Course guide
295755 - 295EM033 - Advanced Ceramics

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.
Degree: MASTER'S DEGREE IN MATERIALS SCIENCE AND ADVANCED MATERIALS ENGINEERING (Syllabus 2019). (Compulsory subject).
ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2021). (Optional subject).

Academic year: 2022 ECTS Credits: 6.0 Languages: Spanish

LECTURER

Coordinating lecturer: Emilio Jiménez
Others: Maria Pau Ginebra

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEMCEAM-01. (ENG) Dissenyar i desenvolupar productes, processos i sistemes, això com l’optimització d’altres ja desenvolupats, atenent a la selecció de materials per aplicacions específiques.
CEMCEAM-02. (ENG) Aplicar mètodes innovadors per a el disseny, simulació, optimització i control de processos de producció y transformación de materiales
CEMCEAM-05. (ENG) Interpretar y aplicar normativas y especificaciones relativas a los materiales y sus aplicaciones

Transversal:
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

1.- Understand the microstructure and properties of advanced ceramics
2- Design optimal sintering and processing strategies to optimize properties
3- Select the best advanced ceramics for different applications
4- Understand the design requirements and the biological response to ceramics and glass for biomedical applications

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>6.0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>6.0</td>
<td>4.00</td>
</tr>
<tr>
<td>Self study</td>
<td>96.0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>42.0</td>
<td>28.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
# CONTENTS

## TOPIC 1 CERAMIC STRUCTURES AND MECHANICAL PROPERTIES

**Description:**

**Full-or-part-time:** 12h 30m  
Theory classes: 3h  
Laboratory classes: 1h  
Self study: 8h 30m

## TOPIC 2. SINTERING

**Description:**
Manufacturing: Dry routes. Wet routes. Colloids. Sintering, including FAST techniques. Monocrystals. 3D printing

**Full-or-part-time:** 25h  
Theory classes: 6h  
Laboratory classes: 2h  
Self study: 17h

## TOPIC 3. CERAMIC TYPES

**Description:**

**Full-or-part-time:** 25h  
Theory classes: 6h  
Laboratory classes: 2h  
Self study: 17h

## TOPIC 4: CERAMICS FOR STRUCTURAL PROSTHESIS

**Description:**
Dental ceramics. Dental implants. Ceramics for Joints. Reliability and mechanical considerations

**Full-or-part-time:** 25h  
Theory classes: 6h  
Laboratory classes: 2h  
Guided activities: 17h

## TOPIC 5. BIOLOGICAL CERAMICS: BIOMINERALS

**Description:**
Biomineralization. Structural characteristics and properties of biological ceramics. Bioceramics in biological tissues.

**Full-or-part-time:** 20h  
Theory classes: 3h  
Self study: 17h
TOPIC 6: BIOCERAMICS

Description:
Bioactive ceramics and resorbable ceramics. Glass and glass ceramic for biomedical applications. Biological characterization of bioceramics

Full-or-part-time: 63h 30m
Theory classes: 15h
Laboratory classes: 6h
Self study : 42h 30m

GRADING SYSTEM

BIBLIOGRAPHY

Basic:

Complementary: