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.

### 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.

### 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
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- Select the optimal processing route of ceramic components
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### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 45h</th>
<th>30.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
# 295703 - MACE - Ceramic Materials

## Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Introduction to ceramic materials**     | 15h           | Theory classes: 6h  
Practical classes: 1h  
Laboratory classes: 2h  
Guided activities: 0h  
Self study: 6h |
| **Crystallographic defects in ceramics**   | 13h           | Theory classes: 4h  
Practical classes: 1h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 8h |
| **Microstructure and Phase Equilibrium**   | 10h           | Theory classes: 2h  
Practical classes: 2h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 6h |
| **Processing Technology**                  | 34h           | Theory classes: 8h  
Practical classes: 1h  
Laboratory classes: 6h  
Guided activities: 0h  
Self study: 19h |

**Description:**  
- **Microstructure and Phase Equilibrium:** Ceramic phase diagrams. Phases out of equilibrium. TTT curves and glass formation. Ceramic Microstructures  
### Design, mechanical properties and reliability

**Learning time:** 21h  
- Theory classes: 5h  
- Practical classes: 1h  
- Laboratory classes: 2h  
- Guided activities: 0h  
- Self study: 13h

**Description:**  

### Thermo-mechanical behaviour

**Learning time:** 8h 30m  
- Theory classes: 1h  
- Practical classes: 1h  
- Laboratory classes: 2h  
- Guided activities: 0h  
- Self study: 4h 30m

**Description:**  
Thermal properties. Thermo-mechanics: thermal shock and creep.

### Engineering applications

**Learning time:** 11h  
- Theory classes: 0h  
- Practical classes: 1h  
- Laboratory classes: 0h  
- Guided activities: 0h  
- Self study: 10h

**Description:**  
Engineering applications

### Qualification system

50% Final Exam + 20% Mid-term exam + 10% laboratory (Activity 1) + 10% quiz (Activity 2) + 10% presentation (Activity 3)

There will not be a reevaluation exam.
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Bibliography

Basic:

Richerson, David W. Modern ceramic engineering: properties, processing, and use in design. 2nd ed. New York: Dekker,

9780387462707.


Complementary: