

## 25807 - Materials

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 25807 - Materials

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

**Degree:** 558 - Bachelor's Degree in Industrial Design and Product Development Engineering

**ECTS:** 6.0

**Year:** 1

**Semester:** Second semester

**Subject type:** Compulsory

**Module:**

### 1. General information

The main objective of this subject is for students to learn the basic fundamentals of materials science, the classification of the different families of materials, the classification of the different families of materials, their properties, applications and behavior in service, and the technology developed for the improvement of the properties of materials, in such a way that it allows any student to choose, in a first approximation, the most suitable material for each application.

These approaches and objectives are aligned with the Sustainable Development Goals

SDGS from the Agenda 2030 from United Nations

(<https://www.un.org/sustainabledevelopment/es/>), in particular, the learning activities foreseen in this subject will contribute to the achievement of objectives 9.5 and 9.b of Goal 9, and objective 13.3 of Goal 13.

### 2. Learning results

In order to pass this subject, the students shall demonstrate they has acquired the following results:

1. Understand the relationship between: Structure-Properties-Processing-Behavior at service.
2. To know the differentiating criteria for the "classification" of the different families of materials (metallic, ceramic, polymeric and composite) according to their structure and properties.
3. To be able to relate the properties of materials with the structure and/or microstructure they present.
4. To be able to relate the properties of materials to applications, and their behavior in service.
5. Know how to determine, in the first instance, which is the most suitable material for a specific application.

### 3. Syllabus

1. Introduction
2. Mechanical properties. Quality control of materials
3. Theoretical fundamentals of solid state
4. Hardening
5. Metallic materials
  1. Iron-carbon alloys
  2. Classification of steels. Heat treatment
  3. Light alloys: Al, Mg and Ti and heavy: Cu
6. Ceramic materials
7. Polymeric materials
8. Composite materials
9. Corrosion
  1. Tensile tests on metals and polymers
  2. Brinell, Vickers, Rockwell and Shore hardness tests
  3. Deformation and recrystallization tests on copper
  4. Metallography and hardening tests on steels
  5. Charpy Assays
  6. Thermal shock tests on glass

## 4. Academic activities

- Lectures: 42 hours. The contents of the subject will be presented, with a practical orientation towards the application of materials in product design.
- Practical laboratory classes: 12 hours, with 6 sessions of 2 hours each.
- Resolution and presentation of papers: 30 hours, including subject and module work.
- Personal study. 61 hours.
- Passing of tests: 5 hours.

## 5. Assessment system

The subject will be evaluated in the **global assessment** modality by means of the following activities:

**Intermediate tests** (10% of the grade, minimum 4 out of 10).

They will consist of theoretical and practical teaching assignments.

**Module work** (10% of the grade, minimum 4 out of 10).

In both cases the following aspects will be evaluated:

1. Request analysis
2. Development and assessment of different solutions
3. Justification of the chosen option
4. Innovation and creativity
5. Environmental assessment of the product
6. Ability to convey conclusions.

**Laboratory practicals** (10% of the grade, minimum 4 out of 10). They will be evaluated by the completion of questionnaires related to the practice performed.

**60-multiple-choice exam** (70% of the grade, minimum 4 out of 10), with only one valid answer out of four possible answers. Questions will cover the entire syllabus and special emphasis will be placed on practical applications. Missed answers subtract points, so four incorrect answers cancel out one correct answer. Unanswered questions do not affect the grade.

To pass the test it is necessary to have 40 correct answers (after subtracting the incorrect ones).

If the student has not passed any of these activities during the semester, they will have the opportunity to pass the subject by means of a global test in the two official exam calls.