

Academic Year/course: 2022/23

## 30010 - Material Engineering: the Basics

### Syllabus Information

**Academic Year:** 2022/23

**Subject:** 30010 - Material Engineering: the Basics

**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

### 2. Learning goals

### 3. Assessment (1st and 2nd call)

### 4. Methodology, learning tasks, syllabus and resources

#### 4.1. Methodological overview

The learning process has been designed based on the methodology detailed below. 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.
- 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 laboratory 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. Autonomous 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.

Further information regarding the course will be provided the first day of class and via the ADD.

#### 4.2. Learning tasks

The course includes 6 ECTS organized according to the following distribution:

- Lectures: 2 weekly hours
- Problems: 1 weekly hour
- Laboratory sessions: 4 sessions of 3 hours
- Autonomous work, group work and tutorials: 6 weekly hours

Notes:

*Lectures:* the professor will explain the theoretical contents of the course and solve illustrative applied problems. The professor will propose some exercises and cases for solving by students. Lectures run for 2 weekly hours. Although it is not a mandatory activity, regular attendance is highly recommended. Lectures will be complemented by problem-solving sessions (1 weekly hour).

*Guided assignments:* students will complete assignments, problems and exercises related to concepts seen in problem-solving sessions and lectures.

*Autonomous work:* students are expected to spend about 4 hours to study theory, solve problems, prepare works and oral presentation, and take exams.

*Tutorials:* the professor's office hours will be posted on Moodle and the degree website to assist students with questions and doubts. It is beneficial for the student to come with clear and specific questions.

### 4.3. Syllabus

The theory program is divided into 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
- 10.- Magnetic properties
- 11.- Optical properties

#### C: GROUPS OF MATERIALS

- 12.- Ferrous and non-ferrous alloys
- 13.- Ceramics
- 14.- Polymers
- 15.- Composite materials

The laboratory program is divided into the following sessions:

- Tensile and Charpy impact tests.
- Hardness tests. Strain hardening. Annealing.
- Thermal treatments and metallographic observations.
- Physical properties tests. Thermal shock in glass.

### 4.4. Course planning and calendar

Further details concerning the calendar, planning and course details can be found at the Escuela de Ingeniería y Arquitectura (EINA) website, <https://eina.unizar.es/>.

### 4.5. Bibliography and recommended resources

Link:

[http://biblos.unizar.es/br/br\\_citas.php?codigo=30010&year=2022](http://biblos.unizar.es/br/br_citas.php?codigo=30010&year=2022) †