295708 - PEMM - Electrical and Magnetic Properties of Materials

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2019
Degree: BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Spanish

Degree competences to which the subject contributes

Specific:
- CEM1. Knowledge on several types of materials' structure, as well as analysis characterisation and techniques of materials.
- CE9. Knowledge of science, technology and materials' chemistry fundaments. Understanding the relation between microstructure, synthesis or processing and materials' properties.
- 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.

Transversal:
- 04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Teaching methodology

During the course theory and problems, along with experimental demonstrations are taught. Several tests are performed, as well as a presentation and laboratory.

Learning objectives of the subject

The aim of the course is to help students acquire basic knowledge about the physical properties of materials. At the end of the course the student should be able to:
- Understand the basics of solid state physics as well as the behaviour of electrons in solids
- Classify materials according to their electrical behavior. Relate the macroscopic electrical behavior with the behavior of electrons in materials
- Distinguish the different magnetic responses of materials. Identify key parameters of ferro magnetic and ferrimagnetic materials
**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Learning time: 50h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group:</td>
<td>Theory classes: 12h</td>
</tr>
<tr>
<td>Hours medium group:</td>
<td>Practical classes: 8h</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>Self study: 30h</td>
</tr>
<tr>
<td>Guided activities:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>30.00%</td>
</tr>
<tr>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>15</td>
<td>10.00%</td>
</tr>
<tr>
<td>90</td>
<td>60.00%</td>
</tr>
</tbody>
</table>

**Content**

**UNIT I: Introduction to Solid State Physics**

- **Learning time: 50h**
  - Theory classes: 12h
  - Practical classes: 8h
  - Self study: 30h

**Description:**

**UNIT II: Electrical behavior of materials**

- **Learning time: 50h**
  - Theory classes: 12h
  - Practical classes: 8h
  - Self study: 30h

**Description:**

**UNIT III: Magnetic behavior of materials**

- **Learning time: 50h**
  - Theory classes: 12h
  - Practical classes: 8h
  - Self study: 30h

**Description:**
Types of magnetism. Curie temperature. Ferro and ferrimagnetic materials. Domains. superconductivity

**Qualification system**

Final Exam 50% + 30% Partial Tests + 5% presentation + 15% lab
NO reevaluation
Bibliography

Basic:


Complementary: