## Degree competences to which the subject contributes

### Specific:

- 4057. Understanding and mastery of the basic concepts of the general laws of mechanics and thermodynamics, and their application in solving engineering problems. Heat transfer and thermal matter and machines.

### Transversal:

- 588. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 1. Analyzing the world’s situation critically and systemically, while taking an interdisciplinary approach to sustainability and adhering to the principles of sustainable human development. Recognizing the social and environmental implications of a particular professional activity.
- 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 lectures, problem solving, practical (real-life problems) and evaluation. Within each theme, these classes are done consecutively, with a load of approximately 55% theory, 20% problem solving, 15% and 10% assessment of practical activities aimed.

## Learning objectives of the subject

Students will acquire advanced knowledge of the laws of thermodynamics for continuous media and learn how they apply to engineering disciplines such as fluid mechanics, mechanics of materials and structural theory and to technological problems.
Upon completion of the course, students will be able to:

1. Describe motion, deformation and stress;
2. Apply conservation equations to structural problems in hydraulics and geotechnics;
3. Model the behaviour of solid and fluid materials and interpret the results;
4. Solve problems involving heat transfer and heat engines.

Describing motion: Lagrange-Euler formulation; Deformations of a continuous medium and compatibility equations; Motion and deformations in cylindrical and spherical coordinates; Cauchy stress, postulates and equations; Mohr's circle stress analysis; Equations of conservation of mass, momentum and energy; Thermodynamics of continuous media; Conservation of energy; Heat transfer and heat engines; Fundamentals of constitutive equations; Theory of elasticity, plasticity, fracture criteria and viscoplasticity; Principle of virtual work; Constitutive behaviour of fluids; Fluid mechanics; Equations of motion; Turbulence

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 35h</th>
<th>23.33%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 13h</td>
<td>8.67%</td>
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<tr>
<td></td>
<td>Hours small group: 12h</td>
<td>8.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 6h</td>
<td>4.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 84h</td>
<td>56.00%</td>
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### Content

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<thead>
<tr>
<th><strong>Kinematics</strong></th>
<th><strong>Learning time:</strong> 14h 23m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 8h 23m</td>
</tr>
</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th><strong>Deformation</strong></th>
<th><strong>Learning time:</strong> 19h 12m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 11h 12m</td>
</tr>
</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th><strong>Tensions</strong></th>
<th><strong>Learning time:</strong> 19h 12m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 11h 12m</td>
</tr>
</tbody>
</table>

**Description:**
### Equations of conservation

**Learning time:** 19h 12m  
**Theory classes:** 5h  
**Practical classes:** 1h  
**Laboratory classes:** 2h  
**Self study:** 11h 12m

**Description:**

### Elasticity

**Learning time:** 24h  
**Theory classes:** 6h  
**Practical classes:** 2h  
**Laboratory classes:** 2h  
**Self study:** 14h

**Description:**

### Plasticity

**Learning time:** 12h  
**Theory classes:** 3h  
**Practical classes:** 1h  
**Laboratory classes:** 1h  
**Self study:** 7h

**Description:**

### Equations of conservation problems
Qualification system

The evaluation of the course will be based on three exams that will be throughout the course and a practical approach to a real problem. To pass, you must:

1. Obtain a mark higher or equal to 4 for each partial exam
2. Obtain an average of exams greater or equal to 5
3. Approve the practical work

Students who do not meet 1 and 2 may make a final examination of the entire course.

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.

Regulations for carrying out activities

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.
250327 - MECMEDCON - Continuum Mechanics

Bibliography

Basic:

Complementary:
MALVERN, L.E.. Introduction to the Mechanics of a Continuous Medium. Prentice-Hall,