Degree competences to which the subject contributes

**Specific:**

1. (ENG) Comprensió i domini dels conceptes fonamentals sobre les lleis generals de camps, ones i electromagnetisme, i la seva aplicació per a la resolució de problemes propis de l¿enginyeria.

**Transversal:**

2. 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.

3. 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.

4. 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

The subject consists of two hours a week of face-to-face lessons in the classroom (large group) and two hours a week in a small group in which applied aspects are worked on. Small-group classes will be held in the physics laboratory or the classroom.

Learning objectives of the subject

On completion of the subject, students must be able to:

- Understand and use the basic principles of electric and magnetic fields.
- Understand wave magnitudes and apply them to the study of mechanical waves, sound and light.
- Handle laboratory instruments, collect data correctly, process these data and draw up a report.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong> 150h</td>
<td>30h</td>
<td>0h</td>
<td>30h</td>
<td>0h</td>
<td>90h</td>
</tr>
<tr>
<td></td>
<td>20.00%</td>
<td>0.00%</td>
<td>20.00%</td>
<td>0.00%</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## 1. ELECTRIC FIELDS

**Learning time:** 60h  
- Theory classes: 12h  
- Laboratory classes: 12h  
- Self study: 36h

**Description:**  
Coulomb's law, electric field, Gauss's law, electric potential. Capacitors, dielectrics. Electric current. Circuits.

**Related activities:**  
- Activity 1: Laboratory practicals  
- Activity 4: Continuous assessment test  
- Activity 7: Deliverables  
- Activity 8: Final exam

## 2. MAGNETIC FIELDS

**Learning time:** 40h  
- Theory classes: 8h  
- Laboratory classes: 8h  
- Self study: 24h

**Description:**  
Magnetic field, sources of magnetic fields, magnetic materials, Faraday's law of induction.

**Related activities:**  
- Activity 2: Laboratory practical  
- Activity 5: Continuous assessment test  
- Activity 7: Deliverables  
- Activity 8: Final exam

## 3. WAVES

**Learning time:** 50h  
- Theory classes: 10h  
- Laboratory classes: 10h  
- Self study: 30h

**Description:**  
Wave motion, sound waves and electromagnetic waves

**Related activities:**  
- Activity 3: Laboratory practicals  
- Activity 6: Continuous assessment test  
- Activity 7: Deliverables  
- Activity 8: Final exam
### Planning of activities

<table>
<thead>
<tr>
<th>Laboratory Practical</th>
<th>Hours: 10h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electric Fields</strong></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td>(Topic 1)</td>
<td>Self study: 6h</td>
</tr>
</tbody>
</table>

**Description:**
Two laboratory practicals in pairs, each lasting two hours. Students read the script beforehand and then draw up a sheet in which they record the experimental data.

**Support materials:**
- Practicals book (available on the ATENEA digital campus)
- Web page: http://www.epsem.upc.edu/practiquesfisica
- All the materials needed for the practical.

**Assessments:**
- Students draw up a report in pairs following the instructions given and they hand it in to the professor. The report is corrected and returned. Feedback is given in the next lesson. It makes up 40% of the laboratory mark.

**Specific objectives:**
- On completion of the activity, students must be able to:
  - Use the apparatus for the practical effectively.
  - Interpret the physical phenomena involved in the practical.

<table>
<thead>
<tr>
<th>Laboratory Practical</th>
<th>Hours: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Magnetic Fields</strong></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>(Topic 2)</td>
<td>Self study: 3h</td>
</tr>
</tbody>
</table>

**Description:**
Laboratory practical in pairs lasting two hours. Students read the script beforehand and then draw up a sheet in which they record the experimental data.

**Support materials:**
- Practicals book (available on the ATENEA digital campus)
- Web page: http://www.epsem.upc.edu/practiquesfisica
- All the materials needed for the practical.

**Assessments:**
- Students draw up a report in pairs following the instructions given and they hand it in to the professor. The report is corrected and returned. Feedback is given in the next lesson. It makes up 20% of the laboratory mark.

**Specific objectives:**
- On completion of the activity, students must be able to:
  - Use the apparatus for the practical effectively.
  - Interpret the physical phenomena involved in the practical.

<table>
<thead>
<tr>
<th>Laboratory Practical</th>
<th>Hours: 10h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Waves</strong></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td>(Topic 3)</td>
<td>Self study: 6h</td>
</tr>
</tbody>
</table>

**Description:**
Students carry out two practicals in pairs, in two 2-hour sessions. Student read the script beforehand and then draw up a sheet in which they record the experimental data.
### Individual Continuous Assessment

**Test: Electric Fields (Topic 1)**

**Description:**
Individual test in the classroom covering part of the theory on thermodynamics and exercises and problems related to the learning objectives.

**Support materials:**
Test paper and calculator.

**Descriptions of the assignments due and their relation to the assessment:**
The completed test represents 22% of the final mark.

**Specific objectives:**
On completion of the activity, students must be able to:
- Use the apparatus for the practical effectively.
- Interpret the physical phenomena involved in the practical.

**Hours:** 7h
- Theory classes: 2h
- Self study: 5h

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**Test: Magnetic Fields (Topic 2)**

**Description:**
Individual test in the classroom covering part of the theory on magnetic fields and exercises and problems related to the learning objectives.

**Support materials:**
Test paper and calculator.

**Descriptions of the assignments due and their relation to the assessment:**
The completed test represents 22% of the final mark.

**Specific objectives:**
On completion of the activity, students must be able to:
- Understand and use the basic principles of electric fields.

**Hours:** 7h
- Theory classes: 2h
- Self study: 5h
<table>
<thead>
<tr>
<th><strong>INDIVIDUAL CONTINUOUS ASSESSMENT TEST: WAVES (TOPIC 3)</strong></th>
<th><strong>Hours:</strong> 7h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Individual test in the classroom covering part of the theory on waves and exercises and problems related to the learning objectives.</td>
<td><strong>Theory classes:</strong> 2h</td>
</tr>
<tr>
<td><strong>Support materials:</strong> Test paper and calculator.</td>
<td><strong>Self study:</strong> 5h</td>
</tr>
</tbody>
</table>

**Descriptions of the assignments due and their relation to the assessment:**
- The completed test
  - It represents 22% of the final mark.

**Specific objectives:**
- On completion of the activity, students must be able to:
  - Understand and use the basic principles of waves.

<table>
<thead>
<tr>
<th><strong>DELIBERABLES (TOPICS 1, 2 AND 3)</strong></th>
<th><strong>Hours:</strong> 13h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> A set of individual or group deliverables covering part of the theory of the subject and exercises and problems related to the learning objectives.</td>
<td><strong>Laboratory classes:</strong> 3h</td>
</tr>
<tr>
<td><strong>Support materials:</strong> Instructions.</td>
<td><strong>Self study:</strong> 10h</td>
</tr>
</tbody>
</table>

**Descriptions of the assignments due and their relation to the assessment:**
- Solution of the problems
  - 9% of the final mark

**Specific objectives:**
- On completion of the activity, students must be able to:
  - Understand and use the basic principles of electric fields, magnetic fields and waves, work independently and in a team and communicate results effectively.

<table>
<thead>
<tr>
<th><strong>FINAL EXAM (TOPICS 1, 2 AND 3)</strong></th>
<th><strong>Hours:</strong> 13h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Individual test in the classroom covering part of the theory of the subject and exercises and problems related to the learning objectives.</td>
<td><strong>Theory classes:</strong> 3h</td>
</tr>
<tr>
<td><strong>Support materials:</strong> Exam paper and calculator.</td>
<td><strong>Self study:</strong> 10h</td>
</tr>
</tbody>
</table>

**Descriptions of the assignments due and their relation to the assessment:**
- The completed exam
  - 66% of the final mark
Specific objectives:
On completion of the activity, students must be able to:
Understand and use the basic principles of electric fields, magnetic fields and waves.

Qualification system
Laboratory (activities 1, 2, 3 and 4) 25% of the final mark
Test on electric fields (Activity 4) 22% of the final mark
Test on magnetic fields (Activity 5) 22% of the final mark
Test on waves (Activity 6) 22% of the final mark
Deliverables (Activity 7) 9% of the final mark
Students who have passed the practicals but have not passed one of the three continuous assessment tests must take the part that is pending in the final exam.
Final exam 66% of the final mark

Regulations for carrying out activities
Students must have carried out the practicals competently to pass the subject.

Bibliography

Basic:

Complementary:

Others resources: