

## 30010 - Material Engineering: the Basics

### Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	436 - Bachelor's Degree in Industrial Engineering Technology
ECTS	6.0
Year	2
Semester	First semester
Subject Type	Compulsory
Module	---

### **1.General information**

#### **1.1.Introduction**

#### **1.2.Recommendations to take this course**

#### **1.3.Context and importance of this course in the degree**

#### **1.4.Activities and key dates**

### **2.Learning goals**

#### **2.1.Learning goals**

#### **2.2.Importance of learning goals**

### **3.Aims of the course and competences**

#### **3.1.Aims of the course**

#### **3.2.Competences**

### **4.Assessment (1st and 2nd call)**

#### **4.1.Assessment tasks (description of tasks, marking system and assessment criteria)**

### **5.Methodology, learning tasks, syllabus and resources**

#### **5.1.Methodological overview**

The learning process has been designed based on the following methodology. It is intended for students to keep the habit of continuous work, which is considered essential in this subject.

1. The lectures are based on the explanation of the subject fundamentals. Before every lesson the student must solve a questionnaire based on readings available through the ADD.

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2. The problems classes are based on the students' personal work. The specific problems to be solved in every session will be announced, and their resolution will be part of the assessment activities.
3. The six 2-hour lab sessions are designed to be self-consistent. Before each session the student must have read the practice explanation and solved a previous questionnaire. A report must be prepared after the session.
4. A group work will be proposed at the beginning of the course and presented during the last month. It is based on the selection of materials for a particular application.
5. Personal work based on studying the lessons and solving the problems is essential in the learning process and will allow the student to successfully face the assessment.

### **5.2.Learning tasks**

### **5.3.Syllabus**

The program is divided in three blocks:

#### A: STRUCTURE OF MATTER

- 1.- Crystal structures
- 2.- Defects and diffusion
- 3.- Phase diagrams and Fe-C diagram
- 4.- Phase transformations

#### B: MATERIALS PROPERTIES

- 5.- Mechanical properties and thermal treatments
- 6.- Failure
- 7.- Fatigue and creep
- 8.- Thermal properties
- 9.- Electrical properties

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10.- Magnetic properties

11.- Optical properties

### C: GROUPS OF MATERIALS

12.- Ferrous and non-ferrous alloys

13.- Ceramics

14.- Polymers

15.- Composite materials

The lab program is divided in the following sessions:

- Tensile test in metals and polymers
- Rockwell and Brinell hardness tests. Charpy impact test
- Strain hardening. Annealing
- Thermal treatments in steel
- Precipitation hardening in aluminium alloys
- Thermal expansion and thermal conductivity in metals and alloys. Thermal shock in glasses

### 5.4.Course planning and calendar

### 5.5.Bibliography and recommended resources