30010 - Material Engineering: the Basics

Información del Plan Docente

Academic Year	2018/19
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

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

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: 1 weekly hour

- 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 proposed some exercises and cases for solving by students in class. 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 during 10 week) .

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

Autonomous work: students are expected to spend about 40 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 in three blocks:

A: STRUCTURE OF MATTER

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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 in the following sessions:

- Tensile test in metals and polymers

- Rockwell and Brinell hardness tests. Charpy impact test

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- 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

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