Course guide
295703 - MACE - Ceramic Materials

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: Spanish

LECTURER

Coordinating lecturer: MIGUEL MORALES COMAS

Others: Primer quadrimestre:
MIGUEL MORALES COMAS - Grup: M11, Grup: M12

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEI-09. Understand the fundamentals of materials science, technology and chemistry. Understand the relationship between the microstructure, synthesis or processing and the properties of materials.
CEMT-19. Knowledge of the structure of different types of materials, as well as material characterisation and analysis techniques.
CEMT-22. Knowledge and application of materials technology in the production, transformation, processing, selection, control, maintenance, recycling and storage of all types of materials.

Transversal:
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

TEACHING METHODOLOGY

Theoretical class in conjunction with Laboratory: sessions and autonomous learning exercises will be done. Two exams, a presentation and small exercises will be part of the grade. Theoretical class in conjunction with Laboratory: sessions and autonomous learning exercises will be done. Two exams, a presentation and small exercises will be part of the grade.

LEARNING OBJECTIVES OF THE SUBJECT

The objective of this subject is that the student will acquire the introductory knowledge and skills over structure, properties, processing, design and in-service response of traditional and advanced ceramic materials. At the end of the course the student should be able to:
- Identify the main crystallographic structures and microstructures of ceramic materials
- Identify the main defects in ceramics, as well as formulate the main reactions between them
- Select the optimal processing route of ceramic components
- Design to optimize the structural integrity and reliability of ceramic devices.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15.0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45.0</td>
<td>30.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>90.0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Introduction to ceramic materials**

**Description:**

**Full-or-part-time:** 15h
- Theory classes: 6h
- Practical classes: 1h
- Laboratory classes: 2h
- Self study: 6h

**Crystallographic defects in ceramics**

**Description:**

**Full-or-part-time:** 13h
- Theory classes: 4h
- Practical classes: 1h
- Self study: 8h

**Microstructure and Phase Equilibrium**

**Description:**
Ceramic phase diagrams. Phases out of equilibrium. TTT curves and glass formation. Ceramic Microstructures

**Full-or-part-time:** 10h
- Theory classes: 2h
- Practical classes: 2h
- Self study: 6h
<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Full-or-part-time</th>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Laboratory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design, mechanical properties and reliability</td>
<td>Design issues. Mechanical properties. Toughness and reliability of ceramics. Weibul statistics Hardness and wear.</td>
<td>21h</td>
<td>5h</td>
<td>1h</td>
<td>2h</td>
<td>13h</td>
</tr>
<tr>
<td>Thermo-mechanical behaviour</td>
<td>Thermal properties. Thermo-mechanics: thermal shock and creep.</td>
<td>8h 30m</td>
<td>1h</td>
<td>1h</td>
<td>2h</td>
<td>4h 30m</td>
</tr>
<tr>
<td>Engineering applications</td>
<td>Engineering applications</td>
<td>11h</td>
<td>1h</td>
<td></td>
<td></td>
<td>10h</td>
</tr>
</tbody>
</table>

**GRADING SYSTEM**

60% Final Exam (15% Mid-term exam 1 + 45% Final-term exam 2) + 10 % laboratory + 30% quiz (12% presentation Lesson 2 + 18% presentation Final activity)

There will not be a reevaluation exam
BIBLIOGRAPHY

Basic:

Complementary: