

29712 - Fundamentals of Engineering Materials

Syllabus Information

Academic year: 2024/25

Subject: 29712 - Fundamentals of Engineering Materials

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 330 - Complementos de formación Máster/Doctorado
434 - Bachelor's Degree in Mechanical Engineering

ECTS: 6.0

Year: 434 - Bachelor's Degree in Mechanical Engineering: 2

330 - Complementos de formación Máster/Doctorado: XX

Semester: First semester

Subject type: 434 - Compulsory

330 - ENG/Complementos de Formación

Module:

1. General information

The objectives of Fundamentals of Materials Engineering are: (1) that the student knows the basic concepts associated with the microstructure of materials, their properties and the main families of materials, and (2) that knows how to perform the tests to determine the most important mechanical properties.

The concepts learned in this subject will serve as a basis for other subjects that appear later in the degree curriculum, in particular Materials Technology (second semester of the same year), and Manufacturing Technologies I and II (third year).

2. Learning results

1. Know the fundamental aspects of the structure of materials commonly used in engineering.
2. Know the main properties of the different types of materials as well as the relationships between them and the microstructural characteristics of these.
3. Know how to perform basic mechanical tests (tensile, hardness, Charpy) and, from the results obtained from them, calculate the values of the corresponding mechanical properties.
4. Have sufficient criteria to be able to select, in a reasoned manner, the most suitable materials for a given practical application.
5. Know how to solve simple problems in the field of Materials Science and Technology.

3. Syllabus

Block A. Study and understanding of the basic concepts associated with the microstructure of a material

- A1. Crystalline structures
- A2. Crystalline imperfections and diffusion
- A3. Equilibrium phase diagrams
- A4. Phase transformations

Block B. Correlation of the properties of a material with its microstructure

- B1. Mechanical properties and deformation mechanisms
- B2. Fracture mechanisms
- B3. Heat treatment of steels
- B4. Physical properties of materials

Block C. Study of the main groups of materials

- C1. Metals and their alloys
- C2. Ceramics
- C3. Polymers
- C4. Composed materials

4. Academic activities

The subject has been planned to facilitate continuous and active student learning. The activities that will use to promote this process, and their approximate duration, are:

1. Theory classes taught by the teacher to the entire group (30 hours).
2. Problem classes (15 hours), in which small groups work on the exercises proposed by the teacher with in advance.
3. Laboratory practices (15 hours: 4 laboratory sessions of 3 hours, plus 3 hours of tutorials and seminars).
4. Tutorials, in which the student can consult the professor about any aspect related to the subject.
5. Student's autonomous work (90 hours).

All these resources will be supported by the teaching material available in the ADD.

5. Assessment system

The subject will be evaluated in the **global** assessment modality by means of a single exam per session, which consists of of two tests:

- **First test** (70% of the grade, required to obtain a minimum of 4 out of 10) It consists of a written exam with short questions and problems.

- **Second test** (30% of the grade, required to obtain a minimum of 4 out of 10) The qualification of the second test can be achieved by two routes:

Option 1: Performance of a practical laboratory examination. This exam will consist of a practical part, in which the student will perform in the Practical Laboratory the experiments indicated by the teacher, and a written part, which will refer to the contents, development and experimental results of the practical part.

Option 2: Positive assessment of the teaching activities corresponding to the practices. To be eligible for this assessment the student must meet the following requirements:

- i) to have attended the four practice sessions,
- ii) to have submitted the four reports within the period indicated,
- iii) have taken the written practical examination and obtained a grade of at least 4 out of 10. In case of fulfilling the requirements of sections i) and ii) but not having obtained the minimum of 4/10 in the exam, the student may choose to take the writtenpart of the second test in the global assessment.

6. Sustainable Development Goals

7 - Affordable and Clean Energy

9 - Industry, Innovation and Infrastructure

12 - Responsible Production and Consumption