Degree competences to which the subject contributes

Specific:
3056. Understanding and mastery of the basic concepts of the general laws of mechanics, thermodynamics and electromagnetic fields and waves, and their application in solving engineering problems.

Transversal:
591. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
597. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
600. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

Teaching methodology

On average, the course consists of 2(Th.) + 2(P) hours per week of classroom activity.

The 2(Th) hours are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 2(P) hours is devoted to solving practical problems in order to consolidate the general and specific learning objectives.

During the four weakly lecture hours there will be short gradable exercises.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

Learning objectives of the subject

Students will acquire advanced knowledge of physics of the general laws of thermodynamics, electromagnetism and fields and waves and of the fundamental principles upon which they are built. Students will also learn how these laws can be used to solve engineering problems.
On completion of the course, students will have acquired the ability to:
1. Infer general thermodynamic principles and apply them to basic engineering problems;
2. Infer and apply the concepts of fields and waves in engineering;
3. Solve practical electromagnetism problems.

Basic principles of thermodynamics, including the first and second laws, enthalpy and entropy, heat transmission and the basic concepts of kinetic theory of gases; Basic principles of wave propagation, in particular as applied to acoustic problems; Electromagnetism, including its applications in engineering

<table>
<thead>
<tr>
<th>Study load</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong> 150h</td>
</tr>
<tr>
<td>Theory classes:</td>
</tr>
<tr>
<td>28h</td>
</tr>
<tr>
<td>18.67%</td>
</tr>
<tr>
<td>Practical classes:</td>
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<tr>
<td>20h</td>
</tr>
<tr>
<td>13.33%</td>
</tr>
<tr>
<td>Laboratory classes:</td>
</tr>
<tr>
<td>12h</td>
</tr>
<tr>
<td>8.00%</td>
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<tr>
<td>Guided activities:</td>
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<tr>
<td>6h</td>
</tr>
<tr>
<td>4.00%</td>
</tr>
<tr>
<td>Self study:</td>
</tr>
<tr>
<td>84h</td>
</tr>
<tr>
<td>56.00%</td>
</tr>
</tbody>
</table>
## Content

### Continuum Media

**Learning time:** 19h 12m  
- Theory classes: 4h  
- Practical classes: 4h  
- Self study: 11h 12m

**Description:**
- Examples and problem solving  
- Examples and problem solving  
- Examples and problem solving

### Thermodynamics and heat transfer

**Learning time:** 43h 12m  
- Theory classes: 10h  
- Practical classes: 8h  
- Self study: 25h 12m

**Description:**
- Examples and problem solving  
- Examples and problem solving  
- Examples and problem solving  
- Examples and problem solving  
- Examples and problem solving  
- Examples and problem solving
### Mechanical oscillations and wave phenomena

**Learning time:** 64h 48m  
- Theory classes: 11h  
- Practical classes: 12h  
- Laboratory classes: 4h  
- Self study: 37h 48m

**Description:**  
- Examples and problem solving  
- Examples and problem solving  
  Energy, power and intensity of a wave. Spherical waves.  
- Examples and problem solving  
  Propagation on inhomogeneous media. Reflection, transmission and refraction.  
- Examples and problem solving  
- Examples and problem solving  
  Pressure waves in a solid, a liquid and a gas. Acoustic waves, sound. Intensity and scale of decibels. Standing waves and normal modes.  
- Examples and problem solving  
- Examples and problem solving  
  Treatment of experimental data  
- Speed of sound

### Electricity, circuits and experimental techniques

**Learning time:** 4h 48m  
- Laboratory classes: 2h  
- Self study: 2h 48m

**Description:**  
Electrical Circuits

### Evaluation

**Learning time:** 12h  
- Laboratory classes: 5h  
- Self study: 7h
Qualification system

The final mark is obtained from the weighted sum detailed below:

\[ N_{\text{FINAL}} = 0.30 \times N_{\text{T}} + 0.30 \times N_{\text{O}} + 0.30 \times N_{\text{C}} + 0.10 \times N_{\text{P}} \]

- \( N_{\text{T}} \): mark corresponding to 1st exam (thermodynamics and continuum media)
- \( N_{\text{O}} \): mark corresponding to 2nd exam (oscillations and wave phenomena)
- \( N_{\text{C}} \): mark corresponding to exercises and other activities made in the classroom during the course
- \( N_{\text{P}} \): marks lab reports

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

Not attending to any of the three programmed exams will result in a numerical mark of 0.0 for that particular exam. Under exceptional conditions (illness or professional activity, officially justified) an extra exam will be arranged.

Bibliography

Basic: