



## 1. General information

**Course:** MANUFACTURING SYSTEMS AND MATERIALS PROCESSING**Code:** 310623**Type:** CORE COURSE**ECTS credits:** 6**Degree:** 2338 - MASTERS DEGREE PROGRAMME IN INDUSTRIAL ENGINEERING (AB)**Academic year:** 2022-23**Center:** 605 - SCHOOL OF INDUSTRIAL ENGINEERS. AB**Group(s):** 10 11**Year:** 1**Duration:** C2**Main language:** Spanish**Second language:** English**Use of additional languages:****English Friendly:** N**Web site:****Bilingual:** Y**Lecturer:** MARIA CARMEN MANJABACAS TENDERO - Group(s): 10 11

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## 2. Pre-Requisites

It is strongly recommended to have acquired previously a basic knowledge of manufacturing systems and processes and the fundamentals of Materials Science.

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

This course belongs to the part of Industrial Technologies described as a specific competence in CIN/311/2009 (2/9/2009) related to the curriculum requirements of the Studies conducting to the regulated career of Industrial Engineering.

## 4. Degree competences achieved in this course

## Course competences

Code	Description
A01	To have appropriate knowledge of the scientific and technological aspects of mathematical, analytical and numerical methods in engineering, electrical engineering, energy engineering, chemical engineering, mechanical engineering, continuous medium mechanics industrial electronics, automation, manufacturing, materials, quantitative management methods, industrial computing, town planning, infrastructures, etc.
A02	To plan, calculate and design products, processes, facilities and plants.
A03	To lead, plan and supervise multidisciplinary teams.
A04	To conduct research, development and innovation in products, processes and methods.
A05	To perform strategic planning and apply it to construction, production and environmental quality and management systems.
A06	To manage the technical and economic aspects of projects, installations, plants, companies and technology centres.
A07	To exercise functions of general, technical and R&D Project management in plants, companies and technology centres.
B02	Knowledge and capacity to plan, calculate and design integrated manufacturing systems.
CB06	Knowledge and skills to organise and manage enterprises.
CB07	Strategy and planning knowledge and skills applied to different organisational structures.
CB08	Knowledge of commercial and labour law.
CB09	Knowledge of financial and costs accounting.
D01	Ability to design, construct and exploit industrial plants.
D06	Knowledge and ability to perform verification and supervision of installations, processes and products.
D07	Knowledge and ability to conduct certifications, audits, verifications, trials and reports.

## 5. Objectives or Learning Outcomes

## Course learning outcomes

## Description

Acquire advanced knowledge of machine tools, equipment and tools used in manufacturing processes and systems.

Acquire advanced knowledge of the theoretical fundamentals and analytical methods used in manufacturing processes and systems.

Acquire advanced knowledge of manufacturing processes and systems, and their position in industrial production.

Acquire advanced knowledge of dimensional metrology and its application in manufacturing quality control processes.

Acquire knowledge of advanced technologies for forming of materials and non-conventional manufacturing processes.

Be able to take good decisions in operations using objective instruments and systems to support the decision.

Be able to select forming processes according to industrial needs.

Understand the relationship between processing and in-service behaviour of materials.

**Additional outcomes**

To understand the relationship between the material processing and its behaviour.

**6. Units / Contents**

**Unit 1: The state of the art in the manufacturing and materials forming systems and processes**

**Unit 2: Material removing forming: high effectiveness processes and advanced technologies**

**Unit 3: Mechanics of bulk forming processes. Advanced bulk forming processes**

**Unit 4: Procesos avanzados de estampación/ Mechanics of sheet metal forming. Advanced stamping processes**

**Unit 5: Molding processes technology. Simulation of processes**

**Unit 6: Joint of parts. Assembled technologies**

**Unit 7: Metrology applied to Engineering. Quality control and verification of products**

**7. Activities, Units/Modules and Methodology**

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Writing of reports or projects [OFF-SITE]		A01 A02 A03 A04 A05 A06 A07 B02 CB06 CB07 CB08 CB09 D01 D06 D07	0.6	15	Y	N	
Class Attendance (theory) [ON-SITE]	Lectures	A01 A02 A03 A04 A05 A06 A07 B02 CB06 CB07 CB08 CB09 D01 D06 D07	0.96	24	Y	N	
Class Attendance (practical) [ON-SITE]	Problem solving and exercises	A01 A02 A03 A04 A05 A06 A07 B02 CB06 CB07 CB08 CB09 D01 D06 D07	0.72	18	Y	N	
Laboratory practice or sessions [ON-SITE]	Combination of methods	A01 A02 A03 A04 A05 A06 A07 B02 CB06 CB07 CB08 CB09 D01 D06 D07	0.4	10	Y	N	
Group tutoring sessions [ON-SITE]	Project/Problem Based Learning (PBL)		0.16	4	Y	N	
Study and Exam Preparation [OFF-SITE]	Self-study		2.8	70	Y	N	
Practicum and practical activities report writing or preparation [OFF-SITE]	Group Work		0.2	5	Y	N	
Final test [ON-SITE]	Assessment tests		0.16	4	Y	Y	
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>			<b>Total class time hours: 60</b>				
<b>Total credits of out of class work: 3.6</b>			<b>Total hours of out of class work: 90</b>				

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
Practicum and practical activities reports assessment	10.00%	0.00%	The evaluation of the practical reports will consist of either the own evaluation of those or an individual questionnaire (oral or written).
Final test	70.00%	100.00%	
Laboratory sessions	10.00%	0.00%	
Theoretical papers assessment	10.00%	0.00%	This part will be composed of several activities proposed to the students for reinforcing the lessons of the course.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

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 student will have to do an exam with no evaluated contents (70%). The minimum mark in that exam to be able to pass the course will be 4 points. The students that don't obtain that mark, will be evaluated taking into account all the activities of the course, but with a maximum qualification of 4 points.

**Non-continuous evaluation:**

Students will must carried out a final exam with theoretical-practical contents of the course (80%) and a specific evaluations of lab classes (20%). The lab exam will consist of some practices carried out during the course. It will be programmed, preferably in the ordinary official date. (if it were not possible, another different date would agree between teachers and involved students. Nevertheless, the student must claim the exam.

It is mandatory to obtain at least 4 points in the theoretical-practical exam to pass the course. In the case of less than 4 points in the mentioned exam, the final score of the student will compound by the two exams (theoretical-practical + laboratory) with a maximum of 4 points.

**Specifications for the resit/retake exam:**

Students that carried out a continuous assessment in the ordinary convocation: in the extraordinary convocation the final exam will value 80% in order to allow the 10% corresponding to the resolution of problems or cases (academically supervised work) could be recovered. The recovering of lab activities is considered by doing an specific exam consisting of some practice carried out during the course, in case the student claims to that.

Students that carried out a non-continuous evaluation in the ordinary convocatory: the evaluation considerations for the extraordinary convocatory will be the same than for the ordinary one.

**Specifications for the second resit / retake exam:**

The same considerations than in the extraordinary convocatory are taken into account.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Writing of reports or projects [AUTÓNOMA]	15
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	70
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	5
Final test [PRESENCIAL][Assessment tests]	4
<b>General comments about the planning:</b> This planning can be modified during the development of the course justified in some circumstances that could happen.	
Unit 1 (de 7): The state of the art in the manufacturing and materials forming systems and processes	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Unit 2 (de 7): Material removing forming: high effectiveness processes and advanced technologies	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	5
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	3
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Unit 3 (de 7): Mechanics of bulk forming processes. Advanced bulk forming processes	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	5
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	1
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Unit 4 (de 7): Procesos avanzados de estampación/ Mechanics of sheet metal forming. Advanced stamping processes	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	2
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	1
Unit 5 (de 7): Molding processes technology. Simulation of processes	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	5
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	2
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	1
Unit 6 (de 7): Joint of parts. Assembled technologies	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	1
Unit 7 (de 7): Metrology applied to Engineering. Quality control and verification of products	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	1
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	2
Global activity	
Activities	hours
Writing of reports or projects [AUTÓNOMA]	15
Class Attendance (theory) [PRESENCIAL][Lectures]	24
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	18
Laboratory practice or sessions [PRESENCIAL][Combination of methods]	10
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	5
Final test [PRESENCIAL][Assessment tests]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	70
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	4
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Manjabacas, M.C., Miguel, V.	Apuntes de metrología y práctica de la metrología dimensional	Miguel, V.	España		2007	
Marziniak, Z.,Duncan,J.L. Hu, S.J.	Mechanics of Sheet Metal Forming	Butterworth-Heinemann	UK		2002	
	A comparison between traditional	AIP Conf. Proc. 1431, 751 ;				

Miguel, V., Manjabacas, M.C.	criteria and FEM analysis results for gravity casting feeding and risering systems	American Institute of Physics	USA		2012
Miguel, V., Martínez, A., Manjabacas M.C., Coello, J., Calatayud, A.	Electrical Evaluation Of Welding Machines Based On The Arc Properties. Application To SMAW, GMAW And GTAW Processes	AMER INST. PHYSICS	USA		2009
N.V. Raghavendra; L.Krishnamurthy	Engineering Metrology and Measurements	Oxford University Press	UK	978-0-19-808549-2	2013
P.A.F. Martins, N. Bay, M. Skjoedt, M.B. Silva	Theory of single point incremental forming	CIRP Annals - Manufacturing Technology 57 (2008) 247-252			2008
AWS	Welding Handbook, Vol2: Welding Processes; 8ª Ed;	AWS	USA		1991
Boothroyd, G.	Assembly Automation and Process Design	Francis and Taylor	UK		2005
C. L. Dotson	Fundamentals of Dimensional Metrology 5th edition	Delmar	USA		2012
López de Lacalle, L.N., Sánchez, J., Lamikiz, A.	Mecanizado de Alto Rendimiento	Izaro	España		2008
Hosford, W.F., Caddell, R.M.	Metal Forming. Mechanics and Metallurgy	Cambridge	UK		2007
Norrish, J.	Advanced welding processes	Woodhead Publishing in Materials	Cambridge (UK)	1-84569-130-X	2016
Campbell, J.	Compete Casting Handbook	Elsevier	Birmingham	978-0-444-63509-9	2015
Groover, M.P.	Principles of Modern Manufacturing, Materials, Processes and Systems	John Wiley and Sons	USA		2016
Kalpakjian, S.; Schmid, S.R.	Manufacturing Processes for Engineering Materials 7th Ed.	Pearson	USA		2014
Kalpakjian, S., Schmid, S.R.	Manufacturing Engineering and Technology	Pearson	USA		2010