Course guides
295763 - 295EM123 - Functional Materials

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.
Degree: MASTER'S DEGREE IN MATERIALS SCIENCE AND ADVANCED MATERIALS ENGINEERING (Syllabus 2019).
(Optional subject).
Academic year: 2021  ECTS Credits: 6.0  Languages: Catalan, Spanish, English

LECTURER
Coordinating lecturer: EMILIO JIMENEZ PIQUÉ
Others:
Primer quadrimestre:
PABLO GUARDIA GIRÓS - Grup: T10
MIGUEL MORALES COMAS - Grup: T10

PRIOR SKILLS
Basic knowledge of materials science, chemistry and electrical, magnetic and optic properties of materials.

REQUIREMENTS
There are no requirements.

TEACHING METHODOLOGY
Expository and participatory classes
Work of analysis of practical cases and recent scientific publications with oral presentation.

LEARNING OBJECTIVES OF THE SUBJECT
The objective of this subject is to acquire fundamental knowledge about functional materials and their applications as well as the skills to solve conceptual problems for the challenges of current and future technologies within materials engineering field.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>28,0</td>
<td>18.67</td>
</tr>
<tr>
<td>Hours small group</td>
<td>14,0</td>
<td>9.33</td>
</tr>
<tr>
<td>Self study</td>
<td>102,0</td>
<td>68.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
## CONTENTS

### INTRODUCTION TO FUNCTIONAL MATERIALS

**Description:**

**Specific objectives:**
To learn basic concepts about functional materials including classification, types of materials and different methodologies to fabricate them and finally know some applications.

**Full-or-part-time:** 21h  
Practical classes: 5h  
Guided activities: 1h  
Self study: 15h

### MATERIALS FOR ELECTRIC APPLICATIONS

**Description:**

**Specific objectives:**
To learn basic concepts about electrical properties and phenomena, types of materials with electrical properties and study some applications.

**Related activities:**
Elaboration of a report and presentation about a topic provided by the teaching staff.

**Full-or-part-time:** 35h  
Practical classes: 9h  
Guided activities: 4h  
Self study: 22h

### MATERIALS FOR MAGNETIC APPLICATIONS

**Description:**
Fundamentals of magnetism and magnetic properties. Magnetic phenomena and physical origin. Materials with magnetic properties. Applications.

**Specific objectives:**
To learn basic concepts about magnetic properties and phenomena, types of materials with magnetic properties and study some applications.

**Full-or-part-time:** 31h  
Practical classes: 8h  
Guided activities: 1h  
Self study: 22h
MATERIALS FOR OPTIC APPLICATIONS

Description:

Specific objectives:
To learn basic concepts about optical properties and phenomena, types of materials with optical properties and study some applications.

Full-or-part-time: 25h
Practical classes: 6h
Guided activities: 1h
Self study : 18h

MATERIALS FOR ELECTROCHEMICAL APPLICATIONS

Description:

Specific objectives:
To learn basic concepts about electrochemistry, study some electrochemical devices and the properties of the materials involved. Review some fields of application.

Related activities:
Case study: Analyze a paper about materials for electrochemical applications.

Full-or-part-time: 38h
Theory classes: 25h
Practical classes: 10h
Guided activities: 3h

GRADING SYSTEM

NF = 0.5FEX + 0.2MEX + 0.2TF + 0.1CS
NF = Course Grade
FEX = Final-term exam
MEX = Mid-term exam
TF = Presentation
CS = Case study
If reevaluation is required, the mark of the final-term and mid-term exams will be substituted by the reevaluation exam mark.

EXAMINATION RULES.

The specific rules for conducting the tests will be suitably indicated in each of the tests to be performed.

BIBLIOGRAPHY

Basic:
- Nou llibre.
- Nou llibre.
RESOURCES

Other resources:
Support material for the lectures available at Atenea.