Course guide
295751 - 295EM021 - Modern Manufacture of Metallic 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: JAIRO ALBERTO MUÑOZ BOLAÑOS

Others:

PRIOR SKILLS
Mechanical behaviour of materials. Microstructural characterisation microestructural of materials

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Specific:
CEMCEAM-01. (ENG) Dissenyar i desenvolupar productes, processos i sistemes, això com l'optimització d’altres ja desenvolupats, atenten a la selecció de materials per aplicacions específiques.
CEMCEAM-06. (ENG) Evaluar el tiempo de vida en servicio, la reutilización, la recuperación y el reciclaje de productos atendiendo a las características de los materiales que lo conforman

Transversal:
02 SCS. SUSTAINABILITY AND SOCIAL COMMITMENT. Being aware of and understanding the complexity of social and economic phenomena that characterize the welfare society. Having the ability to relate welfare to globalization and sustainability. Being able to make a balanced use of techniques, technology, the economy and sustainability.
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
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>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Self study</td>
<td>96,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>42,0</td>
<td>28.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Solidification and Casting**

Description: content english

Specific objectives:

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

**Elements of Plasticity Theory**

Description:

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

**Introduction to Forming Operations**

Description:

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

**Description:**
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

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

### Forging

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

**Full-or-part-time:** 2h  
Theory classes: 2h

### Extrusion and Drawing

**Description:**

**Full-or-part-time:** 2h  
Theory classes: 2h

### Sheet forming

**Description:**

**Full-or-part-time:** 2h  
Theory classes: 2h

### Welding

**Description:**

**Full-or-part-time:** 2h  
Theory classes: 2h
### Powder Metallurgy

**Description:**

**Full-or-part-time:** 1h
Theory classes: 1h

### New Processes

**Description:**
Incremental froming: symmetric and asymmetrical. Hydrofroming. Processes of Severe Plastic Deformation

**Full-or-part-time:** 2h
Theory classes: 2h

### GRADING SYSTEM

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

### BIBLIOGRAPHY

**Basic:**

**Complementary:**