Course guide
295707 - MEF - Physical Metallurgy

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.
Degree: BACHELOR’S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Compulsory subject).
Academic year: 2022

LECTURER

Coordinating lecturer:
JOSE ANTONIO BENITO PARAMO

Others:
Primer quadrimestre:
CASIMIR CASAS QUESADA - M21
CRISANTO JOSE VILLALOBOS - M21

Segon quadrimestre:
JOSE ANTONIO BENITO PARAMO - M11
CASIMIR CASAS QUESADA - M11
DANIEL GAUDE FUGAROLAS - M11

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge of science, technology and materials' chemistry fundamentals. Understanding the relation between microstructure, synthesis or processing and materials’ properties.
3. Knowledge and capacities to evaluate security, durability, and structural integrity of materials and components manufactured with these materials.

Transversal:
04 COE N1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.

TEACHING METHODOLOGY

During the course theoretical lectures, problems and laboratory sessions are given. Combined with independent learning practice, it will make possible to relate the knowledge acquired and to achieve the expected objectives. The lectures will be primarily theoretical dissertation while problems and practices will be participatory and cooperative. Two tests will be done, and laboratory practices and sessions of problems will be evaluated.

LEARNING OBJECTIVES OF THE SUBJECT

The aim of the subject is that the student acquires basic knowledge about the physical metallurgy involved in solidification and transformation in solid state of materials, and in particular of metals. At the end of the course the student should be capable of:
Identify and interpret equilibrium and no-equilibrium phase diagrams.
Identify, calculate and formulate the kinetics of the phase transformations.
Identify the major phase transformations.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Chapter I. Equilibrium diagrams**

*Description:* Equilibrium diagrams, Solid Solutions, Intermetallic phases. Binary, multicomponents and polyphasic systems.

*Related competencies:* CEM7. Knowledge and capacities to evaluate security, durability, and structural integrity of materials and components manufactured with these materials. CE9. Knowledge of science, technology and materials’ chemistry fundaments. Understanding the relation between microstructure, synthesis or processing and materials’ properties.

*Full-or-part-time:* 22h
- Theory classes: 7h
- Practical classes: 4h
- Self study: 11h

**Chapter II: Diffusion**


*Related competencies:* CEM7. Knowledge and capacities to evaluate security, durability, and structural integrity of materials and components manufactured with these materials. CE9. Knowledge of science, technology and materials’ chemistry fundaments. Understanding the relation between microstructure, synthesis or processing and materials’ properties.

*Full-or-part-time:* 26h
- Theory classes: 4h
- Practical classes: 2h
- Laboratory classes: 4h
- Self study: 16h
## Chapter III: Solidification

### Description:

### Related competencies:
- CEM7. Knowledge and capacities to evaluate security, durability, and structural integrity of materials and components manufactured with these materials.
- CE9. Knowledge of science, technology and materials' chemistry fundaments. Understanding the relation between microstructure, synthesis or processing and materials' properties.

### Full-or-part-time: 32h
- Theory classes: 6h
- Practical classes: 3h
- Laboratory classes: 4h
- Self study: 19h

## Chapter IV: Phase Transformations in solid state

### Description:

### Related competencies:
- CEM7. Knowledge and capacities to evaluate security, durability, and structural integrity of materials and components manufactured with these materials.
- CE9. Knowledge of science, technology and materials' chemistry fundaments. Understanding the relation between microstructure, synthesis or processing and materials' properties.

### Full-or-part-time: 41h
- Theory classes: 8h
- Practical classes: 3h
- Laboratory classes: 4h
- Self study: 26h

## Chapter V: Microstructural restoration

### Description:
Recovery. Recrystallization and Grain Growth (normal and abnormal)

### Related competencies:
- CEM7. Knowledge and capacities to evaluate security, durability, and structural integrity of materials and components manufactured with these materials.
- CE9. Knowledge of science, technology and materials' chemistry fundaments. Understanding the relation between microstructure, synthesis or processing and materials' properties.

### Full-or-part-time: 29h
- Theory classes: 5h
- Practical classes: 2h
- Laboratory classes: 4h
- Self study: 18h
GRADING SYSTEM

44% Final Exam + 20% Partial Exam + 18 % Practices (Activity 1) + 18% Problems (Activity 2)

THIS SUBJECT HAS NO RE-EVALUATION EXAMS.

BIBLIOGRAPHY

Basic:

RESOURCES

Other resources:
Extra docent material will be available at ATENEA digital campus.