

**1. General information****Course:** METROLOGY AND AUTOMATION OF PRODUCTION**Code:** 56358**Type:** ELECTIVE**ECTS credits:** 6**Degree:** 351 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING (ALM)**Academic year:** 2020-21**Center:** 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING**Group(s):** 56**Year:** 4**Duration:** First semester**Main language:** Spanish**Second language:** English**Use of additional languages:****English Friendly:** Y**Web site:****Bilingual:** N

Lecturer: ELENA MARIA BEAMUD GONZALEZ - Group(s): 56				
Building/Office	Department	Phone number	Email	Office hours
E'l'huyar 2.06	MECÁNICA ADA. E ING. PROYECTOS	926295300 Ext. 6043	elenamaria.beamud@uclm.es	
Lecturer: EUSTAQUIO GARCIA PLAZA - Group(s): 56				
Building/Office	Department	Phone number	Email	Office hours
Politécnico/2A-11	MECÁNICA ADA. E ING. PROYECTOS	926295239	eustaquio.garcia@uclm.es	

2. Pre-Requisites

Knowledge of automation, manufacturing and organization of the company, applied to current specific aspects used in a manufacturing engineering process.

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

The Industrial Engineer is the professional who uses the knowledge of the physical sciences and mathematics and the engineering techniques to develop his professional activity in aspects such as control, instrumentation and automation of processes and equipment, as well as the design, construction, operation and maintenance of industrial products. This training allows you to participate successfully in the different branches that integrate industrial engineering, such as mechanics, electricity, electronics, etc., adapt to the changes in the technologies in these areas and, if necessary, generate them, responding to the needs that are presented in the productive and service branches to achieve the welfare of the society to which it is owed.

Therefore, this subject is responsible for integrating concepts that the student has received in other subjects (calculus, Fundamentals of Computer Science, statistics, Science of materials, etc...) but has not seen a physical utility in a producted system. This aspect is very important to be able to form a practical engineer capable of integrating elements that apparently have not relation in a useful system.

In addition this subject facilitates the understanding of the mode of organization of the production of a company, that must be employed by the student during his practices in companies and during the development of his project end of degree.

4. Degree competences achieved in this course**Course competences**

Code	Description
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.
A07	Knowledge of Information Technology and Communication (ITC).
A08	Appropriate level of oral and written communication.
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.
A16	Ability to analyse and evaluate the social and environmental impact of technical solutions.
A17	Ability to apply principles and methods of quality control.
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
G08	Knowledge of automatization, manufacture and organization of a business, applied to specific aspects currently used in a process of manufacturing engineering.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Ability to carry out design process and development of mechanical products

6. Units / Contents

Unit 1: INTRODUCTION TO THE PRODUCTION AUTOMATIZATION

Unit 2: COMMON MANUFACTURING SYSTEMS

Unit 3: MANUFACTURING ENGINEERING

Unit 4: FLEXIBLES MANUFACTURING SYSTEMS

Unit 5: QUALITY MANAGEMENT AND METROLOGY IN MANUFACTURING ENGINEERING

Unit 6: FUNDAMENTAL AND PROGRAMATION OF NUMERICAL CONTROL

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (practical) [ON-SITE]	Lectures	A02 A03 A04 CB01 CB02 CB03 CB04 CB05 G08	0.83	20.75	N	-	
Individual tutoring sessions [ON-SITE]	Cooperative / Collaborative Learning	A02 A03 A04 A05 A13 A14 A15 A16 CB01 CB02 CB03 CB04 CB05 G08	0.6	15	N	-	
Problem solving and/or case studies [ON-SITE]	Cooperative / Collaborative Learning	A02 A03 A04 A05 A07 A08 A13 A14 A15 A16 A17 CB01 CB02 CB03 CB04 CB05 G08	0.45	11.25	Y	Y	
Laboratory practice or sessions [ON-SITE]	Group Work	A02 A03 A04 A05 A07 A08 A13 A14 A15 A16 A17 CB01 CB02 CB03 CB04 CB05 G08	0.37	9.25	Y	Y	
Final test [ON-SITE]	Assessment tests	A02 A03 A04 A05 A07 A08 A13 A14 A15 A16 A17 CB01 CB02 CB03 CB04 CB05 G08	0.15	3.75	Y	Y	
Study and Exam Preparation [OFF-SITE]	Problem solving and exercises	A02 A03 A04 A05 A07 A08 A13 A14 A15 A16 A17 CB01 CB02 CB03 CB04 CB05 G08	3.6	90	N	-	
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
Final test	33.34%	33.34%	Final test
Laboratory sessions	33.33%	33.33%	Work with contents related to the lessons
Projects	33.33%	33.33%	
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 minimum mark in each of the parts shall be equal to or bigger than 5. The subject will be exceeded by obtaining an assessment equal to or bigger than 5.

The practices will be valued the utilization and the report of the same one. This activity should be exceeded at least, with a 5 over 10

Laboratory and computer practice sessions will be conducted in small groups. The students will perform different experimental measures in the laboratory or a series of calculations with a computer program.

It will be valued both the work in the laboratory or computer classroom as the report of the practice carried out, having both obligatory and recoverable character.

If the above requirements are not met, students, in order to overcome the subject, must do an examination of practices together with the final examination of the subject, whose value on the final qualification will be, in percentage, the same one that could be obtained with the Realization of the practices.

Non-continuous evaluation:

Evaluation criteria not defined

Specifications for the resit/retake exam:

Students who have not performed the present activities (practices and problems), nor have elaborated the technical work, must undergo a single final examination with all the contents of the subject (practical and theoretical) seen throughout the course.

The minimum mark in each of the parts shall be equal to or bigger than 5. The subject will be exceeded by obtaining an assessment equal to or bigger than 5.

Specifications for the second resit / retake exam:

Same as for the extraordinary call

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (practical) [PRESENCIAL][Lectures]	.35
Individual tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	1
Problem solving and/or case studies [PRESENCIAL][Cooperative / Collaborative Learning]	.25
Final test [PRESENCIAL][Assessment tests]	3.75
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	9
Unit 1 (de 6): INTRODUCTION TO THE PRODUCTION AUTOMATIZATION	
Activities	Hours
Class Attendance (practical) [PRESENCIAL][Lectures]	3
Individual tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	1
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	8
Unit 2 (de 6): COMMON MANUFACTURING SYSTEMS	
Activities	Hours
Class Attendance (practical) [PRESENCIAL][Lectures]	3
Individual tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	2
Problem solving and/or case studies [PRESENCIAL][Cooperative / Collaborative Learning]	1
Laboratory practice or sessions [PRESENCIAL][Group Work]	1
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	10
Unit 3 (de 6): MANUFACTURING ENGINEERING	
Activities	Hours
Class Attendance (practical) [PRESENCIAL][Lectures]	3
Individual tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	2
Problem solving and/or case studies [PRESENCIAL][Cooperative / Collaborative Learning]	2
Laboratory practice or sessions [PRESENCIAL][Group Work]	1
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	10
Unit 4 (de 6): FLEXIBLES MANUFACTURING SYSTEMS	
Activities	Hours
Class Attendance (practical) [PRESENCIAL][Lectures]	3
Individual tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	3
Problem solving and/or case studies [PRESENCIAL][Cooperative / Collaborative Learning]	2
Laboratory practice or sessions [PRESENCIAL][Group Work]	2
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	15
Unit 5 (de 6): QUALITY MANAGEMENT AND METROLOGY IN MANUFACTURING ENGINEERING	
Activities	Hours
Class Attendance (practical) [PRESENCIAL][Lectures]	4.2
Individual tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	3
Problem solving and/or case studies [PRESENCIAL][Cooperative / Collaborative Learning]	2
Laboratory practice or sessions [PRESENCIAL][Group Work]	2.25
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	18
Unit 6 (de 6): FUNDAMENTAL AND PROGRAMATION OF NUMERICAL CONTROL	
Activities	Hours
Class Attendance (practical) [PRESENCIAL][Lectures]	4.2
Individual tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	3
Problem solving and/or case studies [PRESENCIAL][Cooperative / Collaborative Learning]	4
Laboratory practice or sessions [PRESENCIAL][Group Work]	3
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	20
Global activity	
Activities	hours
Class Attendance (practical) [PRESENCIAL][Lectures]	20.75
Individual tutoring sessions [PRESENCIAL][Cooperative / Collaborative Learning]	15
Problem solving and/or case studies [PRESENCIAL][Cooperative / Collaborative Learning]	11.25
Laboratory practice or sessions [PRESENCIAL][Group Work]	9.25
Final test [PRESENCIAL][Assessment tests]	3.75
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	90
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
	CONTROL NUMERICO Y	S.A.				

Francisco Cruz Teruel	PROGRAMACION	MARCOMBO	9788426715951	2009
Sevilla, L.	Metrología Dimensional	Universidad de Málaga Serv. Publicaciones	9788497470810	2011
Sánchez, A.M.	Fundamentos de Metrología	ETSII de la UPM	Fundamentos de Metro	1999