Course guide  
295750 - 295EM011 - Advanced Characterization of Materials  

Unit in charge: Barcelona East School of Engineering  
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.  
Degree:  
- ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Optional subject).  
- MASTER'S DEGREE IN MATERIALS SCIENCE AND ADVANCED MATERIALS ENGINEERING (Syllabus 2019). (Compulsory subject).  
- ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2021). (Optional subject).  

Academic year: 2022  
ECTS Credits: 6.0  
Languages: Spanish  

LECTURER  
Coordinating lecturer: JOSE M. MANERO PLANELLA  
Others:  
Primer quadrimestre:  
- JOSE MARIA MANERO PLANELLA - Grup: T10  
- MERITXELL MOLMENEU TRIAS - Grup: T10  
- MARTA PEGUEROLES NEYRA - Grup: T10  
- JOSEP ORIOL Rius Ayra - Grup: T10  
- ORLANDO ONOFRE SANTANA PEREZ - Grup: T10  

PRIOR SKILLS  
Knowledge of engineering materials, physics and chemistry  

REQUIREMENTS  

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES  
Specific:  
CEMCEAM-03. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones  

Transversal:  
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.  

TEACHING METHODOLOGY  
The classes will be taught in theoretical format, problems where the specific competences of the subject will be introduced. Face-to-face activities will be carried out to work on oral and written communication and teamwork.  

LEARNING OBJECTIVES OF THE SUBJECT  
The objective of the subject is that the student acquires knowledge of the different existing experimental techniques for the microstructural and physicochemical characterization of materials. Depending on the problem or needs of each case, the student must have sufficient criteria to select the most appropriate technique, as well as the interpretation of their results.
**STUDY LOAD**

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>6.0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>6.0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>42.0</td>
<td>28.00</td>
</tr>
<tr>
<td>Self study</td>
<td>96.0</td>
<td>64.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

**CONTENTS**

1. **Introduction. The concept of microstructure.**

   **Description:**

   **Specific objectives:**

   **Related activities:**
   Full-or-part-time: 4h
   Theory classes: 4h

2. **X-ray diffraction analysis of the crystalline structure**

   **Description:**

   **Full-or-part-time:** 3h
   Theory classes: 3h

3. **Contact angle in surface analysis**

   **Description:**

   **Specific objectives:**

   **Related activities:**
   Full-or-part-time: 5h
   Theory classes: 5h

Description:
Roughness evaluation. Techniques for roughness evaluation: perfilometry, AFM. What is porosity? Basic principles of the porosity techniques.

Specific objectives:

Related activities:

Full-or-part-time: 4h
Theory classes: 4h

5. Spectroscopic analysis of surface composition.

Description:
X-Ray Photoelectron Spectroscopy. Fourier transform infrared spectroscopy.

Specific objectives:

Related activities:

Full-or-part-time: 4h
Theory classes: 4h

ELECTRON MICROSCOPY OF MATERIALS: 6 Interaction of an electron beam with a specimen. The physics of the process.

Description:

Specific objectives:

Related activities:

Full-or-part-time: 4h
Theory classes: 4h

ELECTRON MICROSCOPY OF MATERIALS 7. Fundamentals and techniques.

Description:

Specific objectives:

Related activities:

Full-or-part-time: 4h
Theory classes: 4h
**ELECTRON MICROSCOPY OF MATERIALS: 8. Sample preparation.**

**Description:**

**Specific objectives:**

**Related activities:**

Full-or-part-time: 5h
Theory classes: 5h

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**ELECTRON MICROSCOPY OF MATERIALS: 9. Electron diffraction**

**Description:**

**Specific objectives:**

**Related activities:**

Practical exercises for the electron diffraction pattens

Full-or-part-time: 5h 30m
Theory classes: 5h 30m

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**ELECTRON MICROSCOPY OF MATERIALS: 10. Contrast theory and applications**

**Description:**

**Specific objectives:**

**Related activities:**

Full-or-part-time: 3h
Theory classes: 3h

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**GRADING SYSTEM**

The student’s grade will be: Final grade = 0.5 (1st partial exam) + 0.5 (2nd partial exam). In case of re-evaluation, the student’s grade will be: Final grade = Reevaluation exam.

The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)

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**EXAMINATION RULES.**
BIBLIOGRAPHY

Basic: