

## 29918 - Materials Engineering

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 29918 - Materials Engineering

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 435 - Bachelor's Degree in Chemical Engineering

**ECTS:** 6.0

**Year:** 2

**Semester:** Second semester

**Subject type:** Compulsory

**Module:**

### 1. General information

The main goal of the subject is that the student knows the properties and characteristics of different materials in order to be able to make a reasoned decision as to which material is the most suitable for a given application. It will be of great importance that the student knows and understand how to apply the main mechanisms to modify the constitution and structure of materials and, thus, achieve the optimization of their properties. The student will have to develop his or her capacity for continuous and autonomous learning, to manage and relate information and to reason critically and with initiative. Sustainable Development Goal 12: ensure sustainable consumption and production patterns. Objective 12.5: by 2030, significantly reduce waste generation through prevention, reduction, recycling and reuse).

### 2. Learning results

The student, in order to pass this subject, must demonstrate that:

- Learn the fundamentals of the science, technology and chemistry of materials commonly used in engineering Industrial in general and Chemical Engineering in particular.
- Understand the relationships between microstructure and macroscopic properties of materials.
- Know how to apply knowledge of materials science, technology and chemistry to the choice and behavior of metallic, ceramic, polymeric and composite materials.
- Know and understand how to perform quality control tests on materials.
- Know the problems of degradation and corrosion of materials and the ways to protect them.

### 3. Syllabus

**Block A.** Study and understanding of the basic concepts of the microstructure of materials. Structure crystalline, imperfections, diffusion. Alloys and equilibrium diagrams. Iron-carbon diagram.

Phase transformations.

**Block B.** Materials testing and microstructure-properties correlation. Mechanical properties and deformation and fracture mechanisms. Tensile, hardness, impact and microscopic metallography tests.

Physical properties.

**Block C.** Metallic materials. Ferrous alloys: types, composition, microstructure, properties, applications, heat and thermochemical treatments. Non-ferrous alloys: types, composition, microstructure, properties and applications. Corrosion and methods for corrosion protection.

**Block D.** Ceramic, polymeric and composite materials. Types, composition, structure, properties and applications.

### 4. Academic activities

#### Face-to-face:

- 36 hours of lectures on theory, problem solving and case studies
- 12 hours of laboratory practice in a small group of students
- 3 hours of seminars and/or tutoring
- 1 hour of oral presentation
- 6 hours dedicated to written assessment activities
- academic tutoring (the hours the student attends tutoring)

#### Non-presential:

- 92 hours of student work distributed throughout the semester: personal study, problem solving and case studies, pre and post-laboratory work, material selection work, etc.

## 5. Assessment system

Global of three tests:

- **First** (70%). Written test of theoretical contents and problems, with a theoretical part in the form of a test and a part of problems. A minimum grade of 3/10 in the theoretical part and a minimum grade of 4/10 in the problems part will be required to average both parts.
- **Second** (20%). Completion of a theoretical-practical test of the part of the program that is carried out in laboratory practices.
- **Third** (10%). Written and/or oral test of selection of materials.

It will be necessary to achieve a minimum grade of 4/10 in each of the three tests to be able to average with the other two and pass the subject.

It is also possible to substitute two tests of the Global Assessment with the following activities:

- **Second** (20%). Continuous laboratory activities. Completion of 12 hours of laboratory practices during the term, together with previous questionnaires, reports and assessment tests, which will allow obtaining up to 100% of the points of the second global test.
- **Third** (10%). Written and/or oral work demonstrating the learning results on a given type of material, which will earn up to 100% of the points on the third overall test.