

# Course guide 240EM134 - 240EM134 - Nanotechnology

Last modified: 26/06/2025

Academic year: 2025	ECTS Credits: 4.5 Languages: English		
Degree:	ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Optional subject).		
Unit in charge: Teaching unit:	Barcelona East School of Engineering 702 - CEM - Department of Materials Science and Engineering.		

### **LECTURER**

Coordinating lecturer: CRISANTO JOSE VILLALOBOS

Others:

### REQUIREMENTS

Mechanical behaviour of materials. Microstructural behavior of materials

### **DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES**

#### Specific:

CEMCEM-07. (ENG) Dissenyar, calcular i modelar aspectes relacionats amb els materials per a components mecànics, estructures i equips

#### Transversal:

03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

### **TEACHING METHODOLOGY**

The structure of the subject is of 4.5 credits. Classes of the discipline occur during three hours a week. One of these hours will be dedicated to the accomplishment of practices and the reading, explanation and putting in common of articles and published scientific works in the area, which will complement with work of library and scientific research. All these activities will be presented in class the last days of the course. The generic competitions that the student will reach will be a) capacity to understand and to rationalize the process of selection of materials, b) capacity to develop manufacturing techniques and knowledge of characterization techniques, c) capacity to work in equipment and e) capacity of communication written and oral technique

# LEARNING OBJECTIVES OF THE SUBJECT

The general aim of the lectures is to provide the necessary bases to understand nanomaterials from the point of view of their synthesis, their properties and their applications. Since materials on this scale display new and mproved characteristics in relation to traditional materials, the lecture will be focused in the description of these new properties and how obtaining nanoestructured materials. The generic competences that the student will reach will be a) capacity to understand and rationalize the process of selection of materials, b) capacity to develop manufacturing techniques and knowledge of characterization techniques, c) capacity to work in equipment and e) capacity of written and oral technique communication



### **STUDY LOAD**

Туре	Hours	Percentage
Hours large group	27,0	24.00
Self study	72,0	64.00
Hours small group	13,5	12.00

Total learning time: 112.5 h

# **CONTENTS**

### Introduction

### **Description:**

Definitions. First approach to nanostructured materials

# Full-or-part-time: 2h

Practical classes: 2h

### **Mechanical properties**

### **Description:**

Mechanical properties: strength and ductility. Deformation mechanism

# **Full-or-part-time:** 5h Practical classes: 5h

### Microstructural characterization: EBSD

**Description:** Microstructural characterization applied to nanomaterials: EBSD

Full-or-part-time: 3h 30m Practical classes: 3h 30m

### Metallic glasses

**Description:** Introduction, types, properties and synthesis

**Full-or-part-time:** 2h Practical classes: 2h



### **Processing routes: Bottom-up**

### **Description:**

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

Full-or-part-time: 3h 30m

Practical classes: 3h 30m

### Processing routes: Top-Down

**Description:** Severe plastic deformation and mechanical milling

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

### Oral defense and guidance on the monographic work

**Description:** Oral defense and guidance of the monographic work

Full-or-part-time: 6h Practical classes: 6h

### **GRADING SYSTEM**

The final mark, Nfinal, will be calculated according to the following equation:

Nfinal= 0.65Nef + 0.20Npract + 0.15Ndefensa

where Nef is the mark obtained in the final exam, Npract is the laboratory mark and Ndefensa is the mark of the oral defense of a scientifical work

In case of reevaluation, Nef will be substitued by the reevaluation exam mark