### Degree competences to which the subject contributes

**Transversal:**

1. **EFFECTIVE USE OF INFORMATION RESOURCES:** Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
2. **FOREIGN LANGUAGE:** Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

### Teaching methodology

- Lectures
- Application classes
- Problem deliveries
- Exams with short questions and problems
- Short oral presentations

### Learning objectives of the subject

**Learning objectives of the subject:**

The aim of this course is to teach students at an introductory level about the physical principles of semiconductor devices and offer them an overview about the reasons why semiconductor devices are the basis of the electronics industry. In particular we go in depth in the physical foundations, then we will present in detail diodes and bipolar transistors. Additionally, a brief description and analysis of fundamental properties of basic electron devices will be done.

**Learning results of the subject:**

- Ability to analyse and predict the general behaviour of semiconductor devices.
- Ability to quantify the electrical properties.
- Ability to obtain the different electrical models to be applied in circuit analysis and design.
<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>39h</th>
<th>31.20%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>86h</td>
<td>68.80%</td>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Learning time</th>
<th>Description</th>
</tr>
</thead>
</table>
| **1. Fundamentals**                       | 42h           | - Crystal structure  
- Atomic structure and wave properties  
- Energy bands  
- Carrier concentrations  
- Currents in semiconductors  
- The continuity equation |
| **2. P/N junctions**                      | 22h           | - Band diagram in thermal equilibrium  
- Electrostatics  
- Steady state I-V characteristics  
- Small signal model  
- Junction breakdown |
| **3. Bipolar junction transistor**        | 23h           | - The transistor effect  
- Band diagram  
- Common-base I-V characteristics  
- Ebers-Moll model  
- Small signal model  
- Non idealities |
**4. Other electron devices**

<table>
<thead>
<tr>
<th>Learning time: 6h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>Self study: 4h</td>
</tr>
</tbody>
</table>

**Description:**
- Description and analysis of basic optoelectronic devices like photoconductors, photodiodes, solar cells, LED's, lasers, TFT, etc.

---

**Planning of activities**

**SHORT ANSWER TEST (CONTROL)**

**Description:**
Mid term control.

**EXTENDED ANSWER TEST (FINAL EXAMINATION)**

**Description:**
Final examination.

---

**Qualification system**

Final examination: 45%
Partial examinations and controls: 45%
Oral presentation: 10%

---

**Bibliography**

**Basic:**
