

## Course guide

# 295759 - 295EM114 - Nanostructured Materials

Last modified: 08/08/2024

**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). (Optional subject).  
ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2021). (Optional subject).

**Academic year:** 2024    **ECTS Credits:** 6.0    **Languages:** English

### LECTURER

**Coordinating lecturer:** JOSE MARIA CABRERA MARRERO

**Others:** Primer quadrimestre:  
SEYED MAHMOOD FATEMI - Grup: T1

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

#### Specific:

CEMCEAM-01. (ENG) Dissenyar i desenvolupar productes, processos i sistemes, aixó com l'optimització d'altres ja desenvolupats, atenent a la selecció de materials per aplicacions específiques.

CEMCEAM-02. (ENG) Aplicar métodos innovadores para el diseño, simulación, optimización y control de procesos de producción y transformación de materiales

CEMCEAM-03. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones

### TEACHING METHODOLOGY

The structure of the lecture is 6 credits. Lessons are held for three hours a week. Within these hours, laboratory practices will be carried out, which given, the complexity of the equipment and infrastructure will generally be demonstrative. One of the lab sessions will consist on the practical application of the EBSD technique, which throughout the course must be applied to a specific case, and presented in writing at the end. Also, throughout the course, students, in groups of two or three, must carry out a bibliographic work, which they will explain, share and present orally and in writing at the end of the course.

The generic competences that the student will achieve will be a) ability to understand and rationalize the materials selection process, b) ability to develop manufacturing techniques and knowledge of characterization techniques, c) ability to work as a team in the pre-project and ) technical oral and written communication skills

### LEARNING OBJECTIVES OF THE SUBJECT

#### STUDY LOAD

Type	Hours	Percentage
Self study	108,0	72.00
Hours small group	14,0	9.33
Hours large group	28,0	18.67



Total learning time: 150 h

## CONTENTS

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### Introduction

**Description:**

Definitions. First approach to nanostructured materials

**Full-or-part-time:** 3h

Theory classes: 3h

### Mechanical properties

**Description:**

Mechanical properties: strength and ductility. Deformation mechanism

**Full-or-part-time:** 6h

Theory classes: 6h

### Microstructural characterization

**Description:**

Microstructural characterization applied to nanomaterials: EBSD, X-RAY diffraction, and others

**Full-or-part-time:** 6h 30m

Theory classes: 6h 30m

### Metalli glasses

**Description:**

Introduction, types, properties and synthesis

**Full-or-part-time:** 5h

Theory classes: 5h

### Processing routes: Bottom-up

**Description:**

Formation of clusters and nanoparticles from supersaturated vapour. Synthesis by chemical routes. Nanostructured materials sol-gel

**Full-or-part-time:** 7h

Theory classes: 7h



### Rutas de procesamiento: Top-Down

**Description:**

Rutas de procesamiento: Top-Down

**Full-or-part-time:** 8h

Theory classes: 8h

### Oral defense and guidance on the monographic work

**Description:**

Oral defense and guidance of the monographic work

**Full-or-part-time:** 8h 30m

Theory classes: 8h 30m

### Laboratory sessions

**Description:**

5 laboratory session on EBSD, metallic glasses, ECAP, Incremental forming, Mechanical Milling

**Full-or-part-time:** 10h

Theory classes: 10h

## GRADING SYSTEM

The final mark,  $N_{final}$ , will be calculated according to the following equation:

$$N_{final} = 0.65N_{ef} + 0.10N_{pract} + 0.25N_{defensa}$$

where  $N_{ef}$  is the mark obtained in the final exam,  $N_{pract}$  is the laboratory mark and  $N_{defensa}$  is the mark of the oral defense of a scientific work

No reevaluation exam will be provided