

## [GJH103] ADVANCED INDUSTRIAL AUTOMATION

### GENERAL INFORMATION

<b>Studies</b>	DEGREE IN MECHATRONICS ENGINEERING		<b>Subject</b> ?
<b>Semester</b>	1	<b>Course</b>	4
<b>Character</b>	COMPULSORY		<b>Mention / Field of specialisation</b>
<b>Plan</b>	2020	<b>Modality</b>	Adapted Face-to-face
<b>Credits</b>	4,5	<b>Hours/week</b>	3.75
		<b>Language</b>	ENGLISH
		<b>Total hours</b>	67.5 class hours + 45 non-class hours = <b>112.5 total hours</b>

### PROFESSORS

GOMEZ DIEZ, CARLOS PEDRO
AZKARATE FERNANDEZ, IGOR
AZURMENDI URTEAGA, ASIER
POGGI, TOMASO

### REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
INTRODUCTION TO AUTOMATION	(No previous knowledge required)

### SKILLS

#### VERIFICA SKILLS

##### SPECIFIC

GJCE18 - Ability to design control systems and industrial automation

##### GENERAL

GJCG03 - Addressing and optimising activities of assembly, commissioning, assistance and maintenance of facilities, machinery, and industrial mechatronic systems

GJCG06 - Implement and materialize projects of automation and control of equipment, processes and flexible industrial systems, through the integration of hardware and software in order to optimize the operation of the different units that make up the system to meet the needs of the productive sector

##### BASIC

G\_CB1 - To have proven to understand and have knowledge in a field of study based on general secondary education at a level found in advanced textbooks and including concepts at the forefront of their field of study.

### LEARNING RESULTS

**RGJ407** They understand the industrial networks, fieldbus, communication protocols and basic concepts of industrial communication

#### LEARNING ACTIVITIES

	CH	NCH	TH
Individual study and work, tests and evaluations and check points	2 h.		2 h.
Presentation of the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	2 h.	1 h.	3 h.
Individual or team workshop and/or lab practice	6 h.	6 h.	12 h.

#### EVALUATION SYSTEM

	W
Individual written and oral tests to assess technical skills of the subject	40%
Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices	60%

#### MAKE-UP MECHANISMS

Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices  
**Comments:** Final mark = % 25 ordinary mark + % 75 retake mark. Only the individual test has a retake option.

CH - Class hours: 10 h.

NCH - Non-class hours: 7 h.

TH - Total hours: 17 h.

**RGJ408** They design, develop and validate HMI interfaces with specified requirements

#### LEARNING ACTIVITIES

CH NCH TH

Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	7 h.	4,5 h.	11,5 h.
Presentation of the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	2 h.	2 h.	4 h.
Individual or team workshop and/or lab practice	4,5 h.	2,5 h.	7 h.

**EVALUATION SYSTEM**

*W*

Individual written and oral tests to assess technical skills of the subject	64%
Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices	16%
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	20%

**Comments:** The practical exercise must be approved to evaluate the individual test.

**MAKE-UP MECHANISMS**

Individual written and oral tests to assess technical skills of the subject  
**Comments:** Final mark = % 25 ordinary mark + % 75 retake mark. Only the individual test has retake option.

**CH - Class hours:** 13,5 h.  
**NCH - Non-class hours:** 9 h.  
**TH - Total hours:** 22,5 h.

**RGJ409** They design the automation and supervision system of a real application, assessing the risk, defining and implementing the technical solution required according EN ISO 13.849-1 relative to machine safety.

**LEARNING ACTIVITIES**

*CH*

*NCH*

*TH*

Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	6 h.	4 h.	10 h.
Presentation of the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	25 h.	16 h.	41 h.
Individual or team workshop and/or lab practice	6 h.	4 h.	10 h.

**EVALUATION SYSTEM**

*W*

Individual written and oral tests to assess technical skills of the subject	56%
Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices	14%
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	30%

**Comments:** The practical exercise must be approved to evaluate the individual test.

**MAKE-UP MECHANISMS**

Individual written and oral tests to assess technical skills of the subject  
**Comments:** Final mark = % 25 ordinary mark + % 75 retake mark. Only the individual test has retake option.

**CH - Class hours:** 37 h.  
**NCH - Non-class hours:** 24 h.  
**TH - Total hours:** 61 h.

**RGJ414** They assume responsibilities in the team, organizing and planning the tasks to be developed, dealing with contingencies and encouraging the participation of its members.

**LEARNING ACTIVITIES**

*CH*

*NCH*

*TH*

Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams	2 h.	1 h.	3 h.
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**EVALUATION SYSTEM**

*W*

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	100%
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**MAKE-UP MECHANISMS**

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence  
**Comments:** Continuous assessment. Retake is not foreseen.

**CH - Class hours:** 2 h.
   
**NCH - Non-class hours:** 1 h.
   
**TH - Total hours:** 3 h.

**RGJ415** They analyze the variables involved in the problem and propose actions for a stable situation.

**LEARNING ACTIVITIES**

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Development, writing and presentation of memorandums, reports, audiovisual material, etc.	2 h.	1 h.	3 h.
Relating to projects/POPBLs carried out individually or in teams			

**EVALUATION SYSTEM**

*W*

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

**MAKE-UP MECHANISMS**

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

**Comments:** Continuous assessment. Retake is not foreseen.

**CH - Class hours:** 2 h.
   
**NCH - Non-class hours:** 1 h.
   
**TH - Total hours:** 3 h.

**RGJ416** They define the problem, the development of the solution, as well as the conclusions in an effective way, arguing and justifying each of them, making a correct use of the language, in writing.

**LEARNING ACTIVITIES**

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Development, writing and presentation of memorandums, reports, audiovisual material, etc.	1 h.	2 h.	3 h.
Relating to projects/POPBLs carried out individually or in teams			

**EVALUATION SYSTEM**

*W*

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

**MAKE-UP MECHANISMS**

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

**Comments:** Continuous assessment. Retake is not foreseen.

**CH - Class hours:** 1 h.
   
**NCH - Non-class hours:** 2 h.
   
**TH - Total hours:** 3 h.

**RGJ417** They define the problem, the development of the solution, as well as the conclusions in an effective way, arguing and justifying each one of them, and making a correct use of the language, orally.

**LEARNING ACTIVITIES**

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Development, writing and presentation of memorandums, reports, audiovisual material, etc.	2 h.	1 h.	3 h.
Relating to projects/POPBLs carried out individually or in teams			

**EVALUATION SYSTEM**

*W*

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

**MAKE-UP MECHANISMS**

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

**Comments:** Continuous assessment. Retake is not foreseen.

**CH - Class hours:** 2 h.
   
**NCH - Non-class hours:** 1 h.
   
**TH - Total hours:** 3 h.

## CONTENTS

- 1.-Advanced programming of PLCs
  - 1.1-PLC programmingenvironment.
  - 1.2-PLC basic concepts
  - 1.3-Advanced Programming (Numerical Processing, Analog Processing, FC, FB and Variables)
- 2-Industrial Communications (Industrial Ethernet, industrial field buses, OPC UA)
- 3.-HMIs, monitoring and control.
- 4.-Machine Safety
  - 4.1-Directives and Regulations (2006/42 / CE, CE marked, UNE-EN ISO12.100, UNE-EN ISO 13849-1: 2008)
- 5.-Introduction to "Motion control"

## LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Moodle Platform	<a href="https://www.br-automation.com/en/academy/classroom-learning/training-modules/">https://www.br-automation.com/en/academy/classroom-learning/training-modules/</a>
Lab practical training Programmes	<a href="https://www.br-automation.com/en/academy/virtual-classroom/br-tutorial-portal/">https://www.br-automation.com/en/academy/virtual-classroom/br-tutorial-portal/</a> PLCs OMRON: <a href="https://sites.google.com/view/omron-spain-education/p%C3%A1gina-principal/cursos/sysmac-automat-avanzada">https://sites.google.com/view/omron-spain-education/p%C3%A1gina-principal/cursos/sysmac-automat-avanzada</a> Web Omron: <a href="https://automation.omron.com/es/us/support/resources/downloads.html?filters=type==document&amp;filters=type.document==type.document&amp;page=1&amp;pageSize=10">https://automation.omron.com/es/us/support/resources/downloads.html?filters=type==document&amp;filters=type.document==type.document&amp;page=1&amp;pageSize=10</a> <a href="http://katalogoa.mondragon.edu/janium-bin/janium_login_opac_re_ink.pl?grupo=MECATRONICA41&amp;ejecuta=5&amp;_ST">http://katalogoa.mondragon.edu/janium-bin/janium_login_opac_re_ink.pl?grupo=MECATRONICA41&amp;ejecuta=5&amp;_ST</a>