240EM024 - Metallurgical Technology

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2018
Degree: MASTER'S DEGREE IN MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Teaching unit Compulsory)
MASTER'S DEGREE IN MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Teaching unit Compulsory)
ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Teaching unit Optional)

ECTS credits: 4,5
Teaching languages: Spanish

Teaching staff
Coordinator: JOSE MARIA CABRERA MARRERO
Others: JOSE MARIA CABRERA MARRERO

Opening hours
Timetable: It is published at the beginning of the course depending on the rest of the professor’s teaching load. The professor can be contacted at any time via email or digital campus ATENEA

Prior skills
Mechanical behaviour of materials. Microstructural characterisation microestructural of materials

Requirements
Mechanical behaviour of materials. Microstructural characterisation microestructural of materials

Degree competences to which the subject contributes
Specific:
CEMCEM-02. (ENG) Dissenyar i desenvolupar productes, processos, sistemes i serveis, així com l’optimització d’altres ja desenvolupats, atenent a la selecció de materials per a aplicacions específiques
CEMCEM-03. (ENG) Aplicar métodes innovadors en la resolució de problemes i aplicacions informàtiques adequades, pel disseny, simulació, optimització i control de processos de producció i transformació de materials
CEMCEM-07. (ENG) Dissenyar, calcular i modelar aspectes relacionats amb els materials per a components mecànics, estructures i equips

Transversal:
01 EIN N2. ENTREPRENEURSHIP AND INNOVATION - Level 2. Taking initiatives that give rise to opportunities and to new products and solutions, doing so with a vision of process implementation and market understanding, and involving others in projects that have to be carried out.
02 SCS N2. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 2. Applying sustainability criteria and professional codes of conduct in the design and assessment of technological solutions.
06 URI N2. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have
The general objective of the lecture is to provide the necessary bases to understand the traditional manufacturing processes of metallic materials (casting, rolling, forging, extrusion, drawing, powder metallurgical techniques and welding). The student will also understand the interaction of the different processes with the starting microstructures and those obtained, as well as the correlation with the final mechanical properties. At the end of the course some sessions will be devoted to delineate modern metal forming processes.

The generic competences that the student will achieve will be a) ability to understand how to rationalize the manufacturing process of metallic materials, b) ability to develop manufacturing techniques and knowledge of characterization techniques, c) ability to work as a team in the pre-project and d) ability to communicate written and oral technique.

### Teaching methodology

The structure of the lecture is 4.5 credits. The discipline is taught 3.5 hours a week. At the end of each of the topics in which the subject is grouped a session is dedicated to solve problems. Throughout the course a work has to be done about how to make a concrete piece and it must be defended orally in class.

Given the eminently industrial nature of the subject, lectures are is complemented by visits to metallurgical companies of the surroundings.

The generic competences to be achieved by the students are:
- a) ability to understand how to rationalize the manufacturing process of metallic materials,
- b) ability to develop manufacturing techniques and knowledge of characterization techniques,
- c) ability to work as a team in a directed work and
- d) written and oral communication skills

### Learning objectives of the subject

The general objective of the lecture is to provide the necessary bases to understand the traditional manufacturing processes of metallic materials (casting, rolling, forging, extrusion, drawing, powder metallurgical techniques and welding). The student will also understand the interaction of the different processes with the starting microstructures and those obtained, as well as the correlation with the final mechanical properties. At the end of the course some sessions will be devoted to delineate modern metal forming processes.

The generic competences that the student will achieve will be:
- a) ability to understand how to rationalize the manufacturing process of metal parts,
- b) ability to develop manufacturing techniques and knowledge of characterization techniques,
- c) ability to work as a team in the pre-project and
- d) ability to communicate written and oral technique.

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group: 27h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 13h 30m</td>
<td>12.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 72h</td>
<td>64.00%</td>
</tr>
</tbody>
</table>
### 240EM024 - Metallurgical Technology

<table>
<thead>
<tr>
<th>Content</th>
<th>Learning time: 3h</th>
<th>Learning time: 4h</th>
<th>Learning time: 3h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Solidification and Casting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>content english</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Learning time:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theory classes: 3h</td>
<td></td>
<td>Theory classes: 4h</td>
<td>Theory classes: 3h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elements of Plasticity Theory</th>
<th>Learning time: 4h</th>
<th>Learning time: 4h</th>
<th>Learning time: 3h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Learning time:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theory classes: 4h</td>
<td></td>
<td>Theory classes: 4h</td>
<td>Theory classes: 3h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Introduction to Forming Operations</th>
<th>Learning time: 4h</th>
<th>Learning time: 4h</th>
<th>Learning time: 3h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Learning time:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theory classes: 4h</td>
<td></td>
<td>Theory classes: 4h</td>
<td>Theory classes: 3h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rolling</th>
<th>Learning time: 3h</th>
<th>Learning time: 3h</th>
<th>Learning time: 3h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introduction and historical notes. Hot vs cold rolling. Basic mechanics of rolling. Rolling equipment Other rolling processes. Problems and defects of rolled products. Thermomechanical control during rolling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Learning time:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theory classes: 3h</td>
<td></td>
<td>Theory classes: 3h</td>
<td>Theory classes: 3h</td>
</tr>
</tbody>
</table>
### Forging

**Description:**
The Forging process. Forging methods. Types of equipment. Forge mechanics. The fiber. Forge defects

**Learning time:** 2h
- Theory classes: 2h

### Extrusion and Drawing

**Description:**

**Learning time:** 2h
- Theory classes: 2h

### Sheet forming

**Description:**

**Learning time:** 2h
- Theory classes: 2h

### Welding

**Description:**

**Learning time:** 2h
- Theory classes: 2h

### Powder Metallurgy

**Description:**

**Learning time:** 1h
- Theory classes: 1h
The final mark, $N_{\text{final}}$, will be calculated according to the following equation:

$$N_{\text{final}} = 0.80N_{\text{ef}} + 0.20N_{\text{defense}}$$

where $N_{\text{ef}}$ is the mark of the final exam, and $N_{\text{defense}}$ is the note of the work to be done during the course (65% based in the oral defense and 35% in the written report).

In the case of a reassessment exam, $N_{\text{ef}}$ will be replaced by the re-evaluation exam mark.

**Qualification system**

**Regulations for carrying out activities**

Students can only take a non-programmable calculator to the test. No notes or books are allowed.

**Bibliography**

**Basic:**


**Complementary:**
