UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: MATERIALS SCIENCE
Code: 56313
Type: CORE COURSE
ECTS credits: 6
Degree: 354 - UNDERGRADUATE DEGREE PROGRAMME IN ELECTRICAL ENGINEERING (ALM)
Academic year: 2023-24
Center: 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING
Group(s): 55
Year: 2
Duration: First semester
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **Mª TERESA CUBERES MONTSERRAT** - Group(s): **55**

Building/Office	Department	Phone number	Email	Office hours
2.04, Edificio Elhuyar	MECÁNICA ADA. E ING. PROYECTOS	926052849	teresa.cuberes@uclm.es	To be published in the moodle space of the subject

2. Pre-Requisites

In order to take this subject to the maximum advantage, it is recommended that the student has achieved competences related to the application of the basic principles of general chemistry, mastery of the basic concepts of the general laws of physics and the resoluti

3. Justification in the curriculum, relation to other subjects and to the profession

This course enables students to acquire knowledge of the fundamentals of materials science, technology and chemistry by understanding the relationship between their microstructure, synthesis or processing and their properties.

4. Degree competences achieved in this course

Course competences

Code	Description
A08	Appropriate level of oral and written communication.
CB01	Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
CEC03	Knowledge of the fundamentals of science, technology and chemistry of materials. Understanding of the relation between the microstructure, synthesis, processing and properties of materials.
CG03	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
CG04	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Electrical Engineering.
CG05	Knowledge to undertake measurements, calculations, evaluations, appraisals, studies, give expert opinions, reports, work plans and similar tasks.
CG06	Ability to work to specifications and comply with obligatory rules and regulations.
CT02	

5. Objectives or Learning Outcomes

Course learning outcomes

Description
The students will be able to differentiate the mechanical properties of materials, and perform mechanical tests
The students will get introduced to materials science and engineering
The students will be able to understand and select the most appropriate hardening mechanism
The students will be able to understand the structure of materials and the causes of their behaviour, relating it to their microstructure and equilibrium diagrams
The students will be able to understand the relationship between the microstructure of the material and its macroscopic properties (mechanical, optical, electrical, magnetic and chemical)
The students will be able to identify the metal alloys, polymers, ceramics and compounds most commonly used in the industry and their applicability.

6. Units / Contents

Unit 1: Introduction to Material Science and Engineering.
Unit 2: Structure and imperfections.
Unit 3: Mechanical Properties and Microstructure. Microstructural Control.
Unit 4: Mechanical behaviour. Testing.
Unit 5: Hardening methods.
Unit 6: Electrical, magnetic, chemical, thermal and optical properties.
Unit 7: Engineering materials: metals, polymers, ceramics and composites.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Combination of methods	A08 CB01 CB02 CB03 CB04 CB05 CEC03 CG03 CG04 CG05 CG06 CT02	1.36	34	N	-	The Professor will focus the topic and explain the fundamental contents, using blackboard, audiovisual media and chair experiences.
Class Attendance (practical) [ON-SITE]	Combination of methods	A08 CB01 CB02 CB03 CB04 CB05 CEC03 CG03 CG04 CG05 CG06 CT02	0.6	15	Y	Y	Development of Laboratory Practicals in small groups.
Problem solving and/or case studies [ON-SITE]	Combination of methods	A08 CB01 CB02 CB03 CB04 CB05 CEC03 CG03 CG04 CG05 CG06 CT02	0.2	5	Y	Y	Lists of problems -provided to the students in advanced - will be discussed and resolved in the classroom (collective learning). Case studies, or work of further developing concepts, might also be included.
Formative Assessment [ON-SITE]	Assessment tests	A08 CB01 CB02 CB03 CB04 CB05 CEC03 CG03 CG04 CG05 CG06 CT02	0.24	6	Y	Y	There will be a final exam (non-continuous assessment) or partial exams (continuous assessment) that together cover the entire subject syllabus. Each exam will consist of two different tests relating to (a) questions or short answer questions and (b) exercises and application problems.
Study and Exam Preparation [OFF-SITE]	Self-study	A08 CB01 CB02 CB03 CB04 CB05 CEC03 CG03 CG04 CG05 CG06 CT02	3.6	90	N	-	The student will revise and study his/her classroom notes, completing them with the bibliography provided by the Professor. Also, he/she will work on the resolution of the lists of problems and case studies that will be discussed in the classroom.
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity
Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Assessment of problem solving and/or case studies	5.00%	5.00%	The presentation of the provided lists of problems solved in full detail will be assessed.
Mid-term tests	70.00%	0.00%	It will be necessary to achive independently a 4/10 rating in both problem solving and conceptual issues.v
Laboratory sessions	25.00%	25.00%	The participation in the laboratory practicals, the questionnaires related to the practicals and/or the practical reports submitted will be assessed, taking into account the explanation of the theory and procedure of the same, the processing of the data obtained in the laboratory, the preparation of graphs and figures, and the presentation of the results.
Final test	0.00%	70.00%	It will be necessary to achive independently a 4/10 rating in both problem solving and conceptual issues.
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

The laboratory practicals (25%), the resolution of problems or cases (5%), and the mid-term tests (70%) will be assessed. The assessment of the training activities passed by the student will be retained up to a maximum of two academic years after the current one.

Non-continuous evaluation:

The course will be assessed taking into account the laboratory practicals (25%), the resolution of problems or cases (5%) and the final exam (70%). The assessment of the training activities passed by the student will be retained for a maximum of two academic years.

Specifications for the resit/retake exam:

The evaluation will be based on the resit/retake exam. The evaluation of the training activities passed by the student will be retained for a maximum of two academic years.

Specifications for the second resit / retake exam:

The evaluation will be based on the second resit/retake exam. The evaluation of the training activities passed by the student will be retained for a maximum of two academic years.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	34
Class Attendance (practical) [PRESENCIAL][Combination of methods]	15
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	5
Formative Assessment [PRESENCIAL][Assessment tests]	6
Study and Exam Preparation [AUTÓNOMA][Self-study]	90

Global activity

Activities	hours
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	5
Formative Assessment [PRESENCIAL][Assessment tests]	6
Class Attendance (theory) [PRESENCIAL][Combination of methods]	34
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Class Attendance (practical) [PRESENCIAL][Combination of methods]	15
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
M. F. Ashby, D. R. H. Jones	Materiales para ingeniería I: introducción a las propiedades, las aplicaciones y el diseño	Reverté	Barcelona	9788429172553	2008	
W. F. Smith, J. Hashemi	Fundamentos de la ciencia e ingeniería de materiales.	Ed. McGraw Hill (5ª edición)		9786071511522	2014	
Callister, William D.; Rethwisch, David G.	Ciencia e Ingeniería de Materiales 2ed (correspondiente a la 9º edición original)	Reverté		9788429172515	2016	
D. R. Askeland.	Ciencia e ingeniería de los materiales.	Thomson Paraninfo	Madrid	9788497320160	2001	
J. F. Shackelford.	Introducción a la ciencia de materiales para ingenieros.	Ed. Prentice Hall (7ª edición)	Madrid	9788483226599	2010	
Juan Manuel Montes Martos, Francisco Gómez Cuevas y Jesús Cintas Fisico	Ciencia e Ingeniería de los Materiales	Ediciones Paraninfo		9788428330176	2014	
M. F. Ashby, D. R. H. Jones	Materiales para ingeniería II: introducción a la microestructura, el procesamiento y el diseño	Reverté	Barcelona	9788429172560	2009	
Wendelin Wright, Donald R. Askeland	The Science and Engineering of Materials (7th Edition)	CENGAGE Learning Custom Publishing		9781305076761	2015	
D.R.H. Jones Michael Ashby	Engineering Materials 1:An Introduction to Properties, Applications and Design (4th Edition)	Butterworth-Heinemann		9780080966663	2011	
James F. Shackelford	Introduction to Materials Science for Engineers (8th Edition)	Pearson		9780133826654	2015	
D.R.H. Jones, Michael Ashby	Engineering Materials 2. An Introduction to Microstructures and Processing (4th Edition)	Butterworth-Heinemann		9780080966694	2012	
W. F. Smith, J. Hashemi	Foundations of Materials Science and Engineering (5th Edition)	Ed. McGraw Hill			2010	
William D. Callister Jr., David G. Rethwisch	Materials Science and Engineering: An Introduction (10th Edition)	Wiley		978-1-119-40549-8	2018	