

Academic Year/course: 2022/23

29712 - Fundamentals of Engineering Materials

Syllabus Information

Academic Year: 2022/23

Subject: 29712 - Fundamentals of Engineering Materials

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 330 - Complementos de formación Máster/Doctorado
434 - Bachelor's Degree in Mechanical Engineering

ECTS: 6.0

Year: 434 - Bachelor's Degree in Mechanical Engineering: 2
330 - Complementos de formación Máster/Doctorado: XX

Semester: First semester

Subject Type: 434 - Compulsory

330 - ENG/Complementos de Formación

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 methodology followed in this course is oriented towards the achievement of the learning objectives. It is based on the participation and the active role of the student. A wide range of teaching and learning tasks are implemented.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture slides used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (1.2 ECTS): 30 hours.
- Problem-solving sessions (0.6 ECTS): 15 hours.
- Laboratory sessions and guided assignments (0.6 ECTS): 15 hours.
- Autonomous work and tutorials (3,6 ECTS): 90 hours.

Participative lectures: the professor will explain the theoretical contents of the course in whole group sessions. Lectures run for 2 weekly hours. Although it is not a mandatory activity, regular attendance is highly recommended. To favor continuous learning, some volunteer assessment activities will be proposed throughout the course.

Problem-solving sessions. These sessions run for 1 weekly hour. Illustrative applied problems will be solved by the professor and/or students. These problems and exercises of the course can be found in the problem set provided at the beginning of the semester to allow the student to work the exercises proposed by the professor before the session. Some volunteer assessment activities can be proposed to favor the continuous autonomous work of the student.

Laboratory sessions: sessions will take place every 2 weeks (4 sessions in total) and the last 3 hours each. Students will work together in groups actively doing tasks such as material processing and tests, measurements, calculations, and the use of graphical and analytical methods. Students will have laboratory guides for each session including theoretical and practical contents of the session and the instructions of the practice session. Pre and post-laboratory assessment activities will be carried out.

Autonomous work: supported by material prepared by the professor, as readings, assessment tests... This activity is essential for student learning and to pass the assessment activities.

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 contents have been structured in 3 sections, each divided into several modules:

A. Study and understanding of basic concepts related to the microstructure of a material

- A1. Crystalline structures
- A2. Crystal defects and diffusion
- A3. Equilibrium phase diagrams
- A4. Phase transformations

B. Correlation between properties and microstructure of a material

- B1. Mechanical properties and deformation mechanisms
- B2. Fracture mechanisms
- B3. Thermal treatments of steels
- B4. Physical properties of materials

C. Study of the main groups of materials

- C1. Metals and alloys
- C2. Ceramics
- C3. Polymers
- C4. Composite materials

Practical sessions

- P1. Tensile testing. Charpy impact test.
- P2. Brinell and Vickers hardness tests. Cold rolling of copper and recrystallization annealing.
- P3. Rockwell B and C hardness tests. Thermal treatments of steels. Metallography of Fe-C alloys.
- P4. Precipitation in aluminium alloys. Jominy test

4.4. Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course please refer to the "Escuela de Ingeniería y Arquitectura " website (<https://eina.unizar.es/>)