29712 - Fundamentals of Engineering Materials

Información del Plan Docente

Academic Year	2017/18
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	XX
Semester	Indeterminate
Subject Type	Compulsory, ENG/Complementos de Formación
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 methodology followed in this course is oriented towards 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.

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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.

5.2.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 favour the continuous learning, some volunteer assessments 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 assessments 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 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.
Guided assignments: addressed to guide the students in the writing of lab reports, quality procedures and oral presentations.
Autonomous work: supported by material prepared by the professor, as readings, assessment tests... This activity is essential for the 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.

5.3.Syllabus

The contents have been structured in 3 blocks, each divided in 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

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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

5.4.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/)

5.5.Bibliography and recommended resources

[BB: Basic Bibliography / BC: Additional Bibliography]

- [BB] Martín San José, Jesús. Ingeniería de materiales para industria y construcción / Jesús Martín Sanjosé, María Antonieta Madre Sediles, José . Zaragoza : Mirá Editores, 2004

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- [BC] Callister, William D., jr.. Ciencia e ingeniería de los materiales / William D. Callister, jr., David G. Rethwisch ; versión española por, Pere Molera Solà , Núria Salán Ballesteros . 2ª ed. Barcelona [etc] : Reverté, 2016
- [BC] Gamboa Atienza, Rafael. Ejercicios teórico-prácticos de las aleaciones ferreas y no ferreas / Rafael Gamboa Atienza . Madrid : Universidad Politécnica de Madrid, 1994
- [BC] Smith, William F.. Fundamentos de la ciencia e ingeniería de materiales / William F.Smith, Javad Hashemi ; revisión técnica Ramón Esquivel González, Arturo Barba pingarrón , [traductor, Gabriel Nagore Cázares] . 5ª ed. México D. F. : McGraw-Hill Interamericana, cop. 2014
- [BC] Varela Lafuente, Angel. Problemas de metalotecnia (1a parte) / Angel Varela Lafuente . Madrid : Universidad Politécnica de Madrid, 1992