295707 - MEF - Physical Metallurgy

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2018
Degree: BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: JOSE MARIA CABRERA MARRERO
Others: Cabrera Marrero, Jose Maria

Degree competences to which the subject contributes

Specific:
1. Knowledge of science, technology and materials' chemistry fundaments. 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>Total learning time: 150h</th>
<th>Hours large group: 45h</th>
<th>30.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>10.00%</td>
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<td></td>
<td>Guided activities: 90h</td>
<td>60.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Learning time</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Chapter I. Equilibrium diagrams</strong></td>
<td>22h</td>
<td>Equilibrium diagrams, Solid Solutions, Intermetallic phases. Binary, multicomponents and polyphasic systems.</td>
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<tr>
<td><strong>Chapter II: Diffusion</strong></td>
<td>26h</td>
<td>Diffusion en solid state. Diffusion coefficient. Diffusion equations. Diffusion mechanisms. Diffusion in alloys.</td>
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Chapter V: Microstructural restoration

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<tr>
<th>Learning time: 29h</th>
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<tbody>
<tr>
<td>Theory classes: 5h</td>
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<td>Practical classes: 2h</td>
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<tr>
<td>Laboratory classes: 4h</td>
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<td>Self study: 18h</td>
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Description:
Recovery. Recrystallization and Grain Growth (normal and abnormal)

Qualification system

50% Final Exam + 20% Partial Exam + 15% Practices (Activity 1) + 15% Problems (Activity 2)
In case of reevaluation:
80% Reevaluation exam + 10% Practices (Activity 1) + 10% Problems (Activity 2)
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)

Bibliography

Basic:

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