Syllabus
2022 - 2023

GENERAL INFORMATION

Data of the subject	
Subject name	Industrial Automation
Subject code	DEAC-MII-521
Mainprogram	Official Master´s Degree in Industrial Engineering
Involved programs	Grado en Administración y Dirección de Empresas y Máster Universitario en Ingeniería Industrial [Fifth year] Máster Universitario en Ingeniería Industrial + Máster en Medioambien. y Gest. Intel. de la Energía [First year] Máster Universitario en Ingeniería Industrial y Máster Universitario en Sistemas Ferroviarios [First year] Máster Universitario en Ingeniería Industrial + Máster en Industria Conectada / in Smart Industry [First year] Máster Universitario en Ingeniería Industrial + Máster en Medioambiente y Transición Energética [First year] Máster Universitario en Ingeniería Industrial + Máster en Ingeniería para la Movilidad y Seguridad [First year] Máster Universitario en Ingeniería Industrial y Máster Universitario en Administración de Empresas [First year] Máster Universitario en Ingeniería Industrial [First year] Máster Universitario en Ingeniería Industrial y Máster Universitario en Administración de Empresas [First year] Máster Universitario en Ingeniería Industrial y Máster Universitario en Sector Eléctrico [First year] Máster Universitario en Ingeniería Industrial + Máster en Industria Conectada / in Smart Industry [First year] Máster Universitario en Ingeniería Industrial + Máster in Smart Grids [First year] Máster Universitario en Ingeniería Industrial + Máster en Ingeniería para la Movilidad y Seguridad [First year]
Credits	6,0 ECTS
Type	Compulsory
Department	Department of Electronics, Control and Communications

Teacher Information	
Teacher	
Name	Francisco Javier Calmuntia Arroyo
Department	Department of Electronics, Control and Communications
EMail	fjcalmuntia@icai.comillas.edu
Teacher	
Name	Jaime Boal Martín-Larrauri
Department	Department of Electronics, Control and Communications
Office	Alberto Aguilera 25 [220]
EMail	Jaime.Boal@iit.comillas.edu
Phone	2742

Teacher	
Name	José Antonio Rodríguez Mondéjar
Department	Department of Electronics, Control and Communications
Office	Alberto Aguilera 25 [D-211]
EMail	mondejar@iit.comillas.edu
Phone	2422
Teacher	
Name	Sergio Luis Asenjo Vegue
EMail	sasenjo@icai.comillas.edu
Teacher	
Name	David Fernández de Miguel
Department	Department of Electronics, Control and Communications
EMail	dfdemiguel@icai.comillas.edu
Teacher	
Name	Francesc Rafecas Caminals
Department	Department of Electronics, Control and Communications
EMail	frafecas@icai.comillas.edu
Teacher	
Name	Guillermo Pallarés Castillo
EMail	gpallares@icai.comillas.edu
Teacher	
Name	Javier Díaz Machín
Department	Department of Industrial Organization
EMail	jdmachin@icai.comillas.edu
Teacher	
Name	Javier Sánchez Alonso
Department	Department of Electronics, Control and Communications
EMail	jsalonso@icai.comillas.edu
Teacher	
Name	José Antonio Villacañas Palomo
Department	Department of Electronics, Control and Communications
EMail	jvillacanas@icai.comillas.edu
Teacher	
Name	Jose María Cogollor Delgado
Department	Department of Electronics, Control and Communications

EMail	jmcogollor@icai.comillas.edu
Teacher	
Name	Lucía Güitta López
Department	Instituto de Investigación Tecnológica (IIT)
Office	Francisco de Ricci, 3
EMail	lguitta@comillas.edu
Phone	4518
Teacher	
Name	Manuel Richi de Zavala
Department	Department of Electronics, Control and Communications
EMail	mrichi@icai.comillas.edu
Teacher	
Name	Rául Puyuelo Morillo
Department	Department of Electronics, Control and Communications
EMail	rpuyuelo@icai.comillas.edu

DESCRIPTION OF THE SUBJECT

Contextualization of the subject

Prerequisites

Basic knowledge of programming, mechanics, electrical engineering and electronics.

Course contents

Contents

Theory:

Topic 1: Introduction
Basic concepts: plant (process), control, operator, sensors, drives, open loop control, closed loop control, continuous processes, discrete processes, batch processing.

Topic 2: Technologies
Automation by means of automatisms and programmable controllers.

Topic 3: Basic methodologies
Programming languages. Programming using combinational and sequential strategies (Grafcet).

Topic 4: Advanced methodologies
Advanced programming of automations using templates: GEMMA and PackML.

Topic 5: Architecture of automated systems
Classical and new architectures for advanced process control. Functional, physical, data and communications organisation. ISA model. Industry 4.0 model. Supervision and control systems (SCADA).

Topic 6: Case studies
Case studies of advanced process control: energy systems, industrial plants (ISA S95), intelligent building management, logistics systems, home automation and security systems.

Topic 7: Reliability
Definitions. Architectures. Reliability analysis. SIL levels. Standardisation: IEC 61508, national legislation.

Lab: Automation, programmable controllers, man-machine interfaces, identification systems, quality control systems and robots.

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
1. Laboratory practice (20%). 2. Class participation (5%).	Understanding of concepts. Application of concepts to the resolution of practical problems in the laboratory. Analysis and interpretation of the results obtained in the problems solved. Ability to work in groups. Presentation and written communication. Participation in solving problems in class. Attitude in class.	25 %
1. Final exam or equivalent project (40%). Those students who have a mark equal to or higher than 7.5 in the follow-up tests and an average mark equal to or higher than 9 in the laboratory practicals may replace the final exam with an individual automation project of average complexity. 2. Follow-up tests (15%). 3. Laboratory exam (20%). For those students who take the equivalent project instead of the final exam, this activity is part of it, with a weight of 60%.	Understanding of concepts. Application of concepts to the resolution of practical problems with special emphasis on the laboratory. Analysis and interpretation of the results obtained in problem solving. Presentation and written communication.	75 %

Grading

The grade in the ordinary call is obtained according to the weights indicated in Assessment Activities, provided that the marks obtained in the final exam, or equivalent project, in the laboratory exam and in the laboratory practicals are greater than or equal to 5.

The grade in the extraordinary exam will be obtained in the same way as in the ordinary exam, substituting the grade obtained in the final exam, or equivalent project, for the grade obtained in the extraordinary exam. In addition, if the mark in the laboratory practicals or in the laboratory exam was lower than 5, there will be a practical exam in the laboratory that will replace the mark in the practicals or in the

laboratory exam or both.

Class attendance is compulsory, according to the Academic Regulations of the Escuela Técnica Superior de Ingeniería (ICAI).
School of Engineering (ICAI). Attendance requirements will be applied independently for theory and laboratory sessions:

- In the case of theory sessions, failure to comply with this rule may prevent the student from taking the exam in the ordinary exam session.
- In the case of laboratory sessions, failure to comply with this rule may prevent the student from taking the exam in the ordinary and extraordinary exams. In any case, unexcused absences from laboratory sessions will be penalised in the evaluation.

BIBLIOGRAPHY AND RESOURCES

Basic References

Slides and course notes