



1. General information

Course: PROCESS CONTROL AND FACTORY AUTOMATION**Code:** 310628**Type:** CORE COURSE**ECTS credits:** 6**Degree:** 2328 - MASTERS DEGREE PROGRAMME IN INDUSTRIAL ENGINEERING**Academic year:** 2021-22**Center:** 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL**Group(s):** 10 20 21 11**Year:** 1**Duration:** C2**Main language:** Spanish**Second language:** English**Use of additional languages:****English Friendly:** N**Web site:****Bilingual:** Y**Lecturer:** VICENTE FELIU BATLLE - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
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2. Pre-Requisites

Not established

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

Not established

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.
A04	To conduct research, development and innovation in products, processes and methods.
B08	Ability to design and plan automated production and advanced process control systems.
CB06	Knowledge and skills to organise and manage enterprises.
CB07	Strategy and planning knowledge and skills applied to different organisational structures.
CB09	Knowledge of financial and costs accounting.
CB10	Knowledge of information systems for management, industrial organisation, production, logistics and quality management systems.
D04	Knowledge and abilities to plan and design electrical and fluid installations, lighting, heating and ventilation, energy saving and efficiency, acoustics, communications, domotics, Smart buildings and security installations.
D06	Knowledge and ability to perform verification and supervision of installations, processes and products.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Develop criteria to select the best solution for a specific problem.

Acquire basic knowledge required for tasks in production automation projects.

Gain knowledge of the systems used in process control and production automation.

Acquire the knowledge required to understand process control design.

6. Units / Contents

Unit 1: Introduction to Automation

Unit 1.1 Industrial Automation**Unit 1.2** Robotics**Unit 1.3** Computer Vision**Unit 1.4** Automation of the Production

Unit 2: Process and Production Optimization**Unit 2.1** Linear Programming**Unit 2.2** Non Linear Programming**Unit 2.3** Dynamic Programming**Unit 3: Process Identification Techniques****Unit 3.1** Introduction**Unit 3.2** Identification in the Frequency Domain**Unit 3.3** Identification using Correlation Techniques**Unit 3.4** Identification in the Discrete Time Domain**Unit 4: Process Control****Unit 4.1** Control Based on Heuristic Methodologies**Unit 4.2** Control Based on Scientific Methodologies**Unit 4.3** Advanced Process Control**Unit 4.4** Disturbances Rejection**Unit 5: Automated Systems****Unit 5.1** Industrial Programmable Logic Controllers**Unit 5.2** Industrial Communication Networks**Unit 5.3** Modelling of Sequential Systems**Unit 5.4** Automated Storage and Transportation Systems**Unit 5.5** Flexible Manufacturing Systems**Unit 6: Production Control****Unit 6.1** The Supply Chain**Unit 6.2** Manufacturing Efficiency**Unit 6.3** 4.0 Industry**Unit 6.4** Simulation of Discrete Events Systems**Unit 6.5** Offline Design and Programming**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	A01 A02 A04 B08 D04 D06	0.72	18	N	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A01 A02 A04 B08 D04 D06	0.6	15	N	-	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	A01 A02 A04 B08 D04 D06	0.32	8	Y	Y	
Workshops or seminars [ON-SITE]	Workshops and Seminars	A01 A02 A04 B08 D04 D06	0.08	2	N	-	
Study and Exam Preparation [OFF-SITE]	Self-study	A01 A02 A04 B08 D04 D06	2.6	65	N	-	
Writing of reports or projects [OFF-SITE]	Guided or supervised work	A01 A02 A04 B08 D04 D06	0.6	15	Y	Y	
Practicum and practical activities report writing or preparation [OFF-SITE]	Practical or hands-on activities	A01 A02 A04 B08 D04 D06	0.4	10	Y	Y	
Group tutoring sessions [ON-SITE]	Group tutoring sessions	A01 A02 A04 B08	0.24	6	N	-	
Final test [ON-SITE]	Assessment tests	A01 A02 A04 B08 D04 D06	0.16	4	Y	Y	
Individual tutoring sessions [ON-SITE]	Problem solving and exercises	A01 A02 A04 B08	0.28	7	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
Practicum and practical activities reports assessment	20.00%	20.00%	
Laboratory sessions	10.00%	10.00%	
Final test	50.00%	50.00%	
Projects	20.00%	20.00%	
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:**

In order to pass, the student must reach a weighted mean of 5 or more among the evaluations of all the tests. The student could use the final test to pass the parts of the course that can be recovered.

In the case that the student did not present the report of the practical activities or did not attend all these activities, the student will have to carry out the final test of this part.

Non-continuous evaluation:

- The student will have to carry out three final tests of theoretical/practical nature: optimization, process control and production automation.
- Moreover, he must carry out the laboratory activities and practical works (of the blocks of process control and production automation) and deliver the reports of these activities in the 4 days following to the exam date.
- In order to pass, the student must reach a weighted mean of 5 or more among the evaluations of all the tests and activities.
- The above applies to the first and second resits as well to the special finalization exam.

Specifications for the resit/retake exam:

The student will have the opportunity to repeat all the tests that he did not pass through the course at the final exams. In the resit, the student will be waived of taking exams of the parts that he had previously passed.

Specifications for the second resit / retake exam:

It is a test of all the subject. However, this examen will be organized in blocks that could be adapted to the circumstances of each student. This exam allows the student to recover the previously failed blocks without having to repeat the tests of blocks that had been previously passed.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Unit 1 (de 6): Introduction to Automation	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	8
Final test [PRESENCIAL][Assessment tests]	.5
Individual tutoring sessions [PRESENCIAL][Problem solving and exercises]	1
Unit 2 (de 6): Process and Production Optimization	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	17
Final test [PRESENCIAL][Assessment tests]	1.5
Individual tutoring sessions [PRESENCIAL][Problem solving and exercises]	2
Unit 3 (de 6): Process Identification Techniques	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	10
Writing of reports or projects [AUTÓNOMA][Guided or supervised work]	7
Individual tutoring sessions [PRESENCIAL][Problem solving and exercises]	1
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	5
Unit 4 (de 6): Process Control	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	11
Writing of reports or projects [AUTÓNOMA][Guided or supervised work]	8
Individual tutoring sessions [PRESENCIAL][Problem solving and exercises]	1
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	1
Unit 5 (de 6): Automated Systems	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	10
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	5
Final test [PRESENCIAL][Assessment tests]	1
Individual tutoring sessions [PRESENCIAL][Problem solving and exercises]	1
Unit 6 (de 6): Production Control	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	2
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	9
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	5
Final test [PRESENCIAL][Assessment tests]	1
Individual tutoring sessions [PRESENCIAL][Problem solving and exercises]	1
Global activity	
Activities	hours

Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	6
Class Attendance (theory) [PRESENCIAL][Lectures]	18
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	8
Study and Exam Preparation [AUTÓNOMA][Self-study]	65
Writing of reports or projects [AUTÓNOMA][Guided or supervised work]	15
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	10
Final test [PRESENCIAL][Assessment tests]	4
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	2
Individual tutoring sessions [PRESENCIAL][Problem solving and exercises]	7
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
C. A. Smith y A. Corripio	Principles and Practice of Automatic Process Control	John Wiley & Sons			2005	3rd edition
J.A. Somolinos, R. Morales, E. Tremps	Fundamentos de la ingeniería de control	Editorial Universitaria Ramón Areces		978-84-9961-142-6	2013	
K. J. Aström y R. M. Murray	Feedback Systems: An Introduction for Scientists and Engineers http://www.cds.caltech.edu/~murray/amwiki	Princeton University Press			2011	Electronic edition Version 2.10e
Andrés García Higuera	El Control Automático en la Industria	UCLM	Cuenca	84-8427-405-5	2005	