UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: MATERIALS ENGINEERING AND TECHNOLOGY
Code: 56324
Type: CORE COURSE
ECTS credits: 6
Degree: 353 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING (CR)
Academic year: 2021-22
Center: 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL
Group(s): 20
Year: 3
Duration: C2
Main language: Spanish
Second language:
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **GEMA HERRANZ SANCHEZ-COSGALLA** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
POLITÉCNICO/2A-06	MECÁNICA ADA. E ING. PROYECTOS	TEAMS	gemma.herranz@uclm.es	

Lecturer: **GLORIA PATRICIA RODRIGUEZ DONOSO** - Group(s): **20**

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Lecturer: **ANA ROMERO GUTIERREZ** - Group(s): **20**

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2. Pre-Requisites

It is advisable that the student have knowledge of mathematics, physics, chemistry, and Materials Science as well as basic knowledge of manufacturing acquired in previous courses.

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

Material Science is a mandatory subject in Mechanical Engineering, Degree. The concepts developed in this subject are related with Material Science, Manufacturing Systems and Management and they will be used later in electives subjects such as Advanced Materials

4. Degree competences achieved in this course

Course competences

Code	Description
A01	To understand and have knowledge in an area of study that moves on from the general education attained at secondary level and usually found at a level that, while supported in advanced text books, also includes some aspects that include knowledge found at the cutting edge of the field of study.
A02	To know how to apply knowledge to work or vocation in a professional manner and possess the competences that are usually demonstrated by the formulation and defence of arguments and the resolution of problems in the field of study.
A03	To have the capability to gather and interpret relevant data (normally within the area of study) to make judgements that include a reflection on themes of a social, scientific or ethical nature.
A04	To be able to transmit information, ideas, problems and solutions to a specialized audience.
A05	To have developed the learning skills necessary to undertake subsequent studies with a greater degree of autonomy.
A06	Command of a second foreign language at B1 level of the Common European Framework of Refence for Languages.
A08	Appropriate level of oral and written communication.
A12	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
A13	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Mechanical Engineering.
A14	Knowledge to undertake measurements, calculations, evaluations, appraisals, studies, give expert opinions, reports, work plans and similar tasks.
A15	Ability to work to specifications and comply with obligatory rules and regulations.
C03	Knowledge of the fundamentals of science, technology and chemistry of materials. Understanding of the relation between the microstructure, synthesis, processing and properties of materials.
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
D07	Knowledge and ability in the application of materials engineering.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Know the different techniques for inspecting parts and detecting defects using non-destructive tests

Know the techniques for joining parts through soldering and adhesives

Know the basic resources for the improvement of materials through the engineering of surfaces

Communicate the importance of knowing and predicting the behaviour of a material when it is in use

Distinguish the most common techniques of processing materials and recognize the effects of processing on the structure and processing of the material

Distinguish the different thermal treatments of metals

6. Units / Contents

Unit 1: Introduction to Materials Engineering and Technology

Unit 2: Manufacturing Processes

- **Unit 2.1** Casting processes
- **Unit 2.2** Polymer processing
- **Unit 2.3** Plastic deformation processes
- **Unit 2.4** Powder technology
- **Unit 2.5** Advanced manufacturing processes

Unit 3: Thermal treatments

- **Unit 3.1** Thermal treatments of steels
- **Unit 3.2** Precipitation hardening
- **Unit 3.3** Surface treatments

Unit 4: Welding metallurgy

Unit 5: In service behaviour of materials

- **Unit 5.1** Fracture, Fatigue and Creep
- **Unit 5.2** Corrosion and high temperature oxidation
- **Unit 5.3** Tribology. Wear and friction

Unit 6: Inspection of materials. Non destructive testing

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]	Lectures	A04 A08 A12 C03 D07	0.8	20	N	-	
Individual tutoring sessions [ON-SITE]	Combination of methods	A08 A12 A13 A14 C03 CB01 CB02 CB03 CB04 CB05 D07	0.32	8	N	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A12 A13 A14 C03 CB01 CB02 CB03 CB04 CB05 D07	0.8	20	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	C03 D07	3.6	90	N	-	
Final test [ON-SITE]	Assessment tests	A08 A13 A14 C03 D07	0.16	4	Y	Y	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	A08 A12 A13 A14 C03 CB01 CB02 CB03 CB04 CB05 D07	0.32	8	Y	Y	
		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
Laboratory sessions	22.00%	22.00%	Compulsory to pass the subject.
Assessment of problem solving and/or case studies	8.00%	8.00%	Using the Moodle platform, the instructor will conduct individual tests about course contents. No Recoverable.
Final test	70.00%	70.00%	The final exam may include problems and questions about theoretical concepts. Minimum grade to pass the subject: 5 points out of 10.
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:

To pass the course it is compulsory to have a minimum score of 5 out of 10 in the final exam.

Non-continuous evaluation:

Evaluation criteria not defined

Specifications for the resit/retake exam:

To pass the course it is compulsory to have a minimum score of 5 out of 10 in the final exam.

Specifications for the second resit / retake exam:

To pass the course it is compulsory to have a minimum score of 5 out of 10 in the final exam.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Individual tutoring sessions [PRESENCIAL][Combination of methods]	8
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Final test [PRESENCIAL][Assessment tests]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	8
Unit 1 (de 6): Introduction to Materials Engineering and Technology	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Unit 2 (de 6): Manufacturing Processes	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	7
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	5
Unit 3 (de 6): Thermal treatments	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	10
Unit 4 (de 6): Welding metallurgy	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Unit 5 (de 6): In service behaviour of materials	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	5
Unit 6 (de 6): Inspection of materials. Non destructive testing	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Global activity	
Activities	**hours**
Individual tutoring sessions [PRESENCIAL][Combination of methods]	8
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	20
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Final test [PRESENCIAL][Assessment tests]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	8
Class Attendance (theory) [PRESENCIAL][Lectures]	20
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
E. OTERO	Corrosión y degradación de materiales	Síntesis			1997	
E.P. DEGARMO	Materiales y procesos de fabricación	Reverté			1994	
G. Rodríguez, G. Herranz	Apuntes de la asignatura https://campusvirtual.uclm.es/				2012	plataforma moodle
I.M. HUTCHINGS	Tribology, Friction and Wear of Engineering Materials	Edward Arnold			1992	
J. M. Montes Martos, F. Gómez Cuevas y J. Cintas Físico	CIENCIA E INGENIERÍA DE LOS MATERIALES	Paraninfo		978-88428330176	2014	
J. R. DAVIS	SURFACE ENGINEERING FOR CORROSION AND WEAR RESISTANCE	ASM INTERNATIONAL		978-0871707000	2001	Corrosión, desgaste
Jose Antonio Puértolas, Ricardo Ríos, Miguel Castro	Tecnología de los Materiales en Ingeniería	Síntesis		978-84-9077-387-1	2016	
M.K. GROOVER	Fundamentos de Manufactura	Prentice-Hall			1997	

Massachusetts Institute of Technology	Moderna MIT OpenCourseWare http://ocw.mit.edu/courses/materials-science-and-engineering/			2012
R.M. GERMAN	Powder Metallurgy Science	Princeton NJ		1994
RANDALL M. GERMAN & ANIMESH BOSE	INJECTION MOLDING OF METALS AND CERAMICS	METAL POWDER INDUSTRIES FEDERATION	978-1878954619	1997
S. KALPAKJIAN, S. SCHMID	Manufactura, Ingeniería y Tecnología	Pearson Hall.		2001
Universidad de Liverpool.	Programa MATTER, Materials Teaching Educational Resources http://www.matter.org.uk/default.htm			
BLACK, J. TEMPLE.	DeGarmo's materials and processes in manufacturing	Wiley		2008
W.D. CALLISTER	Introducción a la Ciencia e Ingeniería de los Materiales	Reverté		2004
A.J. VÁZQUEZ, J.J. DE DAMBORENEA.	Ciencia e Ingeniería de la superficie de los materiales metálicos	CSIC		2001