60030 - Material science

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	538 - Master's in Physics and Physical Technologies
ECTS	5.0
Year	1
Semester	First semester
Subject Type	Optional
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The course describes the relationship between the structure and microstructure of the materials and their macroscopic properties. This is a multidisciplinary course that includes applied physics, chemistry and materials engineering. Emphasis will be made on the relationship between structure, microstructure and properties of the materials, and how is possible to tailor some properties of the materials by introducing the adequate changes in the microstructure. Other complementary courses of the Master's degree to the present one are "Advanced topics in Physics", and "Nanoscience and Nanotechnology".

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5.2.Learning tasks

The course includes the following learning tasks:

1. Lectures (3h/week)
2. Practice sessions (4 sessions of 3.5h each)
3. Student autonomous work (individual or in group) on solving proposed exercises.
4. Study, and an oral presentation and class discussion, of selected topics.

5.3.Syllabus

The course will address the following topics:

Lectures

1. Introduction. Structure and microstructure. Basics of crystallography. Basic crystal structures in metals and ceramics. Defects in solids.
2. Diffusion in solids.
3. Phase diagrams. Transformations in phase diagrams. Examples.
4. Metals.
5. Ceramics.
6. Polymers.
7. Composites and Novel materials.
8. Materials surface characterization techniques. Nanoindentation. Surface tomography. Spectroscopic surface characterization techniques.

Laboratory work

1. Microscopic techniques.
2. Phase transformation in Fe and Al alloys.
3. Use of CES Selector materials selection software.
4. Experimental techniques for surface analysis: XPS, AES, nano- hardness and confocal microscopy.

5.4.Course planning and calendar

Further information concerning the timetable, classroom, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Faculty of Science http://ciencias.unizar.es/

5.5.Bibliography and recommended resources