60030 - Material science

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	538 - Master's in Physics and Physical Technologies
ECTS	5.0
Course	1
Period	First semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The course describes the relationship between the structure and microstructure of the materials and their macroscopic properties. This is a multidisciplinary course including 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 courses of the Master complementary to the present one are "Advanced topics in Physics", and "Nanoscience and Nanotechnology".

5.2.Learning activities

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Learning activities

1. Lecture classes (3h/week)
2. Practical classes (4 sessions of 3.5h each)
3. Student personal (or by group) work on solving proposed exercises.
4. Study, and oral exposition and discussion with the class, of selected topics.

5.3.Program

Lecture classes are composed of the following contents:

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 is composed of the following contents:

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.Planning and scheduling

The final calendar will be announced.

5.5.Bibliography and recomended resources