Course guide
295759 - 295EM114 - Nanostructured Materials

Last modified: 04/06/2026

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: 2026 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: JOSE MARIA CABRERA MARRERO

Others: Primer quadrimestre:
SEYED MAHMOOD FATEMI - Grup: T1
ELOY PINEDA SOLER - Grup: T1

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 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

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 difraction, 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. Nanoestructured 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

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

The final mark, Nfinal, will be calculated according to the following equation:
Nfinal= 0.65Nef + 0.10Npract + 0.25Ndefensa
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
No reevaluation exam will be provided