.  
If mean qualification of short tests is above 5, final exam becomes optional.  
In case the student fails the course, it is possible to do a re-assessment test, in a date fixed by the School.  
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.
Bibliography

Basic:


Complementary:


Others resources:

Supporting academic resources available at ATENEA