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: 2023 ECTS Credits: 6.0 Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: CASIMIR CASAS QUESADA

Others: Primer quadrimestre:
CASIMIR CASAS QUESADA - Grup: M21, Grup: M22
JOSEP ORIOL RIUS AYRA - Grup: M22
BLAS SORITA LLEDO - Grup: M22

Segon quadrimestre:
PERE BARRIOBERO VILA - Grup: M11, Grup: M12
CASIMIR CASAS QUESADA - Grup: M11, Grup: M12
JOSEP ORIOL RIUS AYRA - Grup: M11, Grup: M12

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 non-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>Guided activities</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<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>
</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:
CE9. Knowledge of science, technology and materials' chemistry fundaments. Understanding the relation between microstructure, synthesis or processing and materials' properties.
CEM7. Knowledge and capacities to evaluate security, durability, and structural integrity of materials and components manufactured with these materials.

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

Chapter II: Diffusion

Description:

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

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

Description:

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

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

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

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.