

Academic Year/course: 2022/23

60030 - Material science

Syllabus Information

Academic Year: 2022/23

Subject: 60030 - Material science

Faculty / School: 100 - Facultad de Ciencias

Degree: 538 - Master's in Physics and Physical Technologies

589 - Master's in Physics and Physical Technologies

ECTS: 5.0

Year: 1

Semester: First semester

Subject Type: Optional

Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. 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".

4.2. 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.

The teaching and assessment activities will be carried out in person unless, due to the health situation, the provisions issued by the competent authorities and by the University of Zaragoza require them to be carried out telematically.

4.3. 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.

4.4. 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/>

4.5. Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=60030&year=2019